Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year Ended 31st December

1956

VICTORIA, B.C.
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1957

BRITISH COLUMBIA DEPARTMENT OF MINES

VICTORIA, B.C.

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J. D. LINEHAM, *Chief, Petroleum and Natural Gas Conservation Branch.*

To His Honour FRANK MACKENZIE ROSS, C.M.G., M.C.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mining Industry of the Province for the year 1956 is herewith respectfully submitted.

W. K. KIERNAN,
Minister of Mines.

Minister of Mines' Office.
May, 1957.

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ANNUAL REPORT OF THE MINISTER OF MINES, 1956

Introduction

A Report of the Minister of Mines of the Province of British Columbia has been published each year since 1874.

The Annual Report records the salient facts in the progress of the mineral industry, also much detail about individual operations, including those undertaken in the search for, exploration of, and development of mineral deposits, as well as the actual winning of material from mineral deposits.

The Annual Report of the Minister of Mines now contains introductory sections dealing with Statistics and Departmental Work, followed by sections dealing with Lode Metals; Placer; Structural Materials and Industrial Minerals; Petroleum and Natural Gas; Inspection of Lode Mines, Placer Mines, and Quarries; Coal; and Inspection of Electrical Equipment and Installations at Mines and Quarries, each with its own table of contents. A table listing the properties described, in geographic groupings, precedes the index.

An introductory review of the mineral industry and notes at the first of several of the main sections deal generally with the industry or its principal subdivisions. Notes in the various sections deal briefly with exploration or production operations during the year or describe a property in more complete detail, outlining the history of past work and the geological setting as well as describing the workings and the mineral deposits exposed in them. Some notes deal with areas rather than with a single property.

The work of the branches of the Department is outlined briefly in the section on Departmental Work. This section is followed by notes dealing briefly with the work of the British Columbia or Federal Government services of particular interest to the mineral industry of British Columbia. Information concerning mine operations and some of the activities of the Inspection Branch of the Department of Mines is contained in the section on Inspection of Lode Mines, Placer Mines, and Quarries, early in the section on Coal and in the section on Inspection of Electrical Equipment and Installations at Mines and Quarries. For this 1956 Annual Report, notes on electrical installations at mines are printed for separate distribution and are not included in the Report.

The section on Statistics begins with an outline of current and past practice in arriving at quantities and calculating the value of the various products.

Review of the Mineral Industry in British Columbia, 1956*

In total value of all products, in the value of two of the five groups of products, in quantity of zinc produced, and in several other items new records were established by the mineral industry of British Columbia in the year ended December 31st, 1956. As a portent of future developments the commercial production of petroleum achieved early in the year may well have been the most significant of the records established.

Substantial progress was made in the construction of the main pipe-line to convey natural gas from northeastern British Columbia and the neighbouring part of Alberta to markets in southern British Columbia and south of the International Boundary. Other features of the year's activities include the equipping of two properties with mills for concentrating copper ore, equipping an iron property with a mill that, in addition to producing a high-grade iron concentrate, recovers a by-product copper concentrate, and the beginning of a programme to prepare another iron property for production.

Prospecting and exploration were carried on in many parts of the Province, notably in the northwestern part where much interest was shown in the search for lode metals and asbestos, in the northeastern part where the interest was in petroleum and natural gas, in south central British Columbia where interest was principally in copper, and on Vancouver and Moresby Islands where the interest was in copper and iron. Interest was also shown in coal, principally on upper Elk River, in the Crowsnest Pass area. The number of mineral claims recorded, more than 26,000, is the greatest in any year and is nearly five times the yearly average for the preceding ten years. The area held under permit, licence, and lease, under the "Petroleum and Natural Gas Act," has been exceeded in one year only, and the total drilling in wells drilled for petroleum and natural gas is substantially greater than for any previous year.

Tables listing average metal prices, quantities and values of mineral products, production from various parts of British Columbia, dividends, and principal items of expenditure by the mineral industry, appear on pages A 16 to A 52 and permit comparison with preceding years.

The total value for all mineral products, $190,084,643, is substantially greater than for any preceding year in British Columbia records of 120 years of mineral production.

The record production value reflects high output in all the major subdivisions of the mineral industry. Principal lode metals contributed 71 per cent of the total. The value for this group, $135,004,363, has been exceeded only in 1951. Miscellaneous metals, including tungsten, iron, and the by-product metals recovered from silver-lead-zinc ores contributed 7 per cent of the total. Structural materials contributed 11 per cent of the total value, and industrial minerals and fuels each contributed more than 5 per cent. The values for industrial minerals and for structural materials exceeded previous years; several items in these groups set new records, notably asbestos, cement, sand and gravel, and rubble, riprap, and crushed rock.

Gold output in 1956 was materially less than in 1955, principally because the historic Nickel Plate mine was closed in September, 1955, but small reductions in gold output were common throughout the Province. Silver output increased by 500,000 ounces, increases in the Omineca and Slocan Mining Divisions being more than enough to offset losses in several other mining divisions. Output of copper and lead declined slightly with little change in value, zinc output increased by 3½ per cent in quantity and 11 per cent in value.

* By Hartley Sargent, Chief of the Mineralogical Branch.

The value of gold, silver, copper, lead, and zinc produced in British Columbia is controlled by United States prices for those metals, by the rate of exchange, and by duties on ores or metals entering the United States*. Prices for silver, lead, and zinc rose slightly in the United States in 1956. The price for copper rose to 49.121 cents a pound in the latter part of March and thereafter fell steadily, reaching 33.58 cents a pound at the end of the year.

The value of the Canadian dollar in United States funds ranged from $0.9908 on January 5th, 1956, to $1.0426 on January 5th, 1957, averaging $1.0162 for the calendar year. Accordingly prices for the principal metals, in Canadian funds, averaged approximately 1.6 per cent below United States prices, compared with 1.37 per cent for 1955. However, at the end of 1956 the discount on United States funds was more than 4 per cent. The steadily increasing discount on the United States dollar in Canada partly offset the small gains in United States prices for silver, lead, and zinc; and for copper accentuated the falling price. The net effect of changing prices and exchange gave average prices in Canadian funds for silver, copper, lead, and zinc for 1956, 2½ to 10½ per cent higher than the 1955 averages.

Metals other than gold, silver, copper, lead, and zinc contributed more than $14,000,000 to the total value of mineral products. These metals include iron and tungsten in the form of high-grade concentrates. They also include antimony, bismuth, cadmium, indium, and tin recovered as by-products from silver-lead-zinc ores. Of these metals, indium has reached a significant level in the last two years.

Silver-lead-zinc mines yielded a total of some 5,000,000 tons of ore in 1956, of which more than half came from Kimberley, a fourth came from the Salmo-Pend d'Oreille River area, and the remainder from camps in widely separated parts of the Province. The large copper mines, at Copper Mountain and Britannia Beach, yielded 81 per cent of the copper produced and about 8 per cent of the gold; lode-gold mines in the Bridge River area and at Wells yielded 80 per cent of the gold; the remaining 12 per cent came mainly from mines worked primarily for silver, lead, and zinc.

In recent years much interest has been shown in limestone for the principal ingredient in cement and for other purposes. The quarry at Cobble Hill has become the principal source of cement rock for the British Columbia Cement Company plant at Bamberton. The plant is supplied in part from quarries at Bamberton and on Texada Island. The company increased the capacity of its plant in 1952, and a further increase was being made in 1956. British Columbia Cement Company did further testing of its limestone holdings at Davie Bay on Texada Island. Ideal Cement Company, Superior Cement Company, and Lafarge Cement of North America Ltd. have all acquired limestone holdings on Texada Island, and the Lafarge company has acquired a site for a cement plant on Lulu Island. Gypsum Lime and Alabastine, Canada, Limited, has acquired limestone on Texada Island and is in production at Blubber Bay. The company closed its gypsum quarries at Falkland and is now supplying its plant at Port Mann with gypsum imported from Mexico. The quarries at Falkland had been in production since 1927. Gypsum produced by Columbia Gypsum Co. Ltd. at Windermere is being sold mainly to cement plants in Alberta and Washington. A very large increase in the production of sand and gravel recorded in 1956 reflects the construction of bridges, highways, and buildings.

Prospecting for lode deposits was carried on actively. In northern British Columbia fixed-wing aircraft and helicopters were used extensively for transportation. Discoveries made by surface prospecting include: Nickel at Opal Lake, southeasterly from Teslin Lake; silver-lead at Tootsee River, 65 miles westerly from Watson Lake; asbestos, some 50 miles southeast of Dease Lake; mercury, a few miles northeasterly from Fort St. James; and silver-lead-zinc on Jordan River, northwest of Revelstoke. Detailed investigations applied in and close to established camps have been successful in recent years,

* United States import duties on these metals remained unchanged in 1956.

notably in silver-lead-zinc camps in the East and West Kootenay areas, and in the copper area at Highland Valley.

Ten years of exploration for petroleum and natural gas involving expenditure of more than $50,000,000 for geological and geophysical exploration and for drilling wells has proven the existence of large reserves of natural gas in a dozen areas and oil in two fields in northeastern British Columbia. The total drilling in 1956 amounted to more than 397,000 feet. Counting a 1952 well reworked in 1956, nine were completed as oil wells, bringing the number of commercial oil wells to ten—six in the Boundary Lake field and four in the Fort St. John field. All the wells were producing by the end of the year, the oil being trucked to the X-L refinery at Dawson Creek that had begun operating early in 1956.

Except for supplying local needs at Fort St. John, production from British Columbia gas wells awaits completion of the 650-mile 30-inch gas pipe-line being built for Westcoast Transmission Company Limited.

The average number employed throughout 1956 in placer, lode, fuel, industrial-mineral, and structural-material mining was 14,539. Major expenditures by those branches of the industry included: Salaries and wages, $57,266,026; fuel and electricity, $9,762,777; process supplies, $22,036,839; Federal taxes, $14,833,556; Provincial taxes, $4,118,363; municipal and other taxes, $151,235; levies for workmen's compensation (including silicosis), unemployment insurance, and other items, $2,636,014. Dividends amounted to $36,262,682. The lode-mining industry spent $31,933,681 in freight and treatment charges on ores and concentrates. Expenditure in exploration for petroleum and natural gas in 1956 was $15,042,918.

Statistics

The statistics of the mineral industry are collected and compiled and the statistical tables for this Report are prepared by the Bureau of Economics and Statistics, Department of Industrial Development, Trade, and Commerce.

In the 1951 Report, extensive rearrangements of tables and of their order were made. The tables in the present Report closely parallel those presented in Reports for years preceding 1951, but additional details have been incorporated, and the present order is considered to make more apparent the relationship between summary tables and the tables giving the details summarized.

METHOD OF COMPUTING PRODUCTION

The tables of statistics recording the mineral production of the Province for each year are compiled from certified returns made by the operators, augmented by some data obtained from the Royal Canadian Mint and from the operators of customs smelters. The value of each mineral product, in Canadian funds, is calculated at the average price for the year (*see* p. A 16). The quantities of metals are net after making deductions for losses in smelting and refining.

METALS

Prior to 1925 the average prices for gold and copper are true average prices, but, as a means of correcting for losses in smelting and refining, the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent. For 1925 and subsequent years the value has been calculated using the true average price and the net metal contents, in accordance with the procedures adopted by the Dominion Bureau of Statistics and the co-operating Provincial Departments of Mines.

Beginning with the Annual Report for 1948, production figures for individual lode-mining operations are the assay contents of the products shipped (ore, concentrates, or bullion), no deductions being made for losses in smelting and refining. In previous Annual Reports the production figures given for individual properties are net, after deductions for smelting and refining losses.

Placer Gold

The data on placer-gold production were very largely obtained from the Gold Commissioners until 1925. The value of placer gold in dollars is now obtained from returns received annually from the operators. At the old standard price, $20.67 per ounce of fine gold, $17 was regarded as a close approximation of the average value per ounce of crude placer gold produced in British Columbia. Dividing the production reported in dollars by 17 gave the equivalent in crude ounces. The average value $17 per ounce is equivalent to a fineness of 822½. Beginning with 1932 the average value per crude ounce has been based on the same fineness but has recognized the varying price of gold. The average price per ounce of crude placer gold for the year is listed on page A 16.

Lode Metals, Gross and Net Contents

The gross contents are the gold and silver contents of bullion and for ores and concentrates the total assay contents, obtained by multiplying the assay by the weight. The quantities for gold, silver, copper, lead, and zinc in Table XV and in " Notes on Metal Mines " are gross.

Calculations of the value of production are based on the total assay content for gold and on net content for the other principal metals. These are: In lead ores and concentrates and zinc concentrates, for silver 98 per cent, lead 95 per cent, and zinc 85 per cent of the total assay content; and in copper concentrates, 95 per cent of the silver and the total assay content of copper less 10 pounds per ton of concentrates. Quantities for silver, lead, zinc, and copper in Tables I to VIII, inclusive, are net.

Average Metal Prices

In the interests of uniformity the Statistical Bureaux of the Provinces and the Dominion Bureau of Statistics use the same average metal prices in valuing mineral production. Up to and including the year 1939 the prices used in evaluating metal and mineral production were:—

Gold and silver: The average United States price for the year, as quoted in the Engineering and Mining Journal, converted into Canadian funds at the average exchange rate.

Copper, lead, and zinc: For lead and zinc, the average London Metal Market price for the year converted into Canadian funds at the average exchange rate; for copper, until 1932 the New York price for copper was used, thereafter the average London Metal Market price was used.

Suspension of trading on the London Metal Exchange in September, 1939, and the controls of metals during the war years necessitated changes from the procedures which had been followed.

The method of arriving at the price for gold continued unchanged, but the prices for the metals controlled were those set by the Canadian Metals Controller. In 1945 the controls were largely removed from sales but not from prices. Control of metal prices ended on June 6th, 1947. For 1945 and subsequent years the prices are those computed by the Dominion Bureau of Statistics, using information supplied by the principal Canadian refiners of silver and the base metals.

In the period 1945–47 the prices received for silver, lead, and zinc sold for use in Canada were substantially less than the prices received for these metals exported to the United States. The prices for silver in 1945 and 1946 and for copper, lead, and zinc in 1946 and 1947 are weighted averages, taking into consideration sales in Canada at the ceiling prices and sales abroad at New York prices converted into Canadian funds.

Prices are now arrived at by the methods as given in the footnotes to table of average prices on page A 16.

FUEL

Coal

In 1926 a change was made in computing coal and coke statistics. The practice in former years had been to list as coke production only the coke made in bee-hive ovens, the coal used in making it not being listed; coke made in by-product ovens was not listed as coke, but the coal used in making this coke was credited as coal production. The result was that both the coal and the coke production figures were incomplete. Starting with the 1926 Annual Report, the standard practice of the Bureau of Statistics, Ottawa, was adopted. This consists of crediting all coal produced, including that used in making coke, as primary mine production. Coke-making is considered a manufacturing industry. As the data are of interest to the mining industry, Table X is included in the Report to show the total coke produced in the Province, together with by-products, and the values given by the producers. The pre-1926 data have now been reworked and brought into conformity with current practice. Table IXA lists the full mine output (gross) produced and its net value, and these figures are incorporated in Table I, in the total mine production for the Province. Table X gives the complete data for coke, gas, and by-products manufactured for the period 1895 to 1925, and for each year subsequent to 1925.

Up to and including the year 1947, production was recorded in long tons (2,240 pounds). Beginning in 1948, production is given in short tons (2,000 pounds). The quantity of coal produced in the preceding years has been recalculated in short tons.

The average price for coal, listed year by year (*see* p. A 16), is the total value divided by the quantity. Up to and including 1945, the quantity is the gross mine output; for 1946 and subsequent years, the quantity is the quantity sold and used. For 1946 and subsequent years, the value (Tables I, III, VIIA, IXA, IXB, and IXC) is the amount realized from sales of coal, at colliery loading points, plus the colliery valuation of coal used under companies' boilers and in making coke. For 1946 and subsequent years the quantity sold and used is shown in Table IXC. " Use " includes coal used under company stationary and locomotive boilers, and used in making coke. Washery loss and changes in stocks, year by year, are shown in the table " Collieries of British Columbia, Production and Distribution by Collieries and by Districts," page 198 of this Report.

Natural Gas

Commercial production of natural gas began in 1954. The production shown in Tables I, III, VIIA, and VIIIA is gas sold in Fort St. John. The figures are compiled from the Crown royalty statements filed monthly with the Department of Mines by the producer. The quantity is reported as thousands of cubic feet at standard conditions (14.4 pounds per square inch pressure, 60° F. temperature).

Petroleum

Commercial production of petroleum began in 1956. The figures shown in Tables I, III, VIIA, and VIIIA are compiled from the Crown royalty statements filed monthly with the Department of Mines by the producer. The quantity is reported in barrels (35 imperial gallons = 1 barrel).

Average Prices Used in Valuing Provincial Production of Gold, Silver, Copper, Lead, Zinc, and Coal

Year	Gold,[1] Crude, Oz.	Gold, Fine, Oz.	Silver, Fine, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.	Coal, Short Ton
	$	$	Cents	Cents	Cents	Cents	$
1901	17.00	20.67	56.002 N.Y.	16.11 N.Y.	2.577 N.Y.	....	2.679
1902	....	....	49.55 „	11.70 „	3.66 „	....	....
1903	....	....	50.78 „	13.24 „	3.81 „	....	....
1904	....	....	53.36 „	12.82 „	3.88 „	....	....
1905	....	....	51.33 „	15.59 „	4.24 „	....	....
1906	....	....	63.45 „	19.28 „	4.81 „	....	....
1907	....	....	62.06 „	20.00 „	4.80 „	....	3.125
1908	....	....	50.22 „	13.20 „	3.78 „	....	....
1909	....	....	48.93 „	12.98 „	3.85 „	....	....
1910	....	....	50.812 „	12.738 „	4.00 „	4.60 E. St. L.	....
1911	....	....	50.64 „	12.38 „	3.98 „	4.90 „	....
1912	....	....	57.79 „	16.341 „	4.024 „	5.90 „	....
1913	....	....	56.80 „	15.27 „	3.93 „	4.80 „	....
1914	....	....	52.10 „	13.60 „	3.50 „	4.40 „	....
1915	....	....	47.20 „	17.28 „	4.17 „	11.25 „	....
1916	....	....	62.38 „	27.202 „	6.172 „	10.88 „	....
1917	....	....	77.35 „	27.18 „	7.91 „	7.566 „	....
1918	....	....	91.93 „	24.63 „	6.67 „	6.94 „	4.464
1919	....	....	105.57 „	18.70 „	5.19 „	6.24 „	....
1920	....	....	95.80 „	17.45 „	7.16 „	6.52 „	....
1921	....	....	59.52 „	12.50 „	4.09 „	3.95 „	....
1922	....	....	64.14 „	13.38 „	5.16 „	4.86 „	....
1923	....	....	61.63 „	14.42 „	6.54 „	5.62 „	....
1924	....	....	63.442 „	13.02 „	7.287 „	5.39 „	....
1925	....	....	69.065 „	14.042 „	7.848 Lond.	7.892 Lond.	....
1926	....	....	62.107 „	13.795 „	6.751 „	7.409 „	....
1927	....	....	56.37 „	12.92 „	5.256 „	6.194 „	....
1928	....	....	58.176 „	14.570 „	4.575 „	5.493 „	....
1929	....	....	52.993 „	18.107 „	5.050 „	5.385 „	....
1930	....	....	38.154 „	12.982 „	3.927 „	3.599 „	....
1931	....	....	28.700 „	8.116 „	2.710 „	2.554 „	4.018
1932	19.30	23.47	31.671 „	6.380 Lond.	2.113 „	2.405 „	3.795
1933	23.02	28.60	37.832 „	7.454 „	2.391 „	3.210 „	....
1934	28.37	34.50	47.461 „	7.419 „	2.436 „	3.044 „	....
1935	28.94	35.19	64.790 „	7.795 „	3.133 „	3.099 „	....
1936	28.81	35.03	45.127 „	9.477 „	3.913 „	3.315 „	....
1937	28.77	34.99	44.881 „	13.078 „	5.110 „	4.902 „	....
1938	28.93	35.18	43.477 „	9.972 „	3.344 „	3.073 „	....
1939	29.72	36.14	40.488 „	10.092 „	3.169 „	3.069 „	....
1940	31.66	38.50	38.249 „	10.086 „	3.362 „	3.411 „	....
1941	31.66	38.50	38.261 „	10.086 „	3.362 „	3.411 „	....
1942	31.66	38.50	41.166 „	10.086 „	3.362 „	3.411 „	....
1943	31.66	38.50	45.254 „	11.75 „	3.754 „	4.000 „	....
1944	31.66	38.50	43.000 „	12.000 „	4.500 „	4.300 „	....
1945	31.66	38.50	47.000 „	12.550 „	5.000 „	6.440 „	....
1946	30.22	36.75	83.650 „	12.80 „	6.750 „	7.810 „	4.68
1947	28.78	35.00	72.000 „	20.39 „	13.670 „	11.230 „	5.12
1948	28.78	35.00	75.000 Mont.	22.35 U.S.	18.040 „	13.930 „	6.09
1949	29.60	36.00	74.250 U.S.	19.973 „	15.800 U.S.	13.247 U.S.	6.51
1950	31.29	38.05	80.635 „	23.428 „	14.454 „	15.075 „	6.43
1951	30.30	36.85	94.55 „	27.70 „	18.4 „	19.9 „	6.46
1952	28.18	34.27	83.157 „	31.079 „	16.121 „	15.874 „	6.94
1953	28.31	34.42	83.774 „	30.333 „	13.265 „	10.675 „	6.88
1954	27.52	34.07	82.982 „	29.112 „	13.680 „	10.417 „	7.00
1955	28.39	34.52	87.851 „	38.276 „	14.926 „	12.127 „	6.74
1956	**28.32**	**34.44**	**89.373 „**	39.787 „	**15.756 „**	**13.278 „**	**6.59**

[1] Unrefined placer gold, average price per ounce, is taken as $17 divided by $20.67 times the price of an ounce of fine gold.

Prices for fine gold are the Canadian Mint buying prices. Prices for other metals are those of the markets indicated, converted into Canadian funds. The abbreviations are: Mont.=Montreal; N.Y.=New York; Lond.=London; E. St. L. =East St. Louis; and U.S.=United States.

Prior to 1925 the prices for gold and copper are true average prices, but the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent.

For coal *see* last paragraph under "Fuel," page A 15.

The bases for the prices listed are discussed in detail on pages A 14 and A 15.

TABLE I.—TOTAL MINERAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1956

	Total Quantity	Total Value	Quantity, 1956	Value, 1956
Gold—placer crude, oz.	5,197,360	$95,874,169	3,865	$109,450
„ lode fine, oz.	14,913,705	427,722,891	191,743	6,603,628
Silver oz.	394,973,659	232,984,039	8,404,600	7,511,443
Copper lb.	2,887,333,591	469,058,693	43,360,575	17,251,872
Lead lb.	12,002,941,191	840,459,498	283,718,073	44,702,619
Zinc lb.	9,443,802,693	731,091,267	443,853,004	58,934,801
Miscellaneous metals[1]		117,144,154		14,327,010
Industrial minerals[2]		62,929,269		10,390,338
Structural materials[3]		223,069,929		20,587,159
Coal tons	139,277,957[4]	532,868,301	1,417,209[4]	9,346,518
Natural gas M c.f.	446,055	44,868	216,521	20,193
Petroleum, crude bbls.	147,146	299,612	147,146	299,612
Totals		$3,733,546,690		$190,084,643

[1] For individual miscellaneous metals, *see* Tables III and VIIIc, pages A 18 and A 32.
[2] For individual industrial minerals, including sulphur, *see* Tables III and VIIID, pages A 18 and A 34.
[3] For individual structural materials, *see* Tables III and VIIIE, pages A 18 and A 36.
[4] Total quantity is *gross* mine output; it includes material discarded in picking and washing. The quantity shown for 1956 is that sold and used (*see also* Table IXc).

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1836 TO 1956, INCLUSIVE

1836–95 (incl.)	$95,355,010	1927	$60,729,358
1896	7,507,956	1928	65,372,583
1897	10,455,268	1929	68,505,527
1898	10,906,861	1930	55,660,399
1899	12,429,707	1931	34,968,916
1900	16,344,751	1932	28,855,660
1901	19,671,572	1933	32,650,554
1902	17,486,550	1934	42,444,013
1903	17,495,954	1935	48,886,303
1904	18,977,359	1936	54,179,442
1905	22,461,325	1937	74,475,902
1906	24,980,546	1938	64,485,551
1907	25,882,560	1939	65,707,398
1908	23,851,277	1940	75,701,145
1909	24,443,025	1941	78,479,719
1910	26,377,066	1942	75,551,093
1911	23,499,072	1943	65,892,395
1912	32,440,800	1944	54,923,803
1913	30,296,398	1945	63,343,949
1914	26,388,825	1946	72,319,951
1915	29,447,508	1947	113,314,314
1916	42,290,462	1948	151,436,039
1917	37,010,392	1949	131,100,468
1918	41,782,474	1950	148,289,687
1919	33,296,313	1951	175,613,693
1920	35,543,084	1952	171,309,429
1921	28,066,641	1953	152,628,683
1922	35,162,843	1954	153,383,860
1923	41,304,320	1955	174,710,606
1924	48,704,604	1956	190,084,643
1925	61,492,242		
1926	67,188,842	Total	$3,733,546,690

Table III.—Quantity and Value of Mineral Products for Years 1947 to 1956

Description	1947		1948		1949		1950		1951	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude .... oz.	6,969	200,585	20,332	585,200	17,886	529,524	19,134	598,717	23,691	717,911
,, lode, fine .... oz.	243,282	8,514,870	286,230	10,018,050	288,396	10,382,256	283,983	10,805,553	261,274	9,627,947
Silver .... oz.	5,707,691	4,109,538	6,718,122	5,038,592	7,636,053	5,669,769	9,507,225	7,666,151	8,215,884	7,768,118
Copper .... lb.	41,783,921	8,519,741	43,025,388	9,616,174	54,856,808	10,956,550	42,212,133	9,889,458	43,249,658	11,980,155
Lead .... lb.	306,400,709	41,884,977	332,996,351	60,072,542	263,580,549	41,645,726	307,122,803	44,391,530	273,456,604	50,316,015
Zinc .... lb.	268,450,926	30,147,039	296,012,941	41,234,603	276,324,451	36,604,700	324,263,778	48,882,765	333,910,764	66,448,242
Totals		93,376,750		126,565,161		105,788,525		122,234,174		146,858,388
Miscellaneous Metals										
Antimony .... lb.	1,150,463	384,255	310,062	113,173	158,288	61,020	643,540	216,229	1,310,836	622,647
Bismuth .... lb.	284,357	560,183	222,000	444,000	102,913	210,972	162,616	369,138	191,471	451,872
Cadmium .... lb.	547,248	941,266	617,226	1,126,437	665,449	1,364,170	650,540	1,535,274	1,164,933	3,122,021
Indium .... oz.					689	1,550	4,952	12,132	582	1,368
Iron ore .... tons					5,472	27,579			113,535	790,000
Mercury .... lb.			679	3,735						
Platinum .... oz.	1	59	242	21,175	99	7,468	111	9,239	22	2,085
Tin .... lb.	714,198	517,794	691,332	688,567	619,117	633,047	796,403	828,259	346,718	495,807
Tungsten (WO_3) .... lb.	496,023	680,792	1,409,297	1,409,297			281,160	281,160		
Totals		3,084,349		3,806,384		2,305,806		3,251,431		5,485,800
Industrial Minerals										
Barite .... tons	2,875	26,650	1,632	16,317	1,314	13,145	1,440	17,284	1,248	16,224
Diatomite .... tons	59	1,472	24	817	36	963	4	108	8	223
Flux (quartz, limestone) .... tons	102,918	174,655	83,389	248,977	108,531	213,773	144,325	268,411	144,235	292,100
Granules (quartz, limestone, granite) .... tons	1,156	19,686	4,958	68,937	5,941	79,661	7,886	104,590	5,727	73,767
Gypsum and products .... tons	67,112	523,298	77,055	546,707	98,977	616,490	92,882	620,108	124,729	263,072
Iron oxides .... tons	58	464	3,386	30,472	2,752	23,301				
Mica .... lb.	1,808,000	24,240	894,000	9,494	578,000	5,675	456,000	5,533	606,000	7,462
Sodium carbonate .... lb.	163	1,793			47	517				
Sulphur .... tons	157,161	1,503,714	144,448	1,409,156	160,435	1,546,798	143,343	1,421,806	194,874	1,840,992
Totals		2,275,972		2,330,877		2,500,323		2,437,840		2,493,840
Structural Materials										
Brick—common .... No.	4,318,000	122,660	3,810,000	111,300	3,220,000	95,075	3,980,500	117,770	1,353,000	41,820
,, face, paving, sewer .... No.	1,232,812	64,849	2,584,752	129,268	509,560	24,793	974,380	52,823	3,127,888	153,575
,, firebrick, blocks		389,899		392,458		135,391		282,962		380,742
Clays .... tons	11,428	9,675	5,673	32,922	6,500	22,339	6,706	32,264	14,786	60,255
Structural tile, hollow blocks		158,276		116,513		145,512		191,016		171,481
Drain-tile, sewer-pipe, flue-linings		361,975		597,541		265,098		428,418		410,206
Pottery—glazed or unglazed		3,476		5,138		5,176		5,860		4,695
Other clay products		9,332		9,611		9,676		11,335		10,393
Cement		1,896,772		2,441,304		3,209,425		3,088,296		3,311,439
Lime and limestone .... tons	151,671	714,126	209,453	1,177,632	179,400	1,295,087	221,454	1,133,776	241,723	1,251,327
Rubble, riprap, crushed rock .... tons	222,044	216,873	896,780	839,780	1,112,272	916,841	1,164,049	990,257	972,178	1,145,072
Sand and gravel		1,828,919		3,060,535		3,967,132		3,723,487		3,355,693
Stone .... tons	19,835	119,971	3,579	54,220	2,287	44,345	26,758	188,675	4,837	309,350
Totals		5,896,803		8,968,222		9,955,890		10,246,939		10,606,048
Fuel										
Coal[1] .... tons	1,514,598	8,680,440	1,604,480	9,765,395	1,621,268	10.549,924	1,574,006	10,119,303	1,573,572	10,169,617
Provincial totals		113,314,314		151,436,039		131,100,468		148,289,687		175,613,693

TABLE III.—QUANTITY AND VALUE OF MINERAL PRODUCTS FOR YEARS 1947 TO 1956—*Continued*

Description	1952		1953		1954		1955		1956	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude ..... oz.	17,554	494,756	14,245	403,230	8,684	238,967	7,666	217,614	3,865	109,450
„ lode, fine ..... oz.	251,393	8,615,238	253,553	8,727,294	258,388	8,803,279	242,477	8,370,306	191,743	6,603,628
Silver ..... oz.	8,796,720	7,315,088	8,376,953	7,017,709	9,825,153	8,153,108	7,902,145	6,942,113	8,404,600	7,511,443
Copper ..... lb.	42,005,512	13,054,893	49,021,013	14,869,544	50,150,087	14,599,693	44,328,031	16,932,549	43,360,575	17,251,872
Lead ..... lb.	284,949,396	45,936,692	296,559,781	39,338,655	332,474,456	45,482,505	302,567,640	45,161,245	283,718,073	44,702,619
Zinc ..... lb.	372,871,717	59,189,656	378,345,159	40,388,346	334,124,560	34,805,755	429,198,565	52,048,909	443,853,004	58,934,801
Totals		134,606,323		110,744,778		112,083,307		129,672,736		135,113,813
Miscellaneous Metals										
Antimony ..... lb.	2,333,239	1,028,025	1,551,043	570,474	1,302,333	382,104	2,021,721	667,776	2,140,432	768,843
Bismuth ..... lb.	142,246	312,941	71,298	157,569	225,351	493,519	160,767	356,903	156,753	346,424
Cadmium ..... lb.	726,172	1,561,270	787,158	1,550,701	680,734	1,123,211	1,593,591	2,677,233	1,937,927	3,236,338
Indium ..... oz.	404	889	6,752	14,922	477	1,281	104,774	232,389	363,192	795,390
Iron ore ..... tons	900,481	5,474,924	991,248	6,763,105	535,746	3,733,891	610,930	3,228,756	369,955	2,190,847
Mercury ..... lb.							75	250		
Platinum ..... oz.	2	176				408				
Tin ..... lb.	212,113	250,293	1,092,228	581,746	587,528	280,437	391,228	311,613	756,934	637,792
Tungsten (WO_3) ..... lb.	1,434,640	4,565,024	2,168,977	5,950,323	2,206,443	5,851,558	1,914,000	5,460,967	2,264,775	6,351,376
Totals		13,193,542		15,588,840		11,866,409		12,935,887		14,327,010
Industrial Minerals										
Asbestos		23,000		988,716		2,920,751		4,265,971		6,620,060
Barite ..... tons	848	13,408	3,560	52,845	5,056	115,337	9,465	238,825	11,436	287,626
Diatomite ..... tons	12	240					14	280	40	800
Flux (quartz, limestone) ..... tons	55,588	141,478	37,358	110,698	39,897	40,804	111,759	208,198	176,311	392,429
Granules (quartz, limestone, granite) ..... tons	1,610	21,026	4,620	59,321	4,541	65,507	6,355	73,858	13,220	173,214
Gypsum and products ..... tons	91,112	235,453	172,665	387,655	175,480	421,734	149,719	383,934	72,973	391,919
Mica ..... lb.	314,000	3,001	604,000	11,338	284,000	5,326	505,300	2,861	200,000	1,100
Perlite ..... tons			1,112	11,120						
Sulphur ..... tons	182,607	1,745,258	151,954	1,590,055	219,999	2,308,422	216,520	2,624,171	212,885	2,523,190
Totals		2,182,864		3,211,748		5,877,881		7,798,098		10,390,338
Structural Materials										
Brick—common ..... No.	830,815	28,248	1,382,883	51,381	1,289,911	35,550	4,853,940	232,139	2,248,447	75,767
„ face, paving, sewer ..... No.	2,566,540	121,254	4,307,894	226,459	5,651,262	316,676	3,901,866	248,913	6,913,682	485,176
„ firebrick, blocks		435,681		426,783		372,528		578,578		600,753
Clays ..... tons	11,483	51,797	5,226	31,990	6,609	36,425	8,033	46,757	7,985	47,101
Structural tile, hollow blocks		60,273		123,469		122,903		114,460		129,257
Drain-tile, sewer-pipe, flue-linings		468,110		627,097		753,297		801,019		696,385
Pottery—glazed or unglazed		6,536		30,012		31,081		38,035		38,385
Other clay products		11,296		19,267		32,697		55,514		69,659
Cement		3,603,273		5,071,260		4,935,298		5,474,875		6,339,071
Lime and limestone ..... tons	321,710	1,552,772	338,005	1,357,958	317,976	1,555,002	318,152	1,711,348	396,012	1,220,792
Rubble, riprap, crushed rock ..... tons	739,504	982,792	770,415	1,122,516	920,707	1,253,856	890,613	962,272	2,028,143	2,210,315
Sand and gravel		3,839,965		4,388,594		4,850,469	7,148,666	4,886,890		8,535,348
Stone ..... tons	122,308	434,964	2,611	78,252	3,055	99,392	26,079	148,454	148,454	139,150
Totals		11,596,961		13,555,038		14,395,174		15,299,501		20,587,159
Fuels										
Coal[1] ..... tons	1,402,347	9,729,739	1,384,138	9,528,279	1,308,284	9,154,544	1,332,874	8,986,501	1,417,209	9,346,518
Natural gas ..... M c.f.					60,883	6,545	168,651	18,130	216,521	20,193
Petroleum, crude ..... bbls.									147,146	299,612
Totals		9,729,739		9,528,279		9,161,089		9,004,631		9,666,323
Provincial totals		171,309,429		152,628,683		153,383,860		174,710,606		190,084,643

[1] The quantity of coal is that sold and used.

TABLE IV.—MINERAL PRODUCTION VALUE, 1895–1956

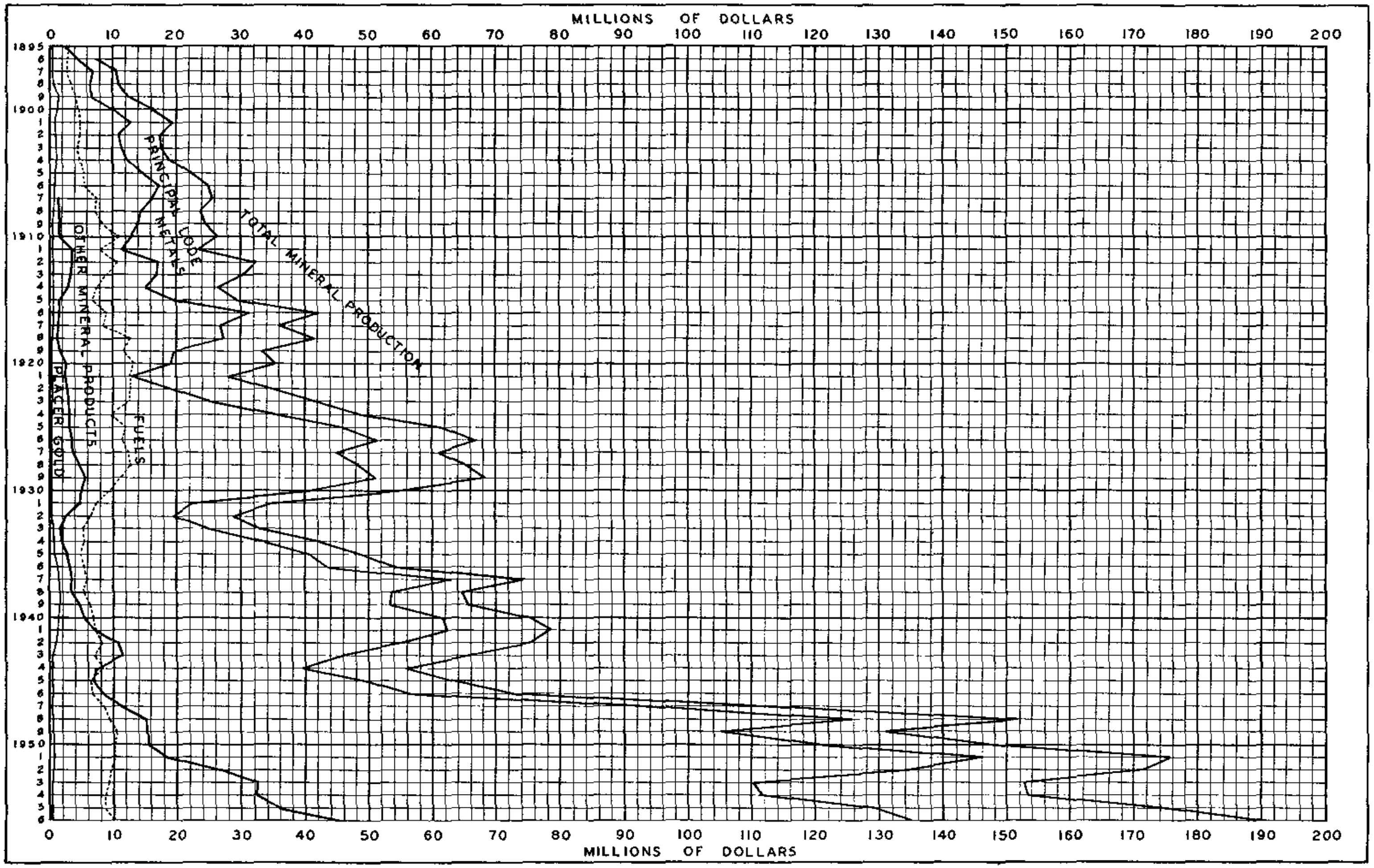


TABLE V.—PRINCIPAL LODE-METALS PRODUCTION, 1913–56

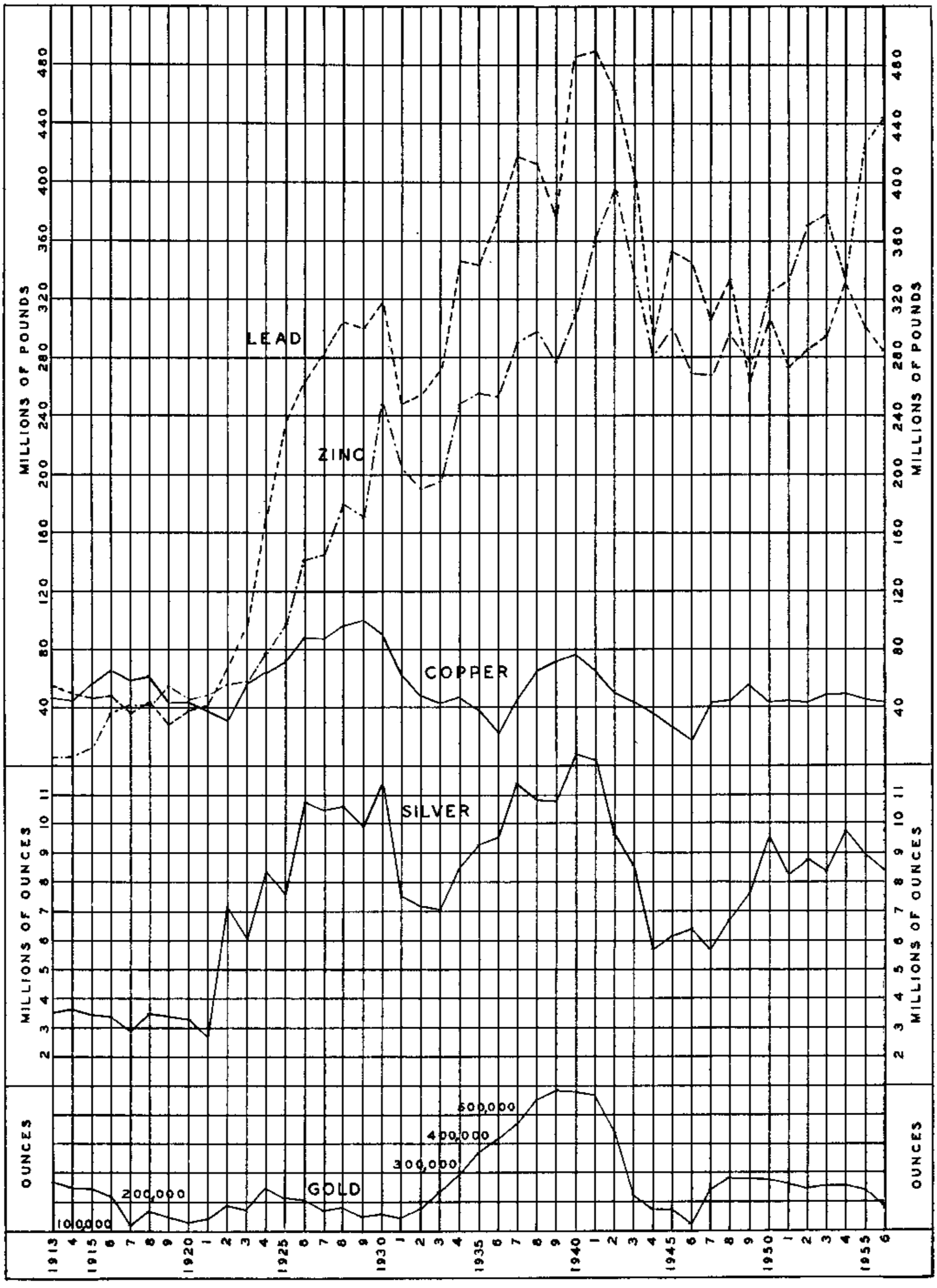


TABLE VI.—PRODUCTION OF PRINCIPAL METALS, 1858–1956

Year	Placer Gold		Gold		Silver		Copper		Lead		Zinc		Total Value
	Quantity[1]	Value	Quantity[2]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
1858–86, incl.	3,105,775	52,798,364											52,798,364
1887	40,810	693,709			17,690	17,331			204,800	9,216			720,256
1888	36,280	616,731			79,780	75,000			674,500	29,813			721,544
1889	34,640	588,923			53,192	47,873			165,100	6,498			643,294
1890	29,080	494,436			70,427	73,948							568,384
1891	25,280	429,811			4,500	4,000							433,811
1892	23,500	399,526			77,160	66,935			808,420	33,064			499,525
1893	20,950	356,131	1,170	23,404	227,000	195,000			2,135,023	78,996			653,531
1894	23,850	405,516	6,252	125,014	746,379	470,219	324,680	16,234	5,662,523	169,875			1,186,858
1895	28,330	481,683	39,270	785,400	1,496,522	977,229	952,840	47,642	16,475,464	532,255			2,824,209
1896	32,000	544,026	62,259	1,244,180	3,135,343	2,100,689	3,818,556	190,926	24,199,977	721,384			4,801,205
1897	30,210	513,520	106,141	2,122,820	5,472,971	3,272,836	5,325,180	266,258	38,841,135	1,390,517			7,565,951
1898	37,840	643,346	110,061	2,201,217	4,292,401	2,375,841	7,271,678	874,781	31,693,559	1,077,581			7,172,766
1899	79,110	1,344,900	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453	21,862,436	878,870			8,096,504
1900	75,220	1,278,724	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289	63,358,621	2,691,887			11,348,481
1901	57,060	970,100	210,384	4,348,605	4,396,447	2,462,008	27,603,746	4,446,963	51,582,906	2,010,260			14,237,936
1902	63,130	1,073,140	236,491	4,888,269	3,917,917	1,941,328	29,636,057	3,446,673	22,536,381	824,832			12,174,242
1903	62,380	1,060,420	232,831	4,812,616	2,996,204	1,521,472	34,359,921	4,547,535	18,089,283	689,744			12,631,787
1904	65,610	1,115,300	222,042	4,589,608	3,222,481	1,719,516	35,710,128	4,578,037	36,646,244	1,421,874			13,424,335
1905	57,020	969,300	238,660	4,933,102	3,439,417	1,971,818	37,692,251	5,876,222	56,580,703	2,399,022			16,149,464
1906	55,790	948,400	224,027	4,630,639	2,990,262	1,897,320	42,990,488	8,288,565	52,408,217	2,667,578			18,432,502
1907	48,710	828,000	196,179	4,055,020	2,745,448	1,703,825	40,832,720	8,166,544	47,738,703	2,291,458			17,044,847
1908	38,060	647,000	255,582	5,282,880	2,631,389	1,321,483	47,274,614	6,240,249	43,195,733	1,632,799			15,124,411
1909	28,060	477,000	238,224	4,924,090	2,532,742	1,239,270	45,597,245	5,918,522	44,396,346	1,709,259	8,500,000	400,000	14,668,141
1910	31,760	540,000	267,701	5,533,380	2,450,241	1,245,016	38,243,934	4,871,512	34,658,746	1,386,350	4,184,192	192,473	13,768,731
1911	25,060	426,000	228,617	4,725,513	1,892,364	958,293	36,927,656	4,571,644	26,872,397	1,069,521	2,634,544	129,092	11,880,063
1912	32,680	555,500	257,496	5,322,442	3,132,108	1,810,045	51,456,537	8,408,513	44,871,454	1,805,627	5,358,280	316,139	18,218,266
1913	30,000	510,000	272,254	5,627,490	3,465,856	1,968,606	46,460,305	7,094,489	55,364,677	2,175,832	6,758,768	324,421	17,700,838
1914	33,240	565,000	247,170	5,109,004	3,602,180	1,876,736	45,009,699	6,121,319	50,625,048	1,771,877	7,866,467	346,125	15,790,061
1915	45,290	770,000	250,021	5,167,934	3,366,506	1,588,991	56,918,405	9,835,500	46,503,590	1,939,200	12,982,440	1,460,524	20,762,149
1916	34,150	580,500	221,932	4,587,334	3,301,923	2,059,739	65,379,364	17,784,494	48,727,516	3,007,462	37,168,980	4,043,985	32,063,514
1917	29,180	496,000	114,523	2,367,190	2,929,216	2,265,749	59,007,565	16,038,256	37,307,465	2,951,020	41,848,513	3,166,259	27,284,474
1918	18,820	320,000	164,674	3,403,812	3,498,172	3,215,870	61,483,754	15,143,449	43,899,661	2,928,107	41,772,916	2,899,040	27,910,278
1919	16,850	286,500	152,426	3,150,645	3,403,119	3,592,673	42,459,339	7,939,896	29,475,968	1,526,855	56,737,651	3,540,429	20,036,998
1920	13,040	221,600	120,048	2,481,392	3,377,849	3,235,980	44,887,676	7,832,899	39,331,218	2,816,115	47,208,268	3,077,979	19,665,965
1921	13,720	233,200	135,663	2,804,154	2,673,389	1,591,201	39,036,993	4,879,624	41,402,288	1,693,354	49,419,372	1,952,065	13,153,598
1922	21,690	368,800	197,856	4,089,684	7,101,311	4,554,781	32,359,896	4,329,754	67,447,985	3,480,316	57,146,548	2,777,322	19,600,657
1923	24,710	420,000	179,245	3,704,994	6,032,986	3,718,129	57,720,290	8,323,266	96,663,152	6,321,770	58,343,462	3,278,903	25,767,062
1924	24,750	420,750	247,716	5,120,535	8,341,768	5,292,184	64,845,393	8,442,870	170,384,481	12,415,917	79,130,970	4,266,741	35,958,997
1925	16,476	280,092	209,719	4,335,269	7,654,844	5,286,818	72,306,432	10,153,269	237,899,199	18,670,329	98,257,099	7,754,450	46,480,227
1926	20,912	355,503	201,427	4,163,859	10,748,556	6,675,606	89,339,768	12,324,421	263,023,937	17,757,535	142,876,947	10,586,610	51,863,534

	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
1927	9,191	156,247	178,001	3,679,601	10,470,185	5,902,043	89,202,871	11,525,011	282,996,423	14,874,292	145,225,443	8,996,135	45,133,329
1928	8,284	143,208	188,087	3,888,097	10,627,167	6,182,461	97,908,316	14,265,242	305,140,792	13,961,412	181,763,147	9,984,613	48,425,033
1929	6,983	118,711	145,387	3,005,411	9,960,172	5,278,194	102,793,669	18,612,850	302,346,268	15,269,696	172,096,841	9,268,792	51,553,654
1930	8,955	152,235	160,853	3,325,126	11,328,263	4,322,185	92,362,240	11,990,466	319,199,752	12,535,931	250,287,306	9,010,093	41,336,036
1931	17,176	291,992	146,133	3,020,837	7,550,331	2,254,979	64,134,746	5,365,690	248,783,508	6,742,282	205,071,247	5,237,520	22,913,300
1932	20,400	395,542	181,651	4,263,349	7,150,655	2,264,729	50,608,036	3,228,892	254,488,952	5,378,878	192,120,091	4,621,641	20,153,031
1933	23,928	562,787	223,589	6,394,645	7,021,754	2,656,526	43,149,460	3,216,701	271,606,071	6,495,731	195,963,751	6,291,416	25,617,806
1934	25,181	714,431	297,216	10,253,952	8,613,977	4,088,280	49,651,733	3,683,662	347,366,967	8,461,859	247,926,844	7,546,893	34,749,077
1935	30,929	895,058	365,343	12,856,419	9,269,944	6,005,996	39,428,203	3,073,428	344,268,444	10,785,930	256,239,446	7,940,860	41,557,691
1936	43,389	1,249,940	404,578	14,172,367	9,547,124	4,308,330	21,671,711	2,053,828	377,971,618	14,790,029	254,581,393	8,439,373	45,013,867
1937	54,153	1,558,245	460,781	16,122,727	11,308,685	5,075,451	46,057,5[illegible]4	6,023,411	419,118,371	21,416,949	291,192,278	14,274,245	64,471,028
1938	57,759	1,671,015	557,522	19,613,624	10,861,578	4,722,288	65,769,906	6,558,575	412,979,182	13,810,024	298,497,295	9,172,822	55,548,348
1939	49,746	1,478,492	587,336	21,226,957	10,821,393	4,381,365	73,254,679	7,392,862	378,743,763	12,002,390	278,409,102	8,544,375	55,026,441
1940	39,067	1,236,928	583,416	22,461,516	12,327,944	4,715,315	77,980,223	7,865,085	485,364,420	16,317,952	310,768,251	10,600,261	63,197,057
1941	43,775	1,385,962	571,026	21,984,501	12,175,700	4,658,545	66,435,583	6,700,693	490,185,657	16,480,042	363,302,195	12,392,238	63,601,981
1942	32,904	1,041,772	444,518	17,113,943	9,677,881	4,080,775	50,097,716	5,052,856	463,269,005	15,575,104	396,857,260	13,536,801	56,401,251
1943	14,600	462,270	224,403	8,639,516	8,526,310	3,858,496	42,307,510	4,971,132	405,285,476	15,214,417	335,137,014	13,405,481	46,551,312
1944	11,433	361,977	186,632	7,185,332	5,705,334	2,453,293	36,300,589	4,356,070	294,797,469	13,265,886	280,356,477	12,055,328	39,677,886
1945	12,589	398,591	175,373	6,751,860	6,157,307	2,893,934	25,852,366	3,244,472	353,497,689	17,674,884	301,737,902	19,431,921	50,395,662
1946	15,729	475,361	117,612	4,322,241	6,365,761	5,324,959	17,500,538	2,240,070	347,990,146	23,489,335	270,718,128	21,143,086	56,995,052
1947	6,969	200,585	243,282	8,514,870	5,707,691	4,109,538	41,783,921	8,519,741	306,400,709	41,884,977	268,450,926	30,147,039	93,376,750
1948	20,332	585,200	286,230	10,018,050	6,718,122	5,038,592	43,025,388	9,616,174	332,996,351	60,072,542	296,012,941	41,234,603	126,565,161
1949	17,886	529,524	288,396	10,382,256	7,636,053	5,669,769	54,856,808	10,956,550	263,580,549	41,645,726	276,324,451	36,604,700	105,788,525
1950	19,134	598,717	283,983	10,805,553	9,507,225	7,666,151	42,212,133	9,889,458	307,122,803	44,391,530	324,263,778	48,882,765	122,234,174
1951	23,691	717,911	261,274	9,627,947	8,215,884	7,768,118	43,249,658	11,980,155	273,456,604	50,316,015	333,910,764	66,448,242	146,858,388
1952	17,554	494,756	251,393	8,615,238	8,796,720	7,315,088	42,005,512	13,054,893	284,949,396	45,936,692	372,871,717	59,189,656	134,606,323
1953	14,245	403,230	253,553	8,727,294	8,376,953	7,017,709	49,021,013	14,869,544	296,559,781	39,338,655	378,345,159	40,388,346	110,744,778
1954	8,684	238,967	258,388	8,803,279	9,825,153	8,153,108	50,150,087	14,599,693	332,474,456	45,482,505	334,124,560	34,805,755	112,083,307
1955	7,666	217,614	242,477	8,370,306	7,902,145	6,942,113	44,238,031	16,932,549	302,567,640	45,161,245	429,198,565	52,048,909	129,672,736
1956	3,865	109,450	191,743	6,603,628	8,404,600	7,511,443	43,360,575	17,251,872	283,718,073	44,702,619	443,853,004	58,934,801	135,113,813
Totals	5,197,360	95,874,169	14,913,705	427,722,891	394,973,659	232,984,039	2,887,333,591	469,058,693	12,002,941,191	840,459,498	9,443,802,693	731,091,267	2,797,190,557

[1] Ounces of crude gold. [2] Ounces of fine gold.

TABLE VIIA.—PRODUCTION, 1955 AND 1956, BY MINING DIVISIONS—SUMMARY

Division	Year	Placer Gold		Principal Lode Metals	Miscellaneous Metals	Industrial Minerals	Structural Materials	Fuels						Division Totals
								Coal		Petroleum		Natural Gas		
		Quantity[1]	Value					Quantity	Value	Quantity	Value	Quantity	Value	
		Oz.	$	$	$	$	$	Tons	$	Bbls.	$	M C.F.	$	$
Alberni	1955						96,470							96,470
	1956						60,833							60,833
Atlin	1955	5,330	151,302	5,881,546	102,085		5,662							6,140,595
	1956	1,818	51,483	5,640,677	84,841		5,428							5,782,429
Cariboo	1955	2,081	59,073	1,434,841		1,066	286,986							1,781,966
	1956	1,505	42,619	1,421,013		1,900	381,026							1,846,558
Clinton	1955						500							500
	1956						7,500							7,500
Fort Steele	1955	35	994	61,847,483	311,613	697,531	282,493	1,050,149	6,564,544					69,704,658
	1956			60,163,461	637,792	510,122	192,694	1,158,213	7,228,993					68,733,062
Golden	1955			4,114,638	74,429	399,618	43,832							4,632,517
	1956			3,978,186	47,368	385,495	57,016							4,468,065
Greenwood	1955			543,890	3,750	72,333	28,070							648,043
	1956			661,911	3,844	73,824	17,621							757,200
Kamloops	1955	1	28	3,539		225,216	579,928							808,711
	1956	28	793	4,367		294,050	663,356							962,566
Liard	1955	19	539			4,265,971	64,213	3,650	32,850			168,651	18,130	4,381,703
	1956	6	170	998		6,620,060	124,404	4,642	38,211	147,146	299,612	216,521	20,193	7,103,648
Lillooet	1955	97	2,754	4,145,072	250		26,470							4,174,546
	1956	54	1,529	4,024,683			75,886							4,102,098
Nanaimo	1955				3,228,756	8,654	1,690,189	174,326	1,769,682					6,697,281
	1956			4,619	2,190,847	39,531	1,260,566	172,529	1,629,168					5,124,731
Nelson	1955			8,406,977	5,955,154		160,971							14,523,102
	1956	16	453	14,266,508	7,134,800		86,041							21,487,802
New Westminster	1955	4	114			19,266	3,353,676							3,373,056
	1956	12	340	776		105,467	5,511,859							5,618,442
Nicola	1955						20,534	1,259	12,904					33,438
	1956			2,349			21,247	1,170	12,092					35,688
Omineca	1955	35	994	554,275	22,695		179,563	30,015	227,010					984,537
	1956	55	1,557	1,479,941	44,339		293,588	8,553	71,234					1,890,659
Osoyoos	1955			1,332,851		160,056	18,179							1,511,086
	1956			24,916		346,821	25,015							396,752
Revelstoke	1955			1,675,888	36,488		41,091							1,753,467
	1956	317	8,977	1,866,610	42,112		67,496							1,985,195
Similkameen	1955	6	170	8,313,534			59,450	73,475	379,511					8,752,665
	1956	4	113	8,132,766			295,150	72,102	366,820					8,794,849
Skeena	1955	14	397	1,732,932			295,295							2,028,624
	1956			1,640,706			1,250,786							2,891,492
Slocan	1955			9,698,464	187,043		73,058							9,958,565
	1956			11,073,608	202,007		53,564							11,329,179
Trail Creek	1955			8,602			112,507							121,109
	1956			22,289			135,798							158,087
Vancouver	1955			8,845,071	90,421	274,817	1,328,891							10,539,200
	1956			8,675,752	85,739	366,278	2,133,859							11,261,628
Vernon	1955	44	1,249				322,975							324,224
	1956	50	1,416				328,888							330,304

Victoria	1955	....	....	143,541	....	....	6,228,251	....	....	....	....	....	....	6,371,792
	1956	....	....	**128,433**	....	....	**7,537,538**	....	....	....	....	....	....	**7,665,971**
Not assigned	1955	....	....	10,771,978[2]	2,923,203[3]	1,673,570	....	....	....	....	....	....	....	15,868,751
	1956	....	....	**11,789,794**[2]	**3,853,321**[3]	**1,646,790**	....	....	....	....	....	....	....	**17,289,905**
Totals	1955	7,666	217,614	129,455,122	12,935,887	7,798,098	15,299,254	1,332,874	8,986,501	....	....	168,651	18,130	174,710,606
	1956	**3,865**	**109,450**	**135,004,363**	**14,327,010**	**10,390,338**	**20,587,159**	**1,417,209**	**9,346,518**	**147,146**	**299,612**	**216,521**	**20,193**	**190,084,643**

[1] Crude gold.

[2] Includes estimated zinc and lead recovered at the Trail smelter from current and reclaimed slags.

[3] Antimony, bismuth, and indium recovered at the Trail smelter; part of the quantities of these metals may be derived from sources outside of British Columbia.

NOTE.—Full details for placer gold are given in this table. The columns headed "Principal Lode Metals," "Miscellaneous Metals," "Industrial Metals," and "Structural Materials" give the total value only, details being set forth in Tables VIIB, VIIC, VIID, and VIIE. The coal is that sold and used; details for coal are given in Tables IXB and IXC.

Table VIIb.—Production, 1955 and 1956, by Mining Divisions—Principal Lode Metals

Division	Year	Lode Gold		Silver		Copper		Lead		Zinc	
		Quantity[1]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$
Alberni	1955										
	1956										
Atlin	1955	20,867	720,329	641,918	563,931	4,703,437	1,800,288	4,606,220	687,524	17,394,852	2,109,474
	1956	**13,496**	**464,802**	**690,100**	**616,763**	**5,215,386**	**2,075,046**	**3,421,993**	**539,169**	**14,647,514**	**1,944,897**
Cariboo	1955	41,464	1,431,337	3,989	3,504						
	1956	**41,118**	**1,416,104**	**4,482**	**4,006**	**2,270**	**903**				
Clinton	1955										
	1956										
Fort Steele	1955	335	11,564	2,849,594	2,503,397			214,250,159	31,978,979	225,559,026	27,353,543
	1956	**297**	**10,229**	**2,539,478**	**2,269,608**			**180,268,315**	**28,403,076**	**222,025,518**	**29,480,548**
Golden	1955			233,074	204,758	230,911	88,383	16,616,858	2,480,232	11,060,152	1,341,265
	1956			**178,184**	**159,248**	**228,585**	**90,947**	**15,070,028**	**2,374,434**	**10,193,985**	**1,353,557**
Greenwood	1955	217	7,491	516.448	453,705	14,689	5,622	252,260	37,652	325,061	39,420
	1956	**224**	**7,715**	**630,728**	**563,701**	**1,732**	**689**	**289,968**	**45,687**	**332,270**	**44,119**
Kamloops	1955			518	455			14,956	2,232	7,029	852
	1956	**1**	**34**	**1,107**	**989**			**17,446**	**2,749**	**4,484**	**595**
Liard	1955										
	1956			**336**	**300**	**56**	**22**	**4,292**	**676**		
Lillooet	1955	119,445	4,123,241	24,850	21,831						
	1956	**116,226**	**4,002,823**	**24,459**	**21,860**						
Nanaimo	1955										
	1956			**55**	**49**	**11,487**	**4,570**				
Nelson	1955	33	1,139	57.636	50,634			14,175,926	2,115,899	51,449,702	6,239,305
	1956	**121**	**4,167**	**133,922**	**119,690**	**63,039**	**25,081**	**23,533,297**	**3,707,906**	**78,397,830**	**10,409,664**
New Westminster	1955										
	1956			**121**	**108**	**1,678**	**668**				
Nicola	1955										
	1956			**74**	**66**	**5.737**	**2,283**				
Omineca	1955	643	22,196	256,489	225,328	48,183	18,443	864,352	129,013	1,313,553	159,295
	1956	**1,153**	**39,709**	**782,336**	**699,197**	**83,995**	**33,419**	**2,376,730**	**374,478**	**2,508,949**	**333,138**
Osoyoos	1955	38,521	1,329,745	3,536	3,106						
	1956	**688**	**23,695**	**224**	**200**	**2,565**	**1,021**				
Revelstoke	1955	2,475	85,437	320,291	281,379			4,886,167	729,309	4,780,764	579,763
	1956	**2,129**	**73,323**	**327,040**	**292,286**	**78,681**	**31,305**	**4,933,765**	**777,364**	**5,214,132**	**692,332**
Similkameen	1955	6,932	239,293	147,681	129,739	20,754,222	7,943,886	1,780	266	2,885	350
	1956	**6,353**	**218,797**	**124,965**	**111,685**	**19,610,133**	**7,802,284**				
Skeena	1955			1,790,380	1,572,867			1,072,391	160,065		
	1956	**114**	**3,926**	**1,541,908**	**1,378,049**			**1,374,597**	**216.582**	**317,437**	**42,149**
Slocan	1955	253	8,734	846,858	743,973			36,168,405	5,398,496	29,250,939	3,547,261
	1956	**360**	**12,398**	**1,178,107**	**1,052,910**			**36,836,684**	**5,803,988**	**31,663,743**	**4,204,312**
Trail Creek	1955	179	6,179	58	51	6,198	2,372				
	1956	**180**	**6,199**	**290**	**259**	**39,790**	**15.831**				
Vancouver	1955	10,969	378,650	85,856	75,425	16,347,307	6,257,095	677,594	101,138	16,762,292	2,032,763
	1956	**9,165**	**315,643**	**86,023**	**76,881**	**15,271,944**	**6,076,248**	**615,197**	**96,930**	**15,891,320**	**2,110,050**
Vernon	1955										
	1956										
Victoria	1955			1,987	1,746	370,453	141,795				
	1956			**1,464**	**1,309**	**319,511**	**127,124**				
Not assigned[2]	1955	144	4,971	120,982	106,284	1,762.631	674.665	8,980,572	1,340,440	71,292,310	8,645,618
	1956	**118**	**4,064**	**159,197**	**142,279**	**2,423,986**	**964,431**	**14,975,761**	**2,359,580**	**62,655.822**	**8,319,440**
Totals	1955	242,477	8,370,306	7.902,145	6,942,113	44,238,031	16,932,549	302,567,640	45,161,245	429,198,565	52,048,909
	1956	**191,743**	**6,603,628**	**8,404,600**	**7,511,443**	**43,360,575**	**17,251,872**	**283,718,073**	**44,702,619**	**443,853,004**	**58,934,801**

[1] Fine gold. [2] Gold, silver, copper, and some lead "not assigned" were recovered at the Tacoma smelter from dross shipped from the Trail smelter. The zinc and most of the lead were recovered at the Trail smelter by "fuming" current and reclaimed slag.

Table VIIc.—Production, 1955 and 1956, by Mining Divisions—Miscellaneous Metals

Division	Year	Antimony[1]		Bismuth		Cadmium[2]		Indium		Iron Ore		Mercury		Tin		Tungsten (WO_3)		Division Totals
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		Lb.	$	Lb.	$	Lb.	$	Oz.	$	Tons	$	Lb.	$	Lb.	$	Lb.	$	$
Atlin	1955					60,765	102,085											102,085
	1956					**50,803**	**84,841**											**84,841**
Fort Steele	1955													391,228	311,613			311,613
	1956													**756,934**	**637,792**			**637,792**
Golden	1955					44,303	74,429											74,429
	1956					**28,364**	**47,368**											**47,368**
Greenwood	1955					2,232	3,750											3,750
	1956					**2,302**	**3,844**											**3,844**
Lillooet	1955											75	250					250
	1956																	
Nanaimo	1955									610,930	3,228,756							3,228,756
	1956									**369,955**	**2,190,847**							**2,190,847**
Nelson	1955					294,159	494,187									1,914,000	5,460,967	5,955,154
	1956					**469,116**	**783.424**									**2,264,775**	**6,351,376**	**7,134,800**
Omineca	1955					13,509	22,695											22,695
	1956					**26,550**	**44,339**											**44,339**
Revelstoke	1955					21,719	36,488											36,488
	1956					**25,217**	**42,112**											**42,112**
Similkameen	1955																	
	1956																	
Skeena	1955																	
	1956																	
Slocan	1955					111,335	187,043											187,043
	1956					**120,962**	**202,007**											**202,007**
Vancouver	1955					53,822	90,421											90,421
	1956					**51,341**	**85,739**											**85,739**
Not assigned[1 2 3]	1955	2,021,726	667,776	160,767	356,903	991,747	1,666,135	104,774	232,389									2,923,203
	1956	**2,140,432**	**768,843**	**156,753**	**346,424**	**1,163,272**	**1,942,664**	**363,192**	**795,390**									**3,853,321**
Totals	1955	2,021,726	667,776	160,767	356,903	1,593,591	2,677,233	104,774	232,389	610,930	3,228,756	75	250	391,228	311,613	1,914,000	5,460,967	12,935,887
	1956	**2,140,432**	**768,843**	**156,753**	**346,424**	**1,937,927**	**3,236,338**	**363,192**	**795,390**	**369,955**	**2,190,847**			**756,934**	**637,792**	**2,264,775**	**6,351,376**	**14,327,010**

[1] Antimony assigned to individual mining divisions is the reported content of concentrates exported to foreign smelters. Antimony "not assigned" is the antimony content of antimonial lead produced at the Trail smelter and antimony reported as recovered from Dore slag and flue dust exported.

[2] Cadmium assigned to individual mining divisions is the reported content of customs shipments to the Trail smelter and to foreign smelters. Cadmium "not assigned" is the remainder of the reported estimated recovery at the Trail refinery from British Columbia concentrates.

[3] Antimony, bismuth, and indium recovered at the Trail smelter may include some metal from sources outside British Columbia, in addition to metal contained in British Columbia ores and concentrates. The Trail output of each of the three metals is shown as "not assigned."

Note.—In 1956 about 40 tons of manganese ore was shipped for experimental purposes by Olalla Mines Ltd.

TABLE VIID.—PRODUCTION, 1955 AND 1956, BY MINING DIVISIONS—INDUSTRIAL MINERALS

Division	Year	Asbestos		Barite		Diatomite		Fluxes (Limestone, Quartz)		Granules (Quartz, Limestone, and Granite)		Gypsum and Products		Mica		Sulphur		Division Totals
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Lb.	$	Tons	$	$
Cariboo	1955					14	280							80,600	786			1,066
	1956					**40**	**800**							**200,000**[1]	**1,100**[1]			**1,900**
Fort Steele	1955															32,826	697,531	697,531
	1956															**25,006**	**510,122**	**510,122**
Golden	1955			9,465	238,825							47,647	160,793					399,618
	1956			**11,436**	**287,626**							**36,385**	**97,869**					**385,495**
Greenwood	1955							72,333	72,333									72,333
	1956							**73,824**	**73,824**									**73,824**
Kamloops	1955											102,072	223,141	424,700	2,075			225,216
	1956											**36,593**	**294,050**					**294,050**
Liard	1955	17,187	4,265,971															4,265,971
	1956	**20,356**	**6,620,060**[2]															**6,620,060**
Nanaimo	1955							11,157	8,654									8,654
	1956							**39,170**	**39,531**									**39,531**
New Westminster	1955									2,585	19,266							19,266
	1956									**8,055**	**105,467**							**105,467**
Omineca	1955																	
	1956																	
Osoyoos	1955							28,269	127,211	2,676	32,845							160,056
	1956							**63,317**	**279,074**	**5,165**	**67,747**							**346,821**
Vancouver	1955									1,094	21,747					16,338	253,070	274,817
	1956															**23,200**	**366,278**	**366,278**
Not assigned	1955															167,356[3]	1,673,570	1,673,570
	1956															**164,679**[3]	**1,646,790**	**1,646,790**
Totals	1955	17,187	4,265,971	9,465	238,825	14	280	111,759	208,198	6,355	73,858	149,719	383,934	505,300	2,861	216,520	2,624,171	7,798,098
	1956	**20,356**	**6,620,060**	**11,436**	**287,626**	**40**	**800**	**176,311**	**392,429**	**13,220**	**173,214**	**72,978**	**391,919**	**200,000**	**1,100**	**212,885**	**2,523,190**	**10,390,338**

[1] Estimated.
[2] Does not include value of containers.
[3] Recovery at Trail smelter for use in Warfield fertilizer plants, and derived from several mining divisions.

TABLE VIIE.—PRODUCTION, 1955 AND 1956, BY MINING DIVISIONS—STRUCTURAL MATERIALS

Division	Year	Cement	Lime and Limestone	Building-stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Brick (Common)	Face, Paving, and Sewer Brick	Fire-bricks, Blocks	Clays	Structural Tile (Hollow Blocks), Roof-tile, Floor-tile	Drain-tile and Sewer-pipe	Pottery (Glazed or Unglazed)	Other Clay Products	Division Totals
		$	$	$	$	$	$	$	$	$	$	$	$	$	$
Alberni	1955				19	96,451									96,470
	1956				5,790	55,043									60,833
Atlin	1955					5,662									5,662
	1956				380	5,048									5,428
Cariboo	1955				26,778	260,208									286,986
	1956				111,834	269,192									381,026
Clinton	1955					500									500
	1956					7,500									7,500
Fort Steele	1955				23,731	258,762									282,493
	1956				79,473	113,221									192,694
Golden	1955				4,102	39,730									43,832
	1956				400	56,616									57,016
Greenwood	1955				5,433	22,637									28,070
	1956				3,457	14,164									17,621
Kamloops	1955				134,828	445,100									579,928
	1956				393,849	269,507									663,356
Liard	1955				78	64,135									64,213
	1956				217	124,187									124,404
Lillooet	1955				6,000	20,470									26,470
	1956				1,000	74,886									75,886
Nanaimo	1955		1,557,646	30,000	5,491	97,052									1,690,189
	1956		1,063,551	35,000	4,598	157,417									1,260,566
Nelson	1955				63,814	97,157									160,971
	1956				23,313	62,728									86,041
New Westminster	1955		54,508		219,072	1,204,767	219,069	233,427	505,024	46,757	93,877	739,306	31,339	42,778	3,389,924
	1956		97,665		282,239	3,184,877	61,909	472,690	535,550	47,101	110,967	629,085	30,284	59,492	5,511,859
Nicola	1955				4,000	16,534									20,534
	1956				4,500	16,747									21,247
Omineca	1955				4,633	174,930									179,563
	1956				10,000	283,588									293,588
Osoyoos	1955					18,179									18,179
	1956				1,680	23,335									25,015
Revelstoke	1955				900	40,191									41,091
	1956				32,105	35,391									67,496
Similkameen	1955				19,700	39,750									59,450
	1956				39,500	255,650									295,150
Skeena	1955		93,675		82,820	118,800									295,295
	1956		51,182		75,393	1,124,211									1,250,786
Slocan	1955				17,621	55,437									73,058
	1956				5,730	47,834									53,564
Trail Creek	1955				3,450	109,057									112,507
	1956			6,500	16,000	113,298									135,798
Vancouver	1955			118,454	280,454	781,306	12,490	15,486	71,717					12,736	1,292,643
	1956			97,650	1,085,171	857,043	13,308	12,486	58,034					10,167	2,133,859
Vernon	1955				53,000	269,975									322,975
	1956				30,000	298,888									328,888
Victoria	1955	5,474,875	5,519		6,348	650,100	580		1,837		20,583	61,713	6,696		6,228,251
	1956	6,339,071	8,394		3,686	1,084,977	550		7,169		18,290	67,300	8,101		7,537,538
Totals	1955	5,474,875	1,711,348	148,454	962,272	4,886,890	232,139	248,913	578,578	46,757	114,460	801,019	38,035	55,514	15,299,254
	1956	6,339,071	1,220,792	139,150	2,210,315	8,535,348	75,767	485,176	600,753	47,101	129,257	696,385	38,385	69,659	20,587,159

Table VIIIa.—Production to Date by Mining Divisions—Summary

Division	Placer Gold[1]		Principal Lode Metals	Miscellaneous Metals	Industrial Minerals	Structural Materials	Fuels						Division Totals
							Coal		Petroleum		Natural Gas		
	Quantity	Value					Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	$	$	$	$	Tons	$	Bbls.	$	M C.F.	$	$
Alberni	1,610	33,052	11,657,082	....	9,398	732,239	....	....	....	....	....	....	12,431,771
Atlin	726,857	17,134,373	32,649,702	283,654	20,325	158,878	....	....	....	....	....	....	50,246,932
Cariboo	2,588,772	53,551,181	35,385,880	23,730	159,080	2,451,860	290	1,100	....	....	....	....	91,572,831
Clinton	10,063	240,004	847,454	900	162,867	79,945	....	....	....	....	....	....	1,331,170
Fort Steele	20,423	465,308	1,379,609,686	7,746,334	1,875,041	3,278,288	51,729,154	206,947,014	....	....	....	....	1,599,921,671
Golden	469	11,268	30,604,075	173,759	1,727,121	905,889	....	....	....	....	....	....	33,422,112
Greenwood	5,051	114,996	113,573,817	43,086	2,300,771	498,449	....	....	....	....	....	....	116,531,119
Kamloops	27,512	602,401	3,044,836	65,678	6,528,308	4,024,253	14,995	59,765	....	....	....	....	14,325,241
Liard	50,076	1,245,021	6,312	79	14,818,498	673,617	83,585	549,131	147,146	299,612	446,055	44,868	17,637,138
Lillooet	91,593	1,885,237	103,309,074	48,350	5,129	650,798	....	....	....	....	....	....	105,898,588
Nanaimo	866	19,300	5,880,933	22,358,443	642,867	21,755,819	79,484,850	292,370,867	....	....	....	....	343,028,229
Nelson	3,508	86,856	114,967,009	28,668,578	64,126	2,192,961	....	....	....	....	....	....	145,979,530
New Westminster	11,479	240,020	127,234	87,724	171,881	42,069,411	....	....	....	....	....	....	42,696,270
Nicola	230	4,652	571,128	17	9,610	278,188	2,927,291	11,053,657	....	....	....	....	11,917,252
Omineca	52,331	1,385,534	15,406,212	15,274,365	11,460	1,293,152	401,533	2,442,757	....	....	....	....	35,813,480
Osoyoos	190	4,142	50,067,663	1,020	1,729,001	898,594	1,122	5,008	....	....	....	....	52,705,428
Revelstoke	7,573	164,223	8,877,323	126,298	....	914,286	....	....	....	....	....	....	10,082,130
Similkameen	12,079	286,293	118,067,882	128,401	18,558	1,897,892	4,635,137	19,439,002	....	....	....	....	139,838,028
Skeena	4,603	105,569	205,983,352	269,575	1,240,215	5,383,333	....	....	....	....	....	....	212,982,044
Slocan	362	9,286	147,331,068	862,681	....	539,814	....	....	....	....	....	....	148,742,849
Trail Creek[2]	848	24,176	88,784,044	35,564[2]	....	1,152,904	....	....	....	....	....	....	89,996,688
Vancouver	182	5,306	186,330,101	467,194	5,341,019	20,516,164	....	....	....	....	....	....	212,659,784
Vernon	2,394	63,588	188,310	....	3,978	1,718,824	....	....	....	....	....	....	1,974,700
Victoria	628	15,680	5,340,280	24,508	190,451	83,076,816	....	....	....	....	....	....	88,647,735
Not assigned	1,577,661	18,176,703	42,705,931[2]	40,454,216[2]	25,899,565	25,927,555	....	....	....	....	....	....	153,163,970
Totals	5,197,360	95,874,169	2,701,316,388	117,144,154	62,929,269	223,069,929	139,277,957	532,868,301	147,146	299,612	446,055	44,868	3,733,546,690

[1] Quantity of placer gold is given in ounces of crude gold. The year of first recorded production for the major placer-producing mining divisions was: Atlin, 1898; Cariboo, 1858; Lillooet, 1874; Quesnel, 1858.

[2] *Re* "Trail Creek" and *re* "not assigned," *see* footnotes under Tables VIIIb and VIIIc.

Note.—Full details for placer gold are given in this table. The columns headed "Principal Lode Metals," "Miscellaneous Metals," "Industrial Minerals," and "Structural Materials" give the total value only, details being set forth in Tables VIIIb, VIIIc, VIIId, and VIIIe. The quantity of coal is gross output; *see* footnotes to Tables IXa, IXb, and IXc.

Table VIIIb.—Production to Date by Mining Divisions—Principal Lode Metals

Division	Lode Gold		Silver		Copper		Lead		Zinc		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Alberni	300,091	11,231,599	161,219	77,492	2,290,699	343,518	112,888	4,473			11,657,082
Atlin	328,737	11,608,036	2,790,361	2,384,683	20,907,398	7,152,815	18,907,326	2,755,326	72,135,709	8,748,842	32,649,702
Cariboo	976,986	35,313,829	109,549	67,388	2,352	920	24,560	3,724	505	19	35,385,880
Clinton	23,390	827,328	31,564	14,214	57,548	5,905	193	7			847,454
Fort Steele	3,646	95,237	188,773,482	103,686,013	28,592	6,193	10,667,093,177	724,738,970	7,687,758,971	551,083,273	1,379,609,686
Golden	100	2,503	2,517,096	1,786,059	555,651	199,351	183,183,478	16,424,409	174,043,061	12,191,753	30,604,075
Greenwood	1,133,412	24,382,845	29,523,890	16,921,114	441,254,144	70,513,783	12,857,971	896,556	13,447,253	859,519	113,573,817
Kamloops	47,868	1,608,328	304,512	186,984	6,411,583	1,179,668	538,097	45,030	438,023	29,826	3,044,836
Liard	114	4,120	540	446	56	22	10,102	1,724			6,312
Lillooet	2,936,497	102,883,240	731,446	423,251	400	41	62,463	2,542			103,309,074
Nanaimo	84,009	1,919,998	570,325	336,281	22,135,435	3,624,654					5,880,933
Nelson	1,328,669	41,547,593	7,486,398	4,365,726	14,765,461	1,673,703	177,736,051	21,176,664	344,712,475	46,203,323	114,967,009
New Westminster	4,416	112,407	13,380	6,180	28,167	7,047	28,425	1,119	12,755	481	127,234
Nicola	8,525	234,914	267,419	126,588	555,712	108,513	2,235,428	90,516	320,683	10,597	571,128
Omineca	23,634	725,388	8,544,640	6,711,993	6,687,729	1,529,531	23,395,727	2,924,079	27,958,732	3,515,221	15,406,212
Osoyoos	1,619,594	49,275,749	584,214	383,465	2,783,966	399,900	256,957	8,151	6,839	398	50,067,882
Revelstoke	33,396	956,242	3,688,001	2,402,011	110,041	39,662	30,527,252	3,079,546	19,101,382	2,399,862	8,877,323
Similkameen	180,399	6,205,599	4,183,069	2,550,599	594,133,727	109,297,261	246,806	10,459	72,275	3,964	118,067,663
Skeena	2,392,598	60,211,365	64,553,153	40,340,668	687,106,270	98,025,648	55,954,598	4,927,677	16,706,218	2,477,994	205,983,352
Slocan	14,751	420,187	66,856,492	42,079,178	229,696	43,512	730,833,199	54,309,223	546,845,869	50,478,968	147,331,068
Trail Creek[1] [2]	2,947,707	62,518,913	3,619,352	2,064,832	120,906,400	17,974,797	18,484,672	919,716	158,016,197	5,305,786	88,784,044
Vancouver	427,342	13,584,889	4,618,761	2,769,821	901,840,366	145,445,016	15,727,855	1,499,503	174,221,615	23,030,872	186,330,101
Vernon	5,223	176,048	176,048	12,823	654	100	24,913	2,932	10,816	1,146	188,310
Victoria	37,663	812,730	812,730	811,066	23,235,357	3,774,421	210,097	19,848	3,568,709	283,923	5,340,280
Not assigned[3]	54,838	1,063,804	1,063,804	4,220,907	39,296,187	7,712,712	39,774,496	6,617,304	204,424,606	24,465,500	42,705,931
Totals	14,913,605	427,722,891	394,973,659	232,984,039	2,887,323,591	469,058,693	11,978,226,731	840,459,498	9,443,802,693	731,091,267	2,701,316,388

[1] Includes zinc and lead recovered at the Trail smelter from current and reclaimed slags, prior to 1953. From 1953 this recovery is listed as " not assigned."
[2] Includes lead recovered at the Tacoma smelter from dross shipped by the Trail smelter, prior to 1953. From 1953 this recovery is listed as " not assigned."
[3] Includes all metals recovered from dross and slag (*see* notes 1 and 2) in 1955 and 1956.

TABLE VIIIc.—PRODUCTION TO DATE BY MINING DIVISIONS—MISCELLANEOUS METALS

Division	Antimony[1]		Bismuth		Cadmium[2]		Chromite		Cobalt		Indium		Iron Ore		Magnesium		Manganese	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Lb.	$	Lb.	$	Lb.	$	Tons	$	Lb.	$	Oz.	$	Tons	$	Lb.	$	Tons	$
Atlin	—	—	—	—	169,973	283,294	—	—	—	—	—	—	—	—	—	—	—	—
Cariboo	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Clinton	—	—	—	—	—	—	126	900	—	—	—	—	—	—	—	—	—	—
Fort Steele	—	—	—	—	2,418	5,155	—	—	—	—	—	—	—	—	204,632	88,184	—	—
Golden	40,062	14,906	—	—	95,095	158,853	—	—	—	—	—	—	—	—	—	—	—	—
Greenwood	—	—	—	—	7,017	11,691	670	31,395	—	—	—	—	—	—	—	—	—	—
Kamloops	—	—	—	—	—	—	—	—	—	—	—	—	17,109	59,883	—	—	—	—
Liard	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lillooet	13,466	4,321	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nanaimo	—	—	—	—	—	—	—	—	—	—	—	—	3,577,813	22,358,443	—	—	—	—
Nelson	—	—	—	—	1,022,807	1,775,191	—	—	—	—	—	—	—	—	—	—	—	—
New Westminster	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nicola	—	—	12	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Omineca	104,489	15,217	—	—	93,025	158,765	—	—	1,730	420	—	—	—	—	—	—	—	—
Osoyoos	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Revelstoke	9,394	3,455	—	—	67,506	117,156	—	—	—	—	—	—	—	—	—	—	—	—
Similkameen	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Skeena	—	—	—	—	120,349	248,835	—	—	—	—	—	—	1,200	6,000	—	—	—	—
Slocan	31,865	8,133	—	—	467,568	846,388	—	—	—	—	—	—	—	—	—	—	541	8,160
Trail Creek	—	—	—	—	—	—	—	—	—	—	—	—	550	1,925	—	—	—	—
Vancouver	—	—	—	—	214,474	467,194	—	—	—	—	—	—	—	—	—	—	—	—
Victoria	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,167	24,508
Not assigned[1 2 3]	33,700,795	8,017,822	4,432,454	7,184,568	17,552,338	24,186,018	—	—	—	—	482,293	1,065,808	—	—	—	—	—	—
Totals	33,900,071	8,063,854	4,432,466	7,184,585	19,812,570	28,258,540	796	32,295	1,730	420	482,293	1,065,808	3,596,672	22,426,251	204,632	88,184	1,708	32,668[4]

[1] Antimony assigned to individual mining is the reported content of concentrates exported to foreign smelters. Antimony "not assigned" is the antimony content of antimonial lead or of other antimony products recovered at the Trail smelter.

[2] Cadmium assigned to individual mining divisions is that reported by operators of individual mines from concentrates shipped to the Trail smelter and to foreign smelters. Cadmium "not assigned" is the remainder of the reported estimated recovery at the Trail refinery from British Columbia concentrates.

[3] The antimony, bismuth, and indium recovered at the Trail smelter are not assigned to mining divisions. In addition to the quantities of these metals from British Columbia sources, some may be from sources outside British Columbia.

[4] Does not include some ore shipped for testing purposes by Olalla Mines Ltd. in 1956.

Year of first recorded production: Antimony, 1907; bismuth, 1929; cadmium, 1929; chromite, 1918; indium, 1942; iron ore, 1885; magnesium, 1941; manganese, 1918.

TABLE VIIIc.—PRODUCTION TO DATE BY MINING DIVISIONS—MISCELLANEOUS METALS—*Continued*

Division	Mercury		Molybdenite		Nickel		Palladium		Platinum		Selenium		Tin		Tungsten (WO_3)		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Lb.	$	Lb.	$	Lb.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Atlin															273	360	283,654
Cariboo									593	2,299					27,698	21,431	23,730
Clinton																	900
Fort Steele													9,825,424	7,652,995			7,746,334
Golden																	173,759
Greenwood																	43,086
Kamloops	10,987	5,795															65,678
Liard									2	79							79
Lillooet	1,783	3,555	2,448	2,440					3	113					32,353	37,921	48,350
Nanaimo																	22,358,443
Nelson			25,058	18,378											11,161,760	26,875,009	28,668,578
New Westminster					281,453	87,724											87,724
Nicola																	17
Omineca	4,150,892	10,400,259	1,600	1,840					3	154					2,210,892	4,697,710	15,274,365
Osoyoos			1,020	1,020													1,020
Revelstoke															7,784	5,687	126,298
Similkameen									1,276	128,401							128,401
Skeena			13,022	13,020							731	1,389			366	331	269,575
Slocan																	862,681
Trail Creek							749	30,462	53	3,177							35,564
Vancouver																	467,194
Victoria																	24,508
Not assigned																	40,454,216
Totals	4,163,662	10,409,609	43,148	36,698	281,453	87,724	749	30,462	1,930	134,223	731	1,389	9,825,424	7,652,995	13,441,126	31,638,449	117,144,154

Year of first recorded production: Mercury, 1895; molybdenite, 1914; nickel, 1936; palladium, 1930; platinum, 1887; selenium, 1931; tin, 1941; tungsten, 1937.

Table VIIId.—Production to Date by Mining Divisions—Industrial Minerals

Division	Arsenious Oxide		Asbestos		Barite		Bentonite		Diatomite		Fluorspar		Flux (Quartz and Limestone)		Granules (Quartz, Limestone, and Granite)		Gypsum and Gypsite		Hydro-Magnesite	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Lb.	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$
Alberni																				
Atlin																			1,450	20,325
Cariboo									1,423	32,095					48	168				
Clinton																	983	6,676	803	7,211
Fort Steele					8	80											112,827	298,824		
Golden					88,517	943,506											234,843	782,339		
Greenwood											40,165	783,578	1,767,376	1,517,193						
Kamloops																	1,246,918	6,323,178		
Liard			49,263	14,818,498																
Lillooet																				
Nanaimo													598,585	642,867						
Nelson													7,601	8,174	2	51				
New Westminster															15,263	171,881				
Nicola																	2,297	9,610		
Omineca	16,997	340																		
Osoyoos	22,002,423	272,861											250,712	1,261,250	11,523	147,652				
Similkameen							791	16,858									250	1,700		
Skeena													601,019	1,050,722						
Vancouver															28,868	411,325				
Vernon																				
Victoria													50	760	9,702	159,471				
Totals	22,019,420	273,201	49,263	14,818,498	88,525	943,586	791	16,858	1,423	32,095[1]	40,165	783,578	3,225,343	4,480,966	65,406	890,548	1,598,118	7,422,327	2,253	27,536

[1] Includes 30 tons of volcanic ash, worth $300.

Year of first recorded production: *Arsenious oxide, 1917; asbestos, 1952; barite, 1940; bentonite, 1926; diatomite, 1928; fluorspar, 1918; flux (quartz and limestone), 1911; granules, 1930; gypsum and gypsite, 1911; hydromagnesite, 1904.*

TABLE VIIID.—PRODUCTION TO DATE BY MINING DIVISIONS—INDUSTRIAL MINERALS—*Continued*

Division	Iron Oxide and Ochre		Magnesium Sulphate		Mica		Natro-alunite		Perlite		Phosphate Rock		Sodium Carbonate		Sulphur		Talc		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Tons	$	Tons	$	Lb.	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	$
Alberni							522	9,398											9,398
Atlin																			20,325
Cariboo					9,463,800	126,817													159,080[1]
Clinton			1,923	39,085									9,524	109,895					162,867
Fort Steele											3,842	16,894			92,990[2]	1,559,243			1,875,041
Golden	27	920															5	346	1,727,111
Greenwood																			2,300,771
Kamloops			8,742	193,967	424,700	2,075							968	9,088					6,528,308
Liard																			14,818,498
Lillooet																	296	5,129	5,129
Nanaimo																			642,867
Nelson	7,292	55,901																	64,126
New Westminster																			171,881
Nicola																			9,610
Omineca									1,112	11,120									11,460
Osoyoos			3,229	21,300	1,588,800	25,938													1,729,001
Similkameen																			18,558
Skeena					634,250	10,815									41,624	178,678			1,240,215
Vancouver	10,669	97,389													566,174[3]	5,004,917			5,513,631
Vernon					160,500	3,978													3,978
Victoria	120	840															1,504	29,380	190,451
Not assigned															2,604,926[4]	25,899,565			25,899,565
Totals	18,108	155,050	13,894	254,352	12,272,050	169,623	522	9,398	1,112	11,120	3,842	16,894	10,492	118,983	3,305,714	32,642,403	1,805	34,855	63,101,871

[1] Includes 30 tons of volcanic ash, worth $300.
[2] Recovery in 1953 and subsequent years for use in fertilizer plant at Marysville.
[3] Includes 11,010 tons valued at $172,612 omitted from 1955 totals.
[4] Recovery at Trail smelter for use in Warfield fertilizer plants, and derived from ores from several mining divisions.

Year of first recorded production: Iron oxide and ochre, 1918; magnesium sulphate, 1915; mica, 1932; natro-alunite, 1912; perlite, 1953; phosphate rock, 1927; sodium carbonate, 1921; sulphur, 1916; talc, 1916.

TABLE VIIIE.—PRODUCTION TO DATE BY MINING DIVISIONS—STRUCTURAL MATERIALS

Division	Cement	Lime and Limestone	Building-stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Brick (Common)	Face, Paving, and Sewer Brick	Fire-bricks, Blocks	Clays	Structural Tile (Hollow Blocks), Roof-tile, Floor-tile	Drain-tile and Sewer-pipe	Pottery (Glazed or Unglazed)	Other Clay Products	Division Totals
	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Alberni	—	—	—	39,923	678,910	—	—	—	—	—	—	—	—	718,833
Atlin	—	1,108	—	64,351	99,527	—	—	—	—	—	—	—	—	164,986
Cariboo	—	7,500	—	321,529	2,186,154	1,193	184	4,651	15,807	—	—	—	9,242	2,546,260
Clinton	—	—	—	1,606	79,339	—	—	—	—	—	—	—	—	80,945
Fort Steele	—	5,350	71,941	459,319	2,890,528	7,800	—	—	—	—	—	—	—	3,434,938
Golden	—	1,000	24,000	84,181	912,605	—	—	—	—	—	—	—	—	1,021,786
Greenwood	—	102,442	30,500	129,040	332,076	114,361	—	—	6,922	—	—	—	—	715,341
Kamloops	—	12,000	18,000	1,607,288	2,499,323	72,379	—	—	—	—	—	—	—	4,208,990
Liard	—	—	—	24,059	676,996	—	—	—	—	—	—	—	—	701,055
Lillooet	—	100	2,000	276,111	586,587	—	—	—	—	—	—	—	—	864,798
Nanaimo	—	20,057,137	2,995,337	52,882	1,431,822	1,104,295	38,939	—	35,758	—	—	—	—	25,716,170
Nelson	—	34,543	356,679	255,859	1,728,622	19,110	2,864	—	—	—	—	—	—	2,397,677
New Westminster	—	641,293	—	4,837,537	13,631,218	1,388,131	3,381,536	8,885,721	753,289	2,314,517	7,845,652	101,508	205,691	43,986,093
Nicola	—	—	8,000	74,061	236,527	—	—	—	—	—	—	—	—	318,588
Omineca	—	3,077	—	230,364	1,180,178	5,274	—	—	—	—	—	—	—	1,418,893
Osoyoos	—	32,070	14,850	135,557	777,547	—	—	—	—	—	—	—	—	960,024
Revelstoke	—	1,000	5,575	290,378	740,528	—	—	—	—	—	—	—	—	1,037,481
Similkameen	10,500	11,571	24,000	484,044	1,430,672	—	—	—	1,363	—	—	—	11,992	1,974,142
Skeena	—	1,231,944	144,000	978,025	2,444,658	—	—	—	4,925	—	—	—	8,324	4,811,876
Slocan	—	1,000	115,143	70,014	409,857	—	—	—	—	—	—	—	—	596,014
Trail Creek	—	28,000	44,900	177,542	1,050,643	—	—	—	—	—	—	—	—	1,301,085
Vancouver	335,718	40,885	3,650,626	7,379,230	13,790,273	123,859	87,336	432,009	17,633	—	—	54,701	69,198	25,981,567
Vernon	—	46,499	81,052	169,609	1,321,935	131,467	6,202	1,011	5	18,224	4,325	—	20	1,780,349
Victoria	71,899,337	728,597	—	410,245	8,777,439	1,803,459	23,052	9,006	—	599,963	698,255	107,431	11,003	85,067,787
Not assigned	—	315,498	505,018	282,455	—	—	—	—	—	—	—	—	—	11,234,250[1]
Totals	72,245,555	23,302,614	8,091,621	18,835,209	59,893,964	4,771,427	3,540,113	9,332,398	835,702	2,932,704	8,548,232	263,640	315,470	223,039,928[2]

[1] Structural materials that so far cannot be assigned to mining divisions include the three items shown, an amount of $3,150,828 for clay products, and a further $6,980,451 that *cannot be allotted to a particular class of material.*

[2] Includes items noted in foot-note No. 1.

Table IXa.—Quantity (Gross[1]) and Value of Coal per Year to Date

Year	Tons (2,000 Lb.)	Value	Year	Tons (2,000 Lb.)	Value
1836–59	41,871	$149,548	1909	2,688,672	$8,574,884
1860	15,956	56,988	1910	3,515,944	11,108,335
1861	15,427	55,096	1911	2,573,444	8,071,747
1862	20,292	72,472	1912	3,388,795	10,786,812
1863	23,906	85,380	1913	2,879,251	9,197,460
1864	32,068	115,528	1914	2,426,399	7,745,847
1865	36,757	131,276	1915	2,209,290	7,114,178
1866	28,129	100,460	1916	2,783,849	8,900,675
1867	34,988	124,956	1917	2,686,561	8,484,343
1868	49,286	176,020	1918	2,888,170	12,833,994
1869	40,098	143,208	1919	2,698,022	11,975,671
1870	33,424	119,372	1920	3,020,387	13,450,169
1871	55,458[2]	164,612	1921	2,877,995	12,836,013
1872	55,458[2]	164,612	1922	2,890,625	12,880,060
1873	55,459[2]	164,612	1923	2,848,146	12,678,548
1874	91,334	244,641	1924	2,226,037	9,911,935
1875	123,362	330,435	1925	2,737,607	12,168,905
1876	155,895	417,576	1926	2,609,640	11,650,180
1877	172,540	462,156	1927	2,748,286	12,269,135
1878	191,348	522,538	1928	2,829,906	12,633,510
1879	270,257	723,903	1929	2,521,402	11,256,260
1880	299,708	802,785	1930	2,113,586	9,435,650
1881	255,760	685,171	1931	1,912,501	7,684,155
1882	315,997	846,417	1932	1,719,172	6,523,644
1883	238,895	639,897	1933	1,416,516	5,375,171
1884	441,358	1,182,210	1934	1,508,741	5,725,133
1885	409,468	1,096,788	1935	1,330,524	5,048,864
1886	365,832	979,908	1936	1,508,048	5,722,502
1887	462,964	1,240,080	1937	1,618,051	6,139,920
1888	548,017	1,467,903	1938	1,466,559	5,565,069
1889	649,411	1,739,490	1939	1,655,217	6,280,956
1890	759,518	2,034,420	1940	1,867,966	7,088,265
1891	1,152,590	3,087,291	1941	2,018,635	7,660,000
1892	925,495	2,479,005	1942	2,170,737	8,237,172
1893	1,095,690	2,934,882	1943	2,040,253	7,742,030
1894	1,134,509	3,038,859	1944	2,165,676	8,217,966
1895	1,052,412	2,824,687	1945	1,700,914	6,454,360
1896	1,002,268	2,693,961	1946	1,639,277	6,732,470
1897	999,372	2,734,522	1947	1,923,573	8,680,440
1898	1,263,272	3,582,595	1948	1,809,018	9,765,395
1899	1,435,314	4,126,803	1949	1,917,296	10,549,924
1900	1,781,000	4,744,530	1950	1,756,667	10,119,303
1901	1,894,544	5,016,398	1951	1,824,384	10,169,617
1902	1,838,621	4,832,257	1952	1,650,619	9,729,739
1903	1,624,742	4,332,297	1953	1,576,105	9,528,279
1904	1,887,981	4,953,024	1954	1,447,608	9,154,544
1905	2,044,931	5,511,861	1955	1,484,066	8,986,501
1906	2,126,965	5,548,044	1956	1,589,398	9,346,518
1907	2,485,961	7,637,713			
1908	2,362,514	7,356,866	Totals	139,277,957	$532,868,301

Table IXb.—Coal Production (Gross[1]) by Districts and Mining Divisions

District and Mining Division	Total to Date			1955		1956	
	Period	Quantity	Value	Quantity	Value	Quantity	Value
Vancouver Island District		Tons	$	Tons	$	Tons	$
Nanaimo Mining Division	1836–1956	79,484,850	292,370,867	209,784	1,769,682	200,347	1,629,168
Nicola-Princeton District							
Kamloops Mining Division	1893–1945	14,995	59,765				
Nicola Mining Division	1907–1956	2,927,291	11,053,657	1,259	12,904	1,170	12,092
Osoyoos Mining Division	1926–1927	1,122	5,008				
Similkameen Mining Division	1909–1956	4,635,137	19,439,002	73,475	379,511	72,102	366,820
District totals	1893–1956	7,578,545	30,557,432	74,734	392,415	73,272	378,912
Northern District							
Cariboo Mining Division	1942–1944	290	1,100				
Liard Mining Division	1923–1956	83,585	549,131	3,650	32,850	4,642	38,211
Omineca Mining Division	1918–1956	401,533	2,442,757	31,460	227,010	8,553	71,234
District totals	1918–1956	485,408	2,992,988	35,110	259,860	13,195	109,445
East Kootenay District							
Fort Steele Mining Division	1898–1956	51,729,154	206,947,014	1,164,438	6,564,544	1,302,584	7,228,993
Provincial totals	1836–1956	139,277,957	532,868,301	1,484,066	8,986,501	1,589,398	9,346,518

[1] Gross mine output, including washery loss and coal used in making coke (*see* Table X and discussion under "Fuel," page A 14).

[2] A combined total for 1871, 1872, and 1873 has previously been noted in Annual Reports and the above breakdown is estimated.

TABLE IXc.—QUANTITY[1] AND VALUE OF COAL SOLD AND USED,[2] 1946–56

Year	District and Mining Division	Total Sales[2]*	Used under Companies' Boilers[2]†	Used in Making Coke[2]‡	Total Sold and Used[2]		District Totals, 1956	
		Tons	Tons	Tons	Tons	$	Tons	$
	Vancouver Island	......	......	......	......	......	**172,529**	**1,629,168**
1946	Nanaimo	502,406	4,396	......	506,802	3,474,182		
1947	,,	450,968	3,786	......	454,754	3,625,348		
1948	,,	365,328	2,801	......	368,129	3,219,868		
1949	,,	451,074	3,925	......	454,999	4,055,572		
1950	,,	472,690	4,329	......	477,019	4,060,337		
1951	,,	391,687	3,425	......	395,112	3,486,615		
1952	,,	267,346	2,986	......	270,332	2,749,206		
1953	,,	204,931	1,798	......	206,729	2,059,828		
1954	,,	181,534	536	......	182,070	2,029,099		
1955	,,	173,861	465	......	174,326	1,769,682		
1956	,,	**172,140**	**389**	......	**172,529**	**1,629,168**		
	Nicola-Princeton	......	......	......	......	......	**73,272**	**378,912**
1946	Nicola	1,711	81	......	1,792	8,957		
1947	,,	1,997	261	......	2,258	15,493		
1948	,,	1,777	......	......	1,777	15,281		
1949	,,	1,672	......	......	1,672	14,809		
1950	,,	1,125	......	......	1,125	9,926		
1951	,,	899	......	......	899	8,640		
1952	,,	1,139	......	......	1,139	11,493		
1953	,,	1,040	......	......	1,040	10,400		
1954	,,	1,256	......	......	1,256	12,769		
1955	,,	1,259	......	......	1,259	12,904		
1956	,,	**1,170**	......	......	**1,170**	**12,092**		
1946	Similkameen	43,556	......	......	43,556	214,098		
1947	,,	49,324	......	......	49,324	329,179		
1948	,,	49,859	......	......	49,859	299,387		
1949	,,	49,906	......	......	49,906	298,293		
1950	,,	16,784	......	......	16,784	87,483		
1951	,,	3,941	......	......	3,941	28,094		
1952	,,	6,306	......	......	6,306	48,760		
1953	,,	7,047	......	......	7,047	51,012		
1954	,,	29,713	......	......	29,713	138,080		
1955	,,	73,475	......	......	73,475	379,511		
1956	,,	**72,102**	......	......	**72,102**	**366,820**		
	Northern	......	......	......	......	......	**13,195**	**109,445**
1946	Liard	2,501	78	......	2,579	14,540		
1947	,,	5,958	59	......	6,017	35,012		
1948	,,	8,570	60	......	8,630	52,721		
1949	,,	12,364	......	......	12,364	76,697		
1950	,,	12,250	......	......	12,250	82,258		
1951	,,	3,199	......	......	3,199	26,095		
1952	,,	3,854	......	......	3,854	42,606		
1953	,,	4,815	20	......	4,835	50,895		
1954	,,	4,359	......	......	4,359	33,079		
1955	,,	3,650	......	......	3,650	32,850		
1956	,,	**4,642**	......	......	**4,642**	**38.211**		
1946	Omineca	12,087	51	......	12,138	67,928		
1947	,,	10,751	59	......	10,810	63,375		
1948	,,	10,920	66	......	10,986	85,981		
1949	,,	11,468	63	......	11,531	92,865		
1950	,,	13,037	62	......	13,099	104,790		
1951	,,	27,904	......	......	27,904	206,799		
1952	,,	37,270	......	......	37,270	285,732		
1953	,,	42,079	......	......	42,079	324,986		
1954	,,	36,572	......	......	36,572	292,862		
1955	,,	30,015	......	......	30,015	227,010		
1956	,,	**8,553**	......	......	**8,553**	**71,234**		
	East Kootenay	......	......	......	......	......	**1,158,213**	**7,228,993**
1946	Fort Steele	744,941	21,161	106,122	872,224	2,952,765		
1947	,,	973,358	24,163	175,665	1,173,186	4,612,033		
1948	,,	990,530	20,227	154,342	1,165,099	6,092,157		
1949	,,	842,979	19,025	228,792	1,090,796	6,011,688		
1950	,,	825,315	15,196	213,218	1,053,729	5,774,509		
1951	,,	889,669	15,977	236,871	1,142,517	6,413,374		
1952	,,	822,071	15,813	245,528	1,083,412	6,591,942		
1953	,,	878,865	12,729	230,814	1,122,408	7,031,158		
1954	,,	820,081	15,310	218,923	1,054,314	6,648,655		
1955	,,	803,125	16,560	230,464	1,050,149	6,564,544		
1956	,,	**890,100**	**19,518**	**248,595**	**1,158,213**	**7,228,993**		
1946	Provincial totals	1,307,202	25,767	106,122	1,439,091	6,732,470		
1947	,,	1,492,356	28,328	175,665	1,696,349	8,680,440		
1948	,,	1,426,984	23,154	154,342	1,604,480	9,765,395		
1949	,,	1,369,463	23,013	228,792	1,621,268	10,549,924		
1950	,,	1,341,201	19,587	213,218	1,574,006	10,119,303		
1951	,,	1,317,299	19,402	236,871	1,573,572	10,169,617		
1952	,,	1,137,986	18,799	245,528	1,402,313	9,729,739		
1953	,,	1,138,777	14,547	230,814	1,384,138	9,528,279		
1954	,,	1,073,515	15,846	218,923	1,308,284	9,154,544		
1955	,,	1,085,385	17,025	230,464	1,332,874	8,986,501		
1956	,,	**1,148,707**	**19,907**	**248,595**	**1,417,209**	**9,346,518**	**1,417,209**	**9,346,518**

[1] For differences between gross mine output and coal sold refer to table "Production and Distribution by Collieries and by Districts" in section headed "Coal" or "Coal-mining" in Annual Reports of the Minister of Mines.

[2] The totals "sold and used" include:—

* Sales to retail and wholesale dealers, industrial users, and company employees.

† Coal used in company boilers, including steam locomotives.

‡ Coal used in making coke.

See also discussion under "Fuel," page A 14.

TABLE X.—COKE AND BY-PRODUCTS PRODUCTION FOR YEARS 1895 TO 1925 AND 1926 TO 1956

Year	Coal Used in Making Coke		Coke Made in Bee-hive Ovens		Coke Made in By-product Ovens		Coke Made in Gas Plants		Total Coke Made		Gas Sold and Used	Tar Produced	Other By-products[1]	Total Production Value of Coke Industry
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value				
	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	$	$	$	$
1895–1925	7,955,795	25,673,600	4,920,457	25,673,600	—	—	—	—	4,920,457	25,673,600	—	—	—	25,673,600
1926	299,839	1,338,565	105,227	795,841	42,209	244,469	42,468	221,600	189,904	1,261,910	1,009,613	50,035	45,772	2,367,330
1927	269,482	1,290,760	95,281	595,504	35,900	327,215	39,464	178,682	170,645	1,101,401	1,222,379	44,402	18,080	2,386,262
1928	210,207	940,668	68,734	429,590	32,322	263,781	41,711	187,882	142,767	881,253	1,313,407	45,313	14,036	2,254,009
1929	226,363	950,243	75,426	574,279	33,339	308,867	46,573	214,732	155,338	1,097,878	1,461,445	61,084	39,203	2,659,610
1930	225,325	1,002,684	73,708	558,801	31,904	298,004	45,751	232,917	151,363	1,089,722	1,547,092	65,770	11,935	2,714,519
1931	211,334	924,279	73,248	548,550	27,717	236,537	41,836	210,470	142,801	995,557	1,541,454	66,506	32,603	2,636,120
1932	151,750	710,432	33,090	247,615	25,436	217,221	44,645	237,174	103,171	702,010	1,589,656	54,771	14,109	2,360,546
1933	107,400	554,152	6,097	44,813	24,263	213,750	34,156	214,454	64,516	473,017	1,473,433	45,610	3,666	1,995,726
1934	141,384	571,167	24,840	154,105	23,512	213,653	51,184	198,217	99,536	565,975	1,439,287	43,939	4,756	2,053,957
1935	127,776	494,492	27,066	160,565	14,911	109,684	46,111	160,694	88,088	430,943	1,430,057	44,876	3,081	1,908,957
1936	125,810	436,595	34,009	191,843	—	—	48,859	138,787	82,868	330,630	1,422,783	38,872	—	1,792,285
1937	166,124	570,250	48,393	277,726	—	—	59,141	330,821	107,534	608,547	1,746,047	46,698	—	2,401,292
1938	176,877	623,649	54,602	315,294	—	—	58,643	345,790	113,245	661,084	1,770,839	44,324	—	2,476,247
1939	171,242	569,945	50,153	286,491	7,196	37,015	55,395	325,435	112,744	648,941	1,768,977	44,108	—	2,462,026
1940	184,160	577,706	37,845	220,211	29,124	151,931	60,726	303,421	127,695	675,563	1,810,083	54,379	3,060	2,543,085
1941	235,809	717,584	64,707	392,473	86,656	467,440	8,378	43,758	159,741	903,671	1,925,270	63,569	1,716	2,894,226
1942	255,862	866,795	66,824	439,464	96,428	608,521	6,528	54,307	169,780	1,102,292	2,165,888	86,113	22,028	3,376,321
1943	260,334	983,910	42,766	291,843	43,895	274,402	93,714	647,482	180,375	1,213,727	2,453,592	96,249	18,321	3,781,889
1944	212,883	1,439,891	36,966	301,201	47,401	347,245	88,430	565,393	172,797	1,213,839	2,562,610	56,476	19,046	3,851,971
1945	230,868	1,211,584	13,464	117,369	59,098	434,876	91,682	577,479	164,244	1,129,724	2,721,690	83,828	20,756	3,955,998
1946	251,954	1,441,415	20,542	178,556	53,525	423,025	101,094	648,297	175,161	1,249,878	3,079,009	88,947	53,097	4,470,931
1947	284,049	1,682,602	44,517	427,330	59,638	531,114	91,755	579,635	195,910	1,538,079	3,390,713	124,885	25,780	5,079,457
1948	235,297	1,440,415	47,461	559,735	57,112	630,390	57,678	455,096	162,251	1,645,221	4,520,886	153,130	19,489	6,338,726
1949	323,899	1,979,138	66,407	690,045	89,268	1,018,288	67,449	496,933	223,124	2,205,266	4,148,124	194,728	27,406	6,575,524
1950	333,955	2,027,470	23,703	269,728	127,477	997,200	92,704	686,871	243,884	1,953,799	4,298,161	277,138	27,944	6,557,042
1951	332,416	1,949,117	32,598	387,796	138,051	1,552,764	72,215	571,161	242,864	2,511,721	4,263,754	277,786	22,132	7,075,393
1952	323,922	1,972,918	35,110	440,756	142,156	1,729,924	64,906	525,384	242,172	2,696,064	4,625,747	252,070	25,639	7,599,520
1953	310,431	2,005,551	—	—	177,790	2,090,147	60,407	525,411	238,197	2,615,558	4,857,116	238,771	21,046	7,732,491
1954	302,052	2,052,641	—	—	168,982	2,032,902	67,108	566,660	236,090	2,599,562	5,113,334	226,824	20,586	7,960,306
1955	314,994	2,122,303	—	—	177,031	2,180,516	70,387	594,482	247,418	2,774,998	5,407,842	292,984	18,369	8,494,193
1956	328,805	2,277,402	—	—	180,263	2,270,167	78,185	738,292	258,448	3,008,459	5,145,851	287,437	20,961	8,462,708
Totals	15,288,398	61,399,923	6,223,241	35,571,124	2,032,604	20,211,048	1,829,283	11,777,717	10,084,225	67,559,889	83,226,139	3,551,622	554,617	154,892,267

[1] "Other by-products" total includes ammonium sulphate, $52,492; ammonia liquor, $103,850; light oils, $16,571; motor fuel, $7,009; naphthalene, $4,077; creosote, $34; benzol (thinning), $312; solvent naphtha, $644; cinders, $344,682; pitch, $5,131; sulphuric acid, $6,658; tar-paint, $2,330; and miscellaneous, $10,827.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1956

Dividends Paid during 1955 and 1956

	1955	1956
Bralorne Mines Ltd.	$187,050	$498,800
Canadian Collieries (Dunsmuir) Ltd.		88,333
Canadian Exploration Ltd.	4,722,000	6,453,400
Consolidated Mining and Smelting Co. of Canada, Ltd.	28,665,451	27,027,453
Crow's Nest Pass Coal Co. Ltd.	248,472	248,472
Giant Mascot Mines Ltd.		179,263
Granby Consolidated Mining Smelting and Power Co. Ltd.	225,116	113,058
Island Mountain Mines Co. Ltd.	157,607[1]	79,854[1]
Pioneer Gold Mines of B.C. Ltd.	175,175	224,033
Reeves MacDonald Mines Ltd.		584,500
Sheep Creek Mines Ltd.		93,750
Silver Standard Mines Ltd.	42,883	
Sunshine Lardeau Mines Ltd.		164,000
Torbrit Silver Mines Ltd.	240,000	
Yale Lead and Zinc Mines Ltd.	92,840	185,780
Others	314,989	321,986
Totals	$35,071,583	$36,262,682

[1] "Liquidating" payments completed.

Dividends Paid Yearly, 1917 to 1956, Inclusive

Year	Amount Paid	Year	Amount Paid
1917	$3,269,494	1938	$12,068,875
1918	2,704,469	1939	11,865,698
1919	2,494,283	1940	14,595,530
1920	1,870,296	1941	16,598,110
1921	736,629	1942	13,627,104
1922	3,174,756	1943	11,860,159
1923	2,983,570	1944	11,367,732
1924	2,977,276	1945	10,487,395
1925	5,853,419	1946	15,566,047
1926	8,011,137	1947	27,940,213
1927	8,816,681	1948	37,672,319
1928	9,572,536	1949	33,651,096
1929	11,263,118	1950	34,399,330
1930	10,543,500	1951	40,921,238
1931	4,650,857	1952	32,603,956
1932	2,786,958	1953	22,323,089
1933	2,471,735	1954	25,368,262
1934	4,745,905	1955	35,071,583
1935	7,386,070	1956	36,262,682
1936	10,513,705		
1937	15,085,293	Total	$566,162,105

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1956—*Continued*

Lode-gold Mines[1]

Company or Mine	Locality	Class	Amount Paid
Arlington	Erie	Gold	$94,872
Athabasca	Nelson	Gold	25,000
Bayonne	Tye Siding	Gold	25,000
Bralorne Mines Ltd.	Bridge River	Gold	17,385,400
Belmont-Surf Inlet	Princess Royal Island	Gold	1,437,500
Cariboo Gold Quartz Mining Co. Ltd.	Wells	Gold	1,679,976
Cariboo-McKinney Con. M. & M. Co.	Camp McKinney	Gold	565,588
Canadian Pacific Exploration (Porto Rico)	Nelson	Gold	37,500
Centre Star	Rossland	Gold-copper	472,255
Fairview Amalgamated	Oliver	Gold	5,254
Fern Gold Mining & Milling Co. Ltd.	Nelson	Gold	9,375
Gold Belt Mining Co. Ltd.	Sheep Creek	Gold	668,595[2]
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines Ltd.	Wells	Gold	2,491,236[2]
I.X.L.	Rossland	Gold	134,025
Jewel-Denero	Greenwood	Gold	11,751
Kelowna Exploration Co. Ltd. (Nickel Plate)	Hedley	Gold	2,040,000
Kelowna Mines Hedley Ltd.	Hedley	Gold	780,000[3]
Kootenay Belle Gold Mines Ltd.	Sheep Creek	Gold	357,856
Le Roi Mining Co.	Rossland	Gold-copper	1,475,000
Le Roi No. 2 Ltd.	Rossland	Gold-copper	1,574,640
Lorne (later Bralorne)	Bridge River	Gold	20,450
Motherlode	Sheep Creek	Gold	163,500
Mount Zeballos Gold Mines Ltd.	Zeballos	Gold	165,000
Nickel Plate (Hedley Gold Mining Co. Ltd.)	Hedley	Gold	3,423,191
Pioneer Gold Mines of B.C. Ltd.	Bridge River	Gold	10,092,745
Poorman	Nelson	Gold	25,000
Premier Gold Mining Co. Ltd.	Premier	Gold	18,858,075[4]
Privateer Mine Ltd.	Zeballos	Gold	1,914,183
Queen (prior to Sheep Creek Gold Mines Ltd.)	Sheep Creek	Gold	98,674
Relief Arlington Mines Ltd. (Second Relief)	Erie	Gold	308,000[2]
Reno Gold Mines Ltd.	Sheep Creek	Gold	1,433,640[2]
Sheep Creek Gold Mines Ltd.[6]	Sheep Creek	Gold	3,609,375[5]
Silbak Premier Mines Ltd.	Premier	Gold	2,425,000[4]
Spud Valley Gold Mines Ltd.	Zeballos	Gold	168,000
Sunset No. 2	Rossland	Gold-copper	115,007
Surf Inlet Consolidated Gold Mines Ltd.	Surf Inlet	Gold	120,279
War Eagle	Rossland	Gold-copper	1,245,250
Ymir Gold	Ymir	Gold	300,000
Ymir Yangee Girl	Ymir	Gold	415,002[2]
Miscellaneous mines		Gold	108,623
Total, lode-gold mines			$77,344,101

[1] The gold-copper properties of Rossland are included in this table.
[2] Includes "return of capital" and "liquidating" payments.
[3] Former Kelowna Exploration Company Limited; changed in January, 1951.
[4] Up to and including 1936, dividends paid by Premier Gold Mining Company Limited were derived from operations of the company in British Columbia. Subsequent dividends paid by Premier Gold Mining Company Limited have been derived from the operations of subsidiary companies in British Columbia and elsewhere and are not ncluded in the figure given. In 1936, Silbak Premier, a subsidiary of Premier Gold Mining Company, took over the former gold operations of that company in British Columbia. Dividends paid by Silbak Premier are given above.
[5] In several years, preceding 1953, company revenue has included profits from operations of the Lucky Jim zinc-lead mine.
[6] Sinch March, 1956, company name is Sheep Creek Mines Ltd.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1956—*Continued*

Silver-Lead-Zinc Mines

Company or Mine	Locality	Class	Amount Paid
Antoine	Rambler	Silver-lead-zinc	$10,000
Base Metals Mining Corporation Ltd. (Monarch and Kicking Horse)	Field	Silver-lead-zinc	586,143[1]
Beaverdell-Wellington	Beaverdell	Silver-lead-zinc	97,200
Beaver Silver Mines Ltd.	Greenwood	Silver-lead-zinc	48,000
Bell	Beaverdell	Silver-lead-zinc	388,297
Bosun (Rosebery-Surprise)	New Denver	Silver-lead-zinc	25,000
Canadian Exploration Ltd.	Salmo	Silver-lead-zinc	11,175,400
Capella	New Denver	Silver-lead-zinc	5,500
Consolidated Mining and Smelting Co. of Canada, Ltd.	Trail	Silver-lead-zinc	433,578,697[2]
Couverapee	Field	Silver-lead-zinc	5,203
Duthie Mines Ltd.	Smithers	Silver-lead-zinc	50,000
Florence Silver	Ainsworth	Silver-lead-zinc	35,393
Giant Mascot Mines Ltd.	Spillimacheen	Silver-lead-zinc	179,263
Goodenough	Cody	Silver-lead-zinc	45,668
H.B. Mining Co.	Hall Creek	Silver-lead-zinc	8,904
Highland Lass Ltd.	Beaverdell	Silver-lead-zinc	132,464
Highland-Bell Ltd.	Beaverdell	Silver-lead-zinc	1,398,025
Horn Silver	Similkameen	Silver-lead-zinc	6,000
Idaho-Alamo	Sandon	Silver-lead-zinc	400,000
Iron Mountain (Emerald)	Salmo	Silver-lead-zinc	20,000
Jackson	Retallack	Silver-lead-zinc	20,000
Last Chance	Three Forks	Silver-lead-zinc	213,000
Lone Bachelor	Sandon	Silver-lead-zinc	50,000
Lucky Jim	Three Forks	Silver-lead-zinc	80,000
Mercury	Sandon	Silver-lead-zinc	6,000
Meteor	Slocan City	Silver-lead-zinc	10,257
Monitor and Ajax	Three Forks	Silver-lead-zinc	70,500
Mountain Con	Cody	Silver-lead-zinc	71,387
McAllister	Three Forks	Silver-lead-zinc	45,088
Noble Five	Cody	Silver-lead-zinc	72,859
North Star	Kimberley	Silver-lead-zinc	497,901
No. One	Sandon	Silver-lead-zinc	6,754
Ottawa	Slocan City	Silver-lead-zinc	110,429
Payne	Sandon	Silver-lead-zinc	1,438,000
Providence	Greenwood	Silver-lead-zinc	142,238[3]
Queen Bess	Alamo	Silver-lead-zinc	25,000
Rambler-Cariboo	Rambler	Silver-lead-zinc	467,250
Reeves MacDonald Mines Ltd.	Remac	Silver-lead-zinc	1,753,500
Reco	Cody	Silver-lead-zinc	334,992
Ruth Mines Ltd.	Sandon	Silver-lead-zinc	125,490
St. Eugene	Moyie	Silver-lead-zinc	566,000
Sheep Creek Mines Ltd.	Invermere	Silver-lead-zinc	93,750
Silversmith and Slocan Star[4]	Sandon	Silver-lead-zinc	1,267,600
Silver Standard Mines Ltd.	Hazelton	Silver-lead-zinc	1,715,333
Spokane-Trinket	Ainsworth	Silver-lead-zinc	10,365
Standard Silver Lead	Silverton	Silver-lead-zinc	2,734,688
Sunset and Trade Dollar	Retallack	Silver-lead-zinc	88,000
Sunshine Lardeau Mines Ltd.	Beaton	Silver-lead-zinc	164,000
Torbit Silver Mines Ltd.	Alice Arm	Silver-lead-zinc	390,000
Utica	Kaslo	Silver-lead-zinc	64,000
Violamac Mines (B.C.) Ltd.	New Denver	Silver-lead-zinc	850,000
Wallace Mines Ltd. (Sally)	Beaverdell	Silver-lead-zinc	135,000
Washington	Rambler Station	Silver-lead-zinc	20,000
Western Exploration Co. Ltd.	Silverton	Silver-lead-zinc	30,867
Whitewater	Retallack	Silver-lead-zinc	592,515
Yale Lead and Zinc Mines Ltd.	Ainsworth	Silver-lead-zinc	278,620
Miscellaneous mines			70,239
Total, silver-lead-zinc mines			$462,806,869

[1] Includes $466,143 "return of capital" distribution prior to 1949.
[2] Earnings of several company mines, and customs smelter at Trail.
[3] Includes $10,504 paid in 1944 but not included in the yearly figure.
[4] These two properties were amalgamated as Silversmith Mines Limited in August, 1939.

Table XI.—Dividends Paid by Mining Companies, 1897–1956—*Continued*

Copper Mines

Company or Mine	Locality	Class	Amount Paid
Britannia M. & S. Co.[1]	Britannia Beach	Copper	$18,803,772
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M.S. & P. Co.[2]	Copper Mountain	Copper	29,873,226
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$49,970,647

[1] Britannia Mining and Smelting Company Limited is a subsidiary of the Howe Sound Company, which is the holding company for Britannia and for other mines in Canada, Mexico, and the United States. Dividends paid by the Howe Sound Company, therefore, cannot be credited to British Columbia. Dividends in the above table for Britannia have been paid by that company, none being paid subsequent to 1930, until 1939. In making comparison with yearly totals, the amounts shown as paid by the Howe Sound Company have been deducted for the years shown, so the total in the annual report concerned will show the higher figure.

[2] The Granby Consolidated Mining Smelting and Power Company dividends commenced in 1904 and cover all company activities in British Columbia to date, the present operations being conducted at Allenby and Copper Mountain. The dividends as set out in the table in the Minister of Mines Annual Report for 1942 were incorrect; the correct total is as above. The figure now includes all dividends, capital distributions, and interim liquidating payments, the latter being $4,500,000, paid, in 1936, prior to reorganization.

Coal Mines

Company or Mine	Locality	Class	Amount Paid
Wellington Collieries Ltd.	Nanaimo	Coal	$16,000,000
Bulkley Valley Collieries Ltd.	Telkwa	Coal	24,000
Crow's Nest Pass Coal Co. Ltd.	Fernie	Coal	15,973,782
Canadian Collieries (D.) Ltd.	Nanaimo	Coal	651,605
Total, coal mines			$32,649,054

Aggregate of All Classes

Lode-gold mining	$76,344,101
Silver-lead-zinc mining and smelting	462,806,869
Copper-mining	49,970,647
Coal-mining	32,649,054
Miscellaneous, structural, and placer gold	6,280,145
Total	$629,051,149

Note.—The term "miscellaneous" noted in each class of dividend covers all payments of $5,000 and under, together with payments made by companies or individuals requesting that the item be not disclosed.

In compiling the foregoing table of dividends paid, the Department wishes to acknowledge the kind assistance given by companies, individuals, and trade journals in giving information on the subject.

TABLE XII.—PRINCIPAL ITEMS OF EXPENDITURE, REPORTED FOR MINING OPERATIONS OF ALL CLASSES

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
Lode-mining	$42,174,038	$6,194,807	$15,295,792
Placer-mining	129,702	4,350	4,383
Fuels—coal, coke and gas plants, petroleum and natural gas	7,060,381	705,430	4,427,329
Miscellaneous metals and industrial minerals	2,838,643	634,309	713,493
Structural materials industry	5,063,262	2,223,881	1,595,842
Totals, 1956	**$57,266,026**	**$9,762,777**	**$22,036,839**
Totals, 1955	51,890,246	9,144,034[1]	21,131,572[1]
1954	48,702,746	7,128,669	19,654,724
1953	55,543,490	8,668,099	20,979,411
1952	62,256,631	8,557,845	27,024,500
1951	52,607,171	7,283,051	24,724,101
1950	42,738,035	6,775,998	17,500,663
1949	41,023,786	7,206,637	17,884,408
1948	38,813,506	6,139,174	11,532,121
1947	32,160,338	5,319,470	13,068,948
1946	26,190,200	5,427,458	8,367,705
1945	22,620,975	7,239,726	5,756,628
1944	23,131,874	5,788,671	6,138,084
1943	26,051,467	7,432,585	6,572,317
1942	26,913,160	7,066,109	6,863,398
1941	26,050,491	3,776,747	7,260,441
1940	23,391,330	3,474,721	6,962,162
1939	22,357,035	3,266,000	6,714,347
1938	22,765,711	3,396,106	6,544,500
1937	21,349,690	3,066,311	6,845,330
1936	17,887,619	2,724,144	4,434,501
1935	16,753,367	2,619,639	4,552,730
Grand totals, 1935–56	$758,464,894	$131,263,971	$272,549,430

[1] A major operator reported fuel, electricity, and process supplies for 1955 as a combined total under the heading "Process Supplies." For that reason the lode-mining item "Fuel and Electricity" was unduly small and "Process Supplies" unduly large. These figures have now been revised and are as they appear in the above table.

NOTE.—"Process Supplies" include explosives, chemicals, drill-steel, lubricants, etc.

Table XIII.—Average Number Employed in the Mining Industry, 1901–56

Year	Placer-mining	Lode-mining Under	Lode-mining Above	Lode-mining Total	In Concentrators	In Smelters	Coal-mining Under	Coal-mining Above	Coal-mining Total	Structural Materials Quarries and Pits	Structural Materials Plants	Miscellaneous	Total[1]
1901	....	2,736	1,212	3,948	....	....	3,041	931	3,974	....	....	....	7,922
1902	....	2,219	1,126	3,345	....	....	3,101	910	4,011	....	....	....	7,356
1903	....	1,662	1,088	2,750	....	....	3,137	1,127	4,264	....	....	....	7,014
1904	....	2,143	1,163	3,306	....	....	3,278	1,175	4,453	....	....	....	7,759
1905	....	2,470	1,240	3,710	....	....	3,127	1,280	4,407	....	....	....	8,117
1906	....	2,680	1,303	3,983	....	....	3,415	1,390	4,805	....	....	....	8,788
1907	....	2,704	1,239	3,943	....	....	2,862	907	3,769	....	....	....	7,712
1908	....	2,567	1,127	3,694	....	....	4,432	1,641	6,073	....	....	....	9,767
1909	....	2,184	1,070	3,254	....	....	4,713	1,705	6,418	....	....	....	9,672
1910	....	2,472	1,237	3,709	....	....	5,903	1,855	7,758	....	....	....	11,467
1911	....	2,435	1,159	3,594	....	....	5,212	1,661	6,873	....	....	....	10,467
1912	....	2,472	1,364	3,837	....	....	5,275	1,855	7,130	....	....	....	10,967
1913	....	2,773	1,505	4,278	....	....	4,950	1,721	6,671	....	....	....	10,949
1914	....	2,741	1,433	4,174	....	....	4,267	1,465	5,732	....	....	....	9,906
1915	....	2,709	1,435	4,144	....	....	3,708	1,283	4,991	....	....	....	9,135
1916	....	3,357	2,036	5,393	....	....	3,694	1,366	5,060	....	....	....	10,453
1917	....	3,290	2,198	5,488	....	....	3,760	1,410	5,170	....	....	....	10,658
1918	....	2,626	1,764	4,390	....	....	3,658	1,769	5,247	....	....	....	9,637
1919	....	2,513	1,746	4,259	....	....	4,145	1,821	5,966	....	....	....	10,225
1920	....	2,074	1,605	3,679	....	....	4,191	2,158	6,349	....	....	....	10,028
1921	....	1,355	975	2,330	....	....	4,722	2,163	6,885	....	....	....	9,215
1922	....	1,510	1,239	2,749	....	....	4,712	1,932	6,644	....	....	....	9,393
1923	....	2,102	1,516	3,618	....	....	4,342	1,807	6,149	....	....	....	9,767
1924	....	2,353	1,680	4,033	....	....	3,894	1,524	5,418	....	....	....	9,451
1925	....	2,298	2,840	5,138	....	....	3,828	1,615	5,443	....	....	....	10,581
1926	299	2,606	1,735	4,341	808	2,461	3,757	1,565	5,322	493	324	124	14,172
1927	415	2,671	1,916	4,587	854	2,842	3,646	1,579	5,225	647	138	122	14,830
1928	355	2,707	2,469	5,176	911	2,748	3,814	1,520	5,334	412	368	120	15,424
1929	341	2,926	2,052	4,978	966	2,948	3,675	1,353	5,028	492	544	268	15,565
1930	425	2,316	1,260	3,576	832	3,197	3,389	1,256	4,645	843	344	170	14,032
1931	688	1,463	834	2,297	581	3,157	2,957	1,125	4,082	460	526	380	12,171
1932	874	1,355	900	2,255	542	2,036	2,628	980	3,608	536	329	344	10,524
1933	1,134	1,786	1,335	3,121	531	2,436	2,241	853	3,094	376	269	408	11,369
1934	1,122	2,796	1,729	4,525	631	2,890	2,050	843	2,893	377	187	360	12,985
1935	1,291	2,740	1,497	4,237	907	2,771	2,145	826	2,971	536	270	754	13,737
1936	1,124	2,959	1,840	4,799	720	2,678	2,015	799	2,814	931	288	825	14,179
1937	1,371	3,603	1,818	5,421	1,168	3,027	2,286	867	3,153	724	327	938	16,129
1938	1,303	3,849	2,266	6,115	919	3,158	2,088	874	2,962	900	295	369	16,021
1939	1,252	3,905	2,050	5,955	996	3,187	2,167	809	2,976	652	311	561	15,890
1940	1,004	3,923	2,104	6,027	1,048	2,944	2,175	699	2,874	827	334	647	15,705
1941	939	3,901	1,823	5,724	1,025	3,072	2,229	494	2,723	766	413	422	15,084
1942	489	2,920	1,504	4,424	960	3,555	1,892	468	2,360	842	378	262	13,270
1943	212	2,394	1,699	4,093	891	2,835	2,240	611	2,851	673	326	567	12,448
1944	255	1,896	1,825	3,721	849	2,981	2,150	689	2,839	690	351	628	12,314
1945	209	1,933	1,750	3,683	822	2,834	1,927	503	2,430	921	335	586	11,820
1946	347	1,918	1,817	3,735	672	2,818	1,773	532	2,305	827	555	679	11,933
1947	360	3,024	2,238	5,262	960	3,461	1,694	731	2,425	977	585	869	14,899
1948	348	3,143	2,429	5,572	1,126	3,884	1,594	872	2,466	1,591	656	754	16,397
1949	303	3,034	2,724	5,758	1,203	3,763	1,761	545	2,306	2,120	542	626	16,621
1950	327	3,399	2,415	5,814	1,259	3,759	1,745	516	2,261	1,916	616	660	16,612
1951	205	3,785	3,695	7,480	1,307	4,044	1,462	463	1,925	1,783	628	491	17,863
1952	230	4,171	3,923	8,094	1,516	4,120	1,280	401	1,681	1,530	557	529	18,257
1953	132	3,145	2,589	5,734	1,371	3,901	1,154	396	1,550	1,909	559	634	15,790
1954	199	2,644	2,520	5,164	1,129	3,119	1,076	358	1,434	1,861	638	584	14,128
1955	103	2,564	2,553	5,117	1,091	3,304	1,100	378	1,478	1,646	641	722	14,102
1956	**105**	**2,637**	**2,827**	**5,464**	**1,043**	**3,339**	**968**	**398**	**1,366**	**1,598**	**770**	**854**	**14,539**

[1] The average number employed in the industry is the sum of the averages for individual companies. The average for each company is obtained by taking the sum of the numbers employed each month and dividing by 12, regardless of the number of months worked.

TABLE XIV.—LODE-METAL MINES—TONNAGE, NUMBER OF MINES, NET AND GROSS VALUE OF PRINCIPAL METALS,[4] 1901–56

Year	Tonnage[1]	Number of Shipping Mines	Number of Mines Shipping over 100 Tons	Gross Value as Reported by Shipper[2]	Freight and Treatment[2]	Net Value to Shipper[3]	Gross Value of Lode Metals Produced[4]
1901	926,162	119	78	....	....	....	$14,100,282
1902	1,009,016	124	75	....	....	....	11,581,153
1903	1,288,466	125	74	....	....	....	12,103,237
1904	1,461,609	142	76	....	....	....	12,909,035
1905	1,706,679	146	79	....	....	....	15,980,164
1906	1,963,872	154	77	....	....	....	18,484,102
1907	1,805,614	147	72	....	....	....	17,316,847
1908	2,083,606	108	59	....	....	....	15,847,411
1909	2,057,713	89	52	....	....	....	15,451,141
1910	2,216,428	83	50	....	....	....	14,728,731
1911	1,770,755	80	45	....	....	....	11,454,063
1912	2,688,532	86	51	....	....	....	17,662,766
1913	2,663,809	110	58	....	....	....	17,190,838
1914	2,175,971	98	56	....	....	....	15,225,061
1915	2,720,669	132	59	....	....	....	19,992,149
1916	3,229,942	169	81	....	....	....	31,483,014
1917	2,797,368	193	87	....	....	....	26,788,474
1918	2,912,516	175	80	....	....	....	27,590,278
1919	2,146,920	144	74	....	....	....	19,750,498
1920	2,215,445	121	60	....	....	....	19,444,365
1921	1,586,428	80	35	....	....	....	12,920,398
1922	1,592,163	98	33	....	....	....	19,227,857
1923	2,447,672	77	28	....	....	....	25,347,092
1924	3,413,912	86	37	....	....	....	35,538,247
1925	3,849,269	102	40	....	....	....	46,200,135
1926	4,775,327	138	55	....	....	$38,558,618	51,508,031
1927	5,416,411	132	52	....	....	27,750,364	44,977,082
1928	6,241,672	110	49	....	....	29,070,075	48,281,825
1929	6,977,903	106	48	....	....	34,713,887	51,174,859
1930	6,804,276	68	32	....	....	21,977,688	40,915,395
1931	5,549,622	44	22	....	....	10,513,931	22,535,573
1932	4,354,904	75	29	....	....	7,075,393	19,700,235
1933	4,063,775	109	47	....	....	13,976,858	25,007,137
1934	5,141,744	145	69	....	....	20,243,278	33,895,930
1935	4,927,204	177	72	....	....	25,407,914	40,597,569
1936	4,881,173	168	70	....	....	30,051,207	43,666,452
1937	6,145,244	185	118	$48,617,920	$4,663,843	43,954,077	62,912,783
1938	7,377,117	211	92	40,222,237	4,943,754	35,278,483	53,877,333
1939	7,212,171	217	99	45,133,788	4,416,919	40,716,869	53,522,098
1940	*7,949,736*	*216*	*92*	*50,004,909*	*6,334,611*	*43,670,298*	*62,848,642*
1941	8,007,937	200	96	52,354,870	5,673,048	46,681,822	62,216,019
1942	6,894,844	126	76	50,494,041	5,294,637	45,199,404	55,359,479
1943	5,786,864	48	32	37,234,070	3,940,367	33,293,703	46,089,042
1944	4,879,851	51	31	29,327,114	2,877,706	26,449,408	39,315,910
1945	4,377,722	36	27	34,154,917	2,771,292	31,383,625	49,997,071
1946	3,705,594	50	32	48,920,971	2,904,130	46,016,841	56,519,691
1947	5,011,271	75	33	81,033,093	4,722,010	76,311,087	93,176,165
1948	5,762,321	97	51	118,713,859	18,585,183	100,128,727	125,979,961
1949	6,125,460	118	54	99,426,678	19,613,185	79,814,604	105,259,001
1950	6,802,482	112	*58*	*108,864,792*	22,113,431	*86,751,361*	121,635,457
1951	6,972,400	119	64	142,590,427	25,096,743	117,493,684	146,140,477
1952	9,174,617	95	58	140,070,389	30,444,575	106,601,451	134,111,567
1953	9,660,281	80	48	94,555,069	27,815,152	66,739,892	110,341,548
1954	8,513,865	63	40	106,223,833	29,135,673	77,088,160	111,844,340
1955	9,126,902	53	34	119,039,285	30,696,044	88,343,241	129,455,122
1956	**8,827,037**	**70**	**40**	**125,043,590**	**31,933,681**	**93,110,262**	**141,316,045**

[1] Includes mercury ores, tungsten ores, iron ores, and silica (flux).

[2] Data not collected before 1937.

[3] Previous to 1937 the shipper reported "Net Value at Shipping Point," no indication being given as to how the net value was computed. From 1937 on, the shipper has reported "Gross Value," from which deduction of freight and treatment gives "Net Value."

[4] Gross value as represented by valuing gold, silver, copper, lead, and zinc at yearly average prices and for 1956 includes value of tungsten content in concentrates shipped.

Table XV.—Lode-metal Producers in 1956

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										
Atlin Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Big Bull and Tulsequah Chief	Tulsequah	Tulsequah Mines Ltd., Trail	203,688	Zinc concentrates, 15,853 tons; lead concentrates, 3,103 tons; copper and gold concentrates, 15,335 tons	13,491	675,137	5,661,681	3,975,597	20,329,120	72,576
Maid of Erin	Rainy Hollow	St. Eugene Mining Corporation Ltd., Toronto, Ont.	3,463	Crude ore	5	41,947	459,439	—	—	—
Liard Mining Division										
Contact	Dawson Creek	Telmac Mines Ltd., Edmonton, Alta.	28	Crude ore	—	336	56	4,292	—	—
Central British Columbia										
Cariboo Mining Division										
Cariboo Gold Quartz and Aurum	Wells	The Cariboo Gold Quartz Mining Co. Ltd., Vancouver	94,721	Bullion	41,117	4,473	—	—	—	—
Mouse Mountain	Mouse Mountain	John MacGowan, Quesnel	22	Crude ore	1	10	2,490	—	—	—
Clinton Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Omineca Mining Division										
Cronin Babine	Smithers	New Cronin Babine Mines Ltd., Vancouver	4,200	Lead concentrates, 450 tons; zinc concentrates, 470 tons	40	46,187	—	649,765	607,251	7,622
Silver Standard	Hazelton	Silver Standard Mines, Ltd., Vancouver	19,333	Lead concentrates, 1,947 tons; zinc concentrates, 1,918 tons (fiscal-year production)	1,113	752,115	85,101	1,852,056	2,344,454	30,307
Coast and Islands										
Alberni Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Nanaimo Mining Division										
Argus	Menzies Bay	Argus Consolidated Mines Ltd., Campbell River	5	Crude ore	—	8	2,228	—	—	—

TABLE XV.—LODE-METAL PRODUCERS IN 1956—*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
NORTHERN BRITISH COLUMBIA—*Continued*										
Nanaimo Mining Division—Continued			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Blue Grouse	Reginald Lake	H. Wheatley, Campbell River	21	Crude ore	—	18	4,828	29	—	—
Copper Road	Quadra Island	Adams Bros., Granite Bay	12	Crude ore	—	32	4,811	—	—	—
Iron Hill	Quinsam Lake	Argonaut Mine Co. Ltd., Division of Utah Co. of the Americas, Campbell River	126,801	Iron-ore concentrates, 205,897 tons	—	—	—	—	—	—
Prescott, Paxton, Yellow Kid, Yellow Jacket	Texada Island	Texada Mines Ltd., Vananda	280,220	Iron-ore concentrates, 164,058 tons	—	—	—	—	—	—
New Westminster Mining Division										
Douglas	Agassiz	G. Clitheroe, Vancouver	21	Crude ore	—	127	1,783	380	—	—
Skeena Mining Division										
Silbak Premier	Premier	Silbak Premier Mines Ltd., Vancouver	5,580	Lead concentrates, 177 tons; zinc concentrates, 355 tons	89	5,021	—	395,568	373,455	—
Toric	Kitsault River	Torbrit Silver Mines Ltd., Toronto, Ont.	134,652	Silver-lead concentrates, 1,713 tons; silver bullion	—	1,562,437	—	1,051,376	—	—
Vancouver Mining Division										
Britannia	Britannia Beach	Britannia Mining & Smelting Co. Ltd., Britannia Beach	834,458	Copper concentrates and precipitates, 26,040 tons; zinc concentrates, 15,652 tons; iron pyrite concentrate, 47,640 tons	9,165	89,938	15,532,344	1,230,394	18,377,640	73,344
Victoria Mining Division										
Blue Grouse	Cowichan Lake	Cowichan Copper Co. Ltd., Lake Cowichan	3,075	Crude ore	—	1,541	350,261	—	—	—
SOUTH CENTRAL BRITISH COLUMBIA										
Greenwood Mining Division										
Highland-Bell	Beaverdell	Highland-Bell Ltd., Vancouver	14,322	Lead concentrates, 514 tons; zinc concentrates, 330 tons; jig concentrates, 122 tons	221	642,474	—	304,791	390,345	3,289
Providence	Greenwood	Messrs. Wanke, Johnson, and Kleman, Greenwood	5	Crude ore	3	1,107	—	439	561	—

Ruby	Boundary Falls	Edward Cooke, Greenwood	31	Crude ore, clean-up material	—	19	1,887	—	—	—
Kamloops Mining Division										
East Lemhi	Adams Plateau	East Lemhi Mining Co., Spokane, Wash.	33	Crude ore from road cut and shipped for smelter test	1	1,130	—	18,364	5,275	—
Lillooet Mining Division										
Bralorne	Bridge River	Bralorne Mines Ltd., Vancouver	131,662	Bullion; gold concentrates, 2,218 tons	63,650	14,094	—	—	—	—
Pioneer	Bridge River	Pioneer Gold Mines of B.C. Ltd., Vancouver	88,537	Bullion	52,576	10,589	—	—	—	—
Nicola Mining Division										
Copperado	Nicola	Guichon Mines Ltd., Vancouver	45	Crude ore	—	78	6,187	—	—	—
Osoyoos Mining Division										
Fairview	Oliver	Consolidated Mining and Smelting Co. of Canada, Ltd., Trail	51,856	Silica flux	—	—	—	—	—	—
Little Joe	Fairview	Joe Barillaro, Oliver	4	Crude ore	2	35	—	—	—	—
Nickel Plate	Hedley	W. B. Graham, Hedley; lessee, Kelowna Mines Hedley Ltd.	—	Concentrates, 170 tons; clean-up material	686	200	4,265	—	—	—
Olalla	Olalla	Olalla Mines Ltd., Vancouver	—	Manganese ore, small tonnage shipped for experimental purposes	—	—	—	—	—	—
Similkameen Mining Division										
Copper Mountain	Copper Mountain	Granby Cons. M.S. & P. Co. Ltd., Copper Mountain	1,933,193	Copper concentrates, 43,610 tons	6,353	131,541	20,046,233	—	—	—
Vernon Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
SOUTHEASTERN BRITISH COLUMBIA										
Fort Steele Mining Division										
Sullivan	Kimberley	Consolidated Mining and Smelting Co. of Canada, Ltd., Trail	2,769,177	Lead concentrates, 108,953 tons; zinc concentrates, 279,503 tons; tin concentrates, 384 tons	297	2,591,305	271,206	189,756,121	261,206,492	—
Golden Mining Division										
Mineral King and Paradise	Invermere	Sheep Creek Mines Ltd., Nelson	146,566	Lead concentrates, 3,014 tons; zinc concentrates, 8,850 tons	—	66,928	110,592	3,736,861	10,676,335	32,411
Silver Giant	Spillimacheen	Giant Mascot Mines Ltd., Vancouver	185,441	Lead concentrates, 8,641 tons; zinc concentrates, 783 tons	—	114,893	196,668	12,126,327	1,217,616	8,081

TABLE XV.—LODE-METAL PRODUCERS IN 1956—*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
SOUTHEASTERN BRITISH COLUMBIA—*Continued*										
Nelson Mining Division					Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
H.B.	Salmo	Consolidated Mining and Smelting Co. of Canada, Ltd., Trail	435,305	Lead concentrates, 3,622 tons; zinc concentrates, 31,705 tons	......	74,350	......	5,657,044	31,934,089	279,307
Crawford	Creston	F. E. Crawford, Creston	3	Crude ore	......	37	......	2,157	......	......
Emerald-Feeney-Dodger	Salmo	Canadian Exploration Ltd., Vancouver	207,890	**Tungsten concentrates, 120,208 units WO_3**	......	......	......	......	......	......
Jersey Zinc	Salmo	Canadian Exploration Ltd., Vancouver	371,971	Lead concentrates, 7,609 tons; zinc concentrates, 24,744 tons	......	23,194	......	11,255,304	30,002,972	221,729
Nugget	Sheep Creek	A. Endersby, Jr., and A. Endersby, Sr., Fruitvale	51	Crude ore	31	15	......	......	......	......
Queen	Sheep Creek	A. Kraft and A. MacDonald, Ymir	4	Clean-up material	10	9	......	76	46	......
Queen Victoria, Eureka	Beasley	Finley Co., Kootenay Division, Nelson	4,847	Concentrates, 101 tons	51	9,648	50,037	......	......	......
Reeves MacDonald	Remac	Reeves MacDonald Mines Ltd., Vancouver	400,204	Lead concentrates, 4,700 tons; zinc concentrates, 28,629 tons	......	25,062	......	7,846,288	30,357,752	169,128
Silver King	Ymir	Burgess Bros. and O. Gowing, Ymir	550	Concentrates, 34 tons	5	4,429	14,682	600	......	......
Spokane	Tye	D. G. White and E. J. Novak, Tye	97	Crude ore	24	313	......	9,124	1,408	......
Star No. 1	Kitchener	F. J. Brady, Creston	1	Crude ore	......	28	......	1,583	13	......
Revelstoke Mining Division										
Spider, Eclipse	Camborne	Sunshine Lardeau Mines Ltd., Vancouver	28,142	Lead concentrates, 3,820 tons; zinc concentrates, 4,658 tons	2,129	333,714	97,781	5,193,437	6,064,726	36,024
Slocan Mining Division										
Austin	Silverton	L. Gormley, New Denver	34	Crude ore	......	184	......	1,891	2,944	......
A.U. (Lucky Thought)	Silverton	N.G.H. Partnership, Silverton	90	Crude ore	......	181	......	1,005	11,149	......
Bluebell	Riondel	Consolidated Mining and Smelting Co. of Canada, Ltd., Trail	252,523[1]	Lead concentrates, 17,389 tons; zinc concentrates, 30,806 tons	......	368,632	349,833	26,190,433	30,876,281	142,272
Boomerang	Silverton	Mrs. E. Ward, P. Ward, and N. Subasic, Nelson	3	Crude ore	......	144	......	266	271	......
Caledonia	Retallack	G. E. McCready, Kaslo	347	Crude ore, 22 tons; lead concentrates, 19 tons; zinc concentrates, 31 tons	4	4,715	......	55,869	40,165	130

Discovery Fraction	Sandon	E. H. and H. A. Petersen, Sandon	9	Crude ore	....	1,035	....	11,739	450	....
Fisher Maiden	Silverton	F. Mills and S. Dewis, Silverton	75	Crude ore	....	1,196	....	1,929	11,097	78
Galena Farm	Silverton	F. Mills, Silverton	268	Crude ore, 30 tons; lead concentrates, 22 tons; zinc concentrates, 35 tons	....	6,400	....	71,878	46,200	278
Highlander	Ainsworth	Yale Lead & Zinc Mines Ltd., Ainsworth	53,120	Lead concentrates, 4,064 tons; zinc concentrates, 798 tons	26	100,648	....	6,347,899	1,011,774	....
Hinckley	Silverton	W. D. Pengelly, New Denver; and R. Harding, Sandon	99	Crude ore	1	1,629	....	16,558	16,712	129
Kootenay Florence	Ainsworth	F. Sonnenberg, Ainsworth; lessee from Western Mines Ltd.	2	Clean-up material	....	37	....	2,574	150	....
Laura M.	Ainsworth	F. Sonnenberg, Ainsworth; lessee from Western Mines Ltd.	4	Crude ore	....	41	....	2,556	818	....
Noble Five	Sandon	Cody-Reco Mines Ltd., Toronto, Ont.	....	Lead concentrates, 23 tons	....	1,601	....	25,220	3,118	....
Noonday	Silverton	K. Miller and H. Lyon, Silverton	5	Crude ore	....	25	....	661	428	....
Ottawa	Slocan	W. E. Graham, Slocan	10	Crude ore	....	2,732	....	116	36	....
Promistora	Burton	D. Pearce, Arrow Park	9	Crude ore	23	27	....	185	258	....
Silversmith	Sandon	Carnegie Mines Ltd., Montreal, Que.	3,527	Lead concentrates, 107 tons; zinc concentrates, 305 tons	7	13,108	....	128,646	357,714	2,405
Standard, Enterprise, Buffalo, Mammoth, and Hecla	Silverton	Western Exploration Co. Ltd., Silverton, and lessees	3,520	Crude ore, 20 tons; zinc concentrates, 163 tons from 1952 stockpile; and 442 tons zinc concentrates from current production	15	48,228	....	423,815	702,412	5,147
Star	Ainsworth	D. H. Norcross and A. Endersby, Jr., Nelson	139	Lead concentrates, 9 tons	1	319	....	13,474	590	....
Tariff	Ainsworth	T. Lane, Ainsworth	7	Crude ore	....	148	....	6,445	1,535	....
Utica	Kaslo Creek	J. A. Cooper, Kaslo	193	Crude ore	....	18,459	....	39,550	48,122	....
Van Roi and Hewitt	Silverton	Slocan Van Roi Mines Ltd., Vancouver, and lessees	5,799	Crude ore, 9 tons; lead concentrates, 349 tons; zinc concentrates, 748 tons	6	68,669	....	351,559	807,709	4,888
Victor	Silverton	Violamac Mines (B.C.) Ltd., New Denver	22,236	Crude ore, 348 tons; lead concentrates, 3,276 tons; zinc concentrates, 3,061 tons	275	560,778	....	5,274,047	3,393,616	23,109
Westmont	Silverton	Thickett and Myers, Silverton	170	Dump ore	....	2,453	....	3,986	5,599	....
Whitewater	Retallack	P. McCrory, New Denver	4	Clean-up material	....	194	....	3,090	855	....
Wonderful	Sandon	Silver Ridge Mining Co., Nelson	10	Crude ore	....	596	....	10,521	2,050	....
Trail Creek Mining Division										
Velvet	Rossland	Mid-West Copper and Uranium Mines Ltd., Rossland	1,736	Concentrates, 78 tons	180	300	42,200	....	....	....

[1] Includes 3,397 tons of tailings recovered from Kootenay Lake.

TABLE XVI.—LODE-METAL MINES EMPLOYING AN AVERAGE OF TEN OR MORE MEN DURING 1956[1]

Name of Mine or Operator	Days Operating		Tons		Average Number Employed	
	Mine	Mill	Mined	Milled	Mine	Mill
Shipping Mines						
Big Bull and Tulsequah Chief (Tulsequah Mines Ltd.)	310	364	203,688	203,688	247	26
Cariboo Gold Quartz Mining Co. Ltd.	279	365	94,721	94,721	193	17
New Cronin Babine Mines Ltd.	N.A.	N.A.	4,200	4,200	N.A.	N.A.
Silver Standard Mines Ltd.	278	208	19,333	19,333	82	9
Silbak Premier Mines Ltd.	143	51	5,580	5,580	39	4
Torbrit Silver Mines Ltd.	366	366	134,652	134,652	102	24
Britannia Mining & Smelting Co. Ltd.	272	255	834,458	834,458	657	196
Highland-Bell Ltd.	263	259	14,332	14,332	42	6
Bralorne Mines Ltd.	365	365	131,662	131,662	359	28
Pioneer Gold Mines of B.C. Ltd.	366	366	88,537	88,537	236	22
Copper Mountain (Granby Cons. M.S. & P. Co. Ltd.)	366	366	1,933,193	1,933,193	317	146
Bluebell (Cons. M. & S. Co. of Canada, Ltd.)	254	355	249,126	252,523[2]	284	20
Highlander (Yale Lead & Zinc Mines Ltd.)	222	222	53,120	53,120	63	8
Silversmith (Carnegie Mines Ltd.)	365	182	3,527	3,527	11	4
Western Exploration Co. Ltd.	185	253	3,520	3,500	23	14
Van Roi (Slocan Van Roi Mines Ltd.)	313	223	5,799	5,790	20	3
Victor (Violamac Mines Ltd.)	365	.....	22,236	.....	74	.....
H.B. (Cons. M. & S. Co. of Canada, Ltd.)	366	366	435,305	435,305	122	17
Jersey Zinc (Canadian Exploration Ltd.)	365	365	371,971	371,971	156	15
Emerald-Feeney-Dodger (Canadian Exploration Ltd.)	365	365	204,952	204,952	191	37
Queen Victoria, Eureka (Finley Co., Kootenay Division)	180	180	4,847	4,847	12	5
Reeves MacDonald Mines Ltd.	255	356	400,204	400,204	107	23
Sullivan (Cons. M. & S. Co. of Canada, Ltd.)	252	252	2,769,177	2,769,177	1,112	383
Mineral King and Paradise (Sheep Creek Mines Ltd.)	307	349	146,566	146,566	79	11
Silver Giant (Giant Mascot Mines Ltd.)	365	365	185,441	185,441	107	17
Spider (Sunshine Lardeau Mines Ltd.)	307	340	28,192	28,142	50	13
Velvet (Mid-West Copper & Uranium Mines Ltd.)	365	31	1,736	1,736	27	2
Blue Grouse (Cowichan Copper Co. Ltd.)	270	.....	3,075	.....	45	.....
Argonaut Mine Division of Utah Co. of the Americas	135	186	126,801	175,022[3]	82	21
Texada Mines Ltd.	365	365	280,220	280,220	94	14
Non-shipping Mines						
Noranda Exploration Co. Ltd.	.....	.....	.....	.....	37	.....
Newmont Mining Corporation of Canada Ltd.	.....	.....	.....	.....	13	.....
Northwestern Exploration Ltd.	.....	.....	.....	.....	16	.....
Phoenix Copper Co. Ltd.	.....	.....	.....	.....	10	.....
Farwest Tungsten Copper Mines Ltd.	.....	.....	.....	.....	28	.....
Makaoo Development Co. Ltd.	.....	.....	.....	.....	18	.....
Rio Canadian Exploration Ltd.	.....	.....	.....	.....	13	.....
Trojan Exploration Ltd.	.....	.....	.....	.....	12	.....
Granduc Mines Ltd.	.....	.....	.....	.....	41	.....
Maple Bay Copper Mines Ltd.	.....	.....	.....	.....	10	.....
Rexspar Uranium Metals Mining Co. Ltd.	.....	.....	.....	.....	11	.....

[1] The average number employed includes wage-earners and salaried employees. The average is obtained by adding the monthly figures and dividing by 12, irrespective of the number of months worked.

[2] Includes 3,397 tons of tailings dredged from Kootenay Lake at site of original concentrator.

[3] In addition to the ore shown as milled, 521,000 tons of tailings was reclaimed and retreated.

N.A.=Not available.

Departmental Work

ADMINISTRATION BRANCH

The Administration Branch is responsible for the administration of the Provincial laws regarding the acquisition of rights to mineral and to coal, petroleum and natural gas, and deals with other departments of the Provincial service for the Department or for any branch.

Gold Commissioners, Mining Recorders, and Sub-Mining Recorders, whose duties are laid down in the " Mineral Act " and the " Placer-mining Act," administer these Acts and other Acts relating to mining. Mining Recorders, in addition to their own functions, may also exercise the powers conferred upon Gold Commissioners with regard to mineral claims within the mining division for which they have been appointed. Similar duties may be performed by Mining Recorders with regard to placer claims but not in respect of placer-mining leases. Recording of location and of work upon a mineral claim as required by the " Mineral Act " and upon a placer claim or a placer-mining lease as required by the " Placer-mining Act " must be made at the office of the Mining Recorder for the mining division in which the claim or lease is located. Information concerning claims and leases and concerning the ownership and standing of claims and leases in any mining division may be obtained from the Mining Recorder for the mining division in which the property is situated or from the Department's offices at Victoria, and Room 104, 739 West Hastings Street, Vancouver. Officials in the offices of the Gold Commissioner at Victoria and the Gold Commissioner at Vancouver act as Sub-Mining Recorders for all mining divisions. Sub-Mining Recorders, who act as forwarding agents, are appointed at various places throughout the Province. They are authorized to accept documents and fees, and forward them to the office of the Mining Recorder for the correct mining division. Officials and their offices in various parts of the Province are listed in the table on pages A 54 and A 55.

Central Records Offices (Victoria and Vancouver)

The transcripts of all recordings made in Mining Recorders' offices throughout the Province are sent to the office of the Chief Gold Commissioner in Victoria twice each month, and include the names of lessees of reverted Crown-granted mineral claims. These records and maps showing the approximate positions of mineral claims held by record and of placer-mining leases may be consulted by the public during office hours at Victoria and at the office of the Gold Commissioner at Vancouver, Room 104, 739 West Hastings Street. The maps conform in geographical detail, size, and number to the reference and mineral reference maps issued by the Department of Lands, and the approximate positions of mineral claims held by record and of placer-mining leases are plotted from details supplied by the locators. Provision has been made to supply the general public, on request to the office of the Chief Gold Commissioner, with copies of the maps. The charge for these maps is $1 plus 5 per cent tax for each sheet.

Staking reached an all-time high in 1956; 26,170 mineral claims were recorded, representing twice the number of claims recorded in 1955 and four times the number recorded in 1954. The Highland Valley area of the Kamloops Mining Division continued to attract the greatest interest in staking, but the increase in staking was reflected in nearly all of the mining divisions.

Mining Divisions Amalgamated since 1949

Date	Mining Divisions Amalgamated	New Name	Mining Recorder's Office
Oct. 1, 1949	Revelstoke and Lardeau	Revelstoke	Revelstoke.
Dec. 1, 1949	Kamloops and Ashcroft	Kamloops	Kamloops.
Apr. 1, 1951	Skeena and Portland Canal	Skeena	Prince Rupert.
Mar. 1, 1952	Stikine and Peace River	Liard	Victoria.
Aug. 2, 1954	Slocan and Ainsworth	Slocan	Kaslo.
May 1, 1955	Cariboo and Quesnel	Cariboo	Quesnel.

List of Gold Commissioners, Mining Recorders, and Sub-Mining Recorders in the Province

Mining Division	Location of Office	Gold Commissioner	Mining Recorder	Sub-Mining Recorder
Alberni	Alberni	T. G. O'Neill	T. G. O'Neill.	
Sub-office	Lake Cowichan			W. W. Deans.
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Tofino			B. Warne.
Sub-office	Zeballos			W. Gilchrist.
Atlin	Atlin	L. D. Sands	L. D. Sands.	
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Telegraph Creek			Mrs. B. J. Corder.
Sub-office	Tulsequah			H. L. Abbott.
Sub-office	Watson Lake			P. Shalapata.
Cariboo	Quesnel	F. E. P. Hughes	F. E. P. Hughes.	
Sub-office	Barkerville			A. F. Coleman.
Sub-office	Fort McLeod			J. E. McIntyre.
Sub-office	Fort St. James			N. Henry.
Sub-office	Likely			C. W. Speed.
Sub-office	McBride			R. J. Mercer.
Sub-office	Prince George			S. M. Carling.
Sub-office	Williams Lake			Mrs. J. Pigeon.
Clinton	Clinton	W. E. McLean	W. E. McLean.	
Sub-office	Haylmore			W. Haylmore.
Sub-office	Williams Lake			Mrs. J. Pigeon.
Fort Steele	Cranbrook	E. L. Hedley	E. L. Hedley.	
Sub-office	Fernie			B. I. H. Ryley.
Golden	Golden	R. E. Manson	R. E. Manson.	
Sub-office	Invermere			T. N. Weir.
Greenwood	Grand Forks	R. MacGregor	R. MacGregor.	
Sub-office	Greenwood			G. A. Hartley.
Sub-office	Oliver			L. M. McKinnon.
Kamloops	Kamloops	D. Dalgleish	D. Dalgleish.	
Sub-office	Ashcroft			L. P. Lean.
Sub-office	Chu Chua			G. M. Fennell.
Sub-office	Likely			C. W. Speed.
Sub-office	Salmon Arm			H. S. Tatchell.
Liard	Victoria	R. H. McCrimmon.		
Sub-office	Atlin			L. D. Sands.
Sub-office	Burns Lake			W. H. M. Collison.
Sub-office	Fort Nelson			A. Fisher.
Sub-office	Fort St. James			N. Henry.
Sub-office	Fort St. John			R. W. Sangster.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Prince George			S. M. Carling.
Sub-office	Telegraph Creek			Mrs. B. J. Corder.
Sub-office	Watson Lake			P. Shalapata.
Lillooet	Lillooet	E. B. Offin	E. B. Offin.	
Sub-office	Haylmore			W. Haylmore.
Nanaimo	Nanaimo	W. H. Cochrane	W. H. Cochrane.	
Sub-office	Alberni			T. G. O'Neill.
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Courtenay			G. W. McFarland.
Sub-office	Powell River			J. V. Gaspard.
Sub-office	Quatsino			Axel Hansen.
Nelson	Nelson	K. D. McRae	K. D. McRae	F. R. Carmichael.
Sub-office	Creston			R. S. Allen.
Sub-office	Salmo			M. C. Donaldson.
New Westminster	New Westminster	J. F. McDonald	G. C. Kimberley.	
Sub-office	Chilliwack			E. L. Anderson.
Sub-office	Hope			J. H. Richmond.

List of Gold Commissioners, Mining Recorders, and Sub-Mining Recorders in the Province—*Continued*

Mining Division	Location of Office	Gold Commissioner	Mining Recorder	Sub-Mining Recorder
Nicola	Merritt	D. Dalgleish (Kamloops)	T. S. Dobson.	
Omineca	Smithers	G. H. Beley	G. H. Beley.	
Sub-office	Burns Lake			W. H. M. Collison.
Sub-office	Dorreen			W. E. Horwill.
Sub-office	Fort St. James			N. Henry.
Sub-office	Fort St. John			R. W. Sangster.
Sub-office	Hazelton			C. H. Drake.
Sub-office	Kitimat			N. R. Blake.
Sub-office	Manson Creek			T. C. Hamilton.
Sub-office	Prince George			S. M. Carling.
Sub-office	Takla Landing			Mrs. G. M. Henry.
Sub-office	Telkwa			T. J. Thorp.
Sub-office	Terrace			D. Warren.
Sub-office	Vanderhoof			E. G. Chubak.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby.	
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Oliver			L. M. McKinnon.
Revelstoke	Revelstoke	W. T. McGruder	W. T. McGruder.	
Sub-office	Beaton			J. T. Slater.
Similkameen	Princeton	B. Kennelly	B. Kennelly.	
Skeena	Prince Rupert	T. H. W. Harding	T. H. W. Harding.	
Sub-office	Alice Arm			A. D. York.
Sub-office	Burns Lake			W. H. M. Collison.
Sub-office	Kitimat			N. R. Blake.
Sub-office	Leduc Glacier			J. J. Crowhurst.
Sub-office	Queen Charlotte			H. R. Beaven.
Sub-office	Stewart			Mrs. F. Macleod.
Sub-office	Telegraph Creek			Mrs. B. J. Corder.
Sub-office	Terrace			D. Warren.
Slocan	Kaslo	C. Macdonald	B. F. Palmer.	
Sub-office	New Denver			T. P. McKinnon.
Sub-office	Slocan			W. E. Graham.
Trail Creek	Rossland	W. L. Draper	W. L. Draper.	
Vancouver	Vancouver	J. Egdell	Miss S. Hyham (Deputy).	
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Powell River			J. V. Gaspard.
Vernon	Vernon	G. F. Forbes	G. F. Forbes.	
Sub-office	Kelowna			E. R. Oatman.
Victoria	Victoria	R. H. McCrimmon	R. H. McCrimmon.	
Sub-office	Lake Cowichan			W. W. Deans.

Gold Commissioners' and Mining Recorders' Office Statistics, 1956

Mining Division	Free Miners' Certificates				Lode-mining					Placer-mining				Revenue		
	Individual	Company	Special	Provincial (Placer)	Mineral Claims Recorded	Certificates of Work	Certificates of Improvements	Bills of Sale, etc.	Leases of Reverted Crown-granted Mineral Claims	Placer Claims Recorded	Placer Leases Granted	Certificates of Work, Placer Leases	Bills of Sale, etc.	Free Miners' Certificates	Mining Receipts	Total
Alberni	94	1	2	—	392	420	—	54	10	—	—	6	1	$570.00	$4,056.25	$4,626.25
Atlin	272	3	—	—	1,193	422	—	198	3	7	5	72	27	1,421.75	11,748.75	13,170.50
Cariboo	944	14	9	—	1,096	425	—	91	—	3	58	317	52	5,078.25	16,559.25	21,637.50
Clinton	61	—	—	—	925	376	—	58	2	—	2	18	3	286.50	4,545.00	4,831.50
Fort Steele	283	—	3	—	562	183	—	66	2	—	15	9	4	1,292.00	4,895.07	6,187.07
Golden	202	5	4	—	383	322	14	59	12	—	20	7	9	1,183.25	7,706.75	8,890.00
Greenwood	261	—	7	—	1,518	280	—	154	127	2	2	4	—	1,019.50	12,640.75	13,660.25
Kamloops	1,187	5	28	2	7,324	4,347	—	1,115	35	2	4	2	1	5,152.00	44,072.85	49,224.85
Liard	437	—	3	—	1,302	466	—	170	—	—	9	39	2	1,945.00	14,634.75	16,579.75
Lillooet	239	4	2	—	594	278	1	53	35	—	5	46	5	1,496.75	6,438.75	7,935.50
Nanaimo	214	3	1	—	727	203	—	85	23	—	—	—	—	1,109.75	5,948.25	7,058.00
Nelson	486	13	14	1	540	604	26	121	17	3	—	1	—	3,732.00	7,000.50	10,732.50
New Westminster	380	4	6	13	660	324	—	156	7	—	3	15	4	2,142.50	4,651.50	6,794.00
Nicola	173	—	4	—	2,821	703	—	402	—	—	1	—	—	631.50	13,609.50	14,241.00
Omineca	450	2	8	—	1,222	1,213	1	137	33	3	16	35	24	2,164.25	11,715.25	13,879.50
Osoyoos	169	3	1	3	402	187	—	44	6	—	—	—	—	995.00	3,640.50	4,635.50
Revelstoke	110	3	2	—	426	119	11	384	3	—	11	8	14	732.50	13,484.50	14,217.00
Similkameen	205	2	2	1	903	176	—	80	30	—	—	16	5	977.25	6,730.25	7,707.50
Skeena	338	6	5	—	948	1,200	16	711	107	—	2	—	—	1,969.25	18,337.25	20,306.50
Slocan	227	6	8	—	441	419	3	52	20	—	3	—	—	1,699.25	6,302.75	8,002.00
Trail Creek	115	2	3	—	84	44	—	8	5	—	—	—	—	725.25	1,418.75	2,144.00
Vancouver	2,399	195	38	—	310	103	3	29	8	—	1	—	—	27,637.50	4,175.11	31,812.61
Vernon	287	2	3	8	288	37	—	10	—	—	4	6	11	1,411.50	1,577.50	2,989.00
Victoria	638	31	6	—	1,109	744	—	179	—	—	—	8	—	5,171.50	7,856.86	13,028.36
Totals for Province, 1956	10,171	304	159	28	26,170	13,595	75	4,416	485	20	161	609	162	$70,544.00	$233,746.64	$304,290.64
Totals for Province, 1955	8,326	226	91	35	12,567	6,749	149	2,030	681	20	155	709	219	58,613.25	177,633.78	236,247.03

Coal, Petroleum, and Natural Gas

The Administration Branch has been responsible for the administration of the " Petroleum and Natural Gas Act, 1954," and for the " Coal Act, 1944," since April 1st, 1953. Information concerning applications for permits and leases issued under the " Petroleum and Natural Gas Act " and concerning the ownership and standing of them may be obtained upon application to the office of the Chief Commissioner, Department of Mines, Victoria, B.C. Similar information may be obtained respecting licences and leases issued under the " Coal Act." A series of maps showing the locations of permits and leases under the " Petroleum and Natural Gas Act " is provided, and copies may be obtained upon application to the office of the Department of Mines, Victoria, B.C., accompanied by payment of $3 per sheet. Monthly reports listing additions and revisions to permit-location maps and giving information listing changes in title to permits, licences, and leases and related matters are available from the office of the Chief Commissioner upon application and payment of a fee of $1 per annum.

Petroleum and Natural-gas Statistics, 1956

Permits—	
Issued	50
Renewed	295
Assigned	108
Leases—	
Issued	39
Renewed	95
Assigned	2

Petroleum and Natural-gas Revenue, 1956

Permits—		
Fees	$86,000.00	
Rent	2,567,062.72	
Cash in lieu of work	120,003.94	
		$2,773,066.66
Leases—		
Fees	$700.00	
Rent	121,457.44	
		122,157.44
Tender bonus		1,614,325.15
Royalties—		
Gas	$2,826.46	
Oil	37,196.05	
		40,022.51
Assignment fees		2,500.00
Operators' licences		8,720.00
Miscellaneous		1,207.80
		$4,561,999.56

Coal Revenue, 1956

Licences—		
Fees	$1,825.00	
Rent	5,641.40	
		$7,466.40
Leases—		
Fees	$100.00	
Rent	1,258.24	
Cash in lieu of work	500.00	
		1,858.24
Miscellaneous		67,205.00
		$76,529.64

Mining Laws and Laws Related to the Mineral Industry

Synopses of mining laws and of laws related to mining are available on application. The titles of the various Acts and the prices charged for each are listed on page 236.

ANALYTICAL AND ASSAY BRANCH

By G. C. B. Cave, Chief Analyst

Rock Samples

During 1956 the chemical laboratory in Victoria issued reports on 2,114 samples from prospectors* and Departmental engineers. A laboratory examination of a prospector's sample generally consists of the following: (1) A spectrographic analysis to determine if any base metals are present in interesting percentages; (2) assays for precious metals, and for base metals shown by the spectrographic analysis to be present in interesting percentages. The degree of radioactivity is measured on all samples submitted by prospectors and Departmental engineers; these radiometric assays are not listed below in the table.

The laboratory reports were distributed in the following manner among prospectors who were not grantees, prospectors who were grantees under the "Prospectors' Grubstake Act," and Departmental engineers:—

	Samples	Spectrographic Analyses	Assays
Prospectors (not grantees)	1,558	1,538	3,704
Prospectors (grantees)	157	157	397
Departmental engineers	399	283	829
Totals	2,114	1,978	4,930

Mineralogical specimens submitted for identification and rocks for classification are examined by the Mineralogical Branch of the Department.

Coal, Petroleum, and Gas Samples

Sixty-six samples were analysed. Of these, fifty-one were samples of formation water from wells being drilled for oil and gas; three were samples of coal for proximate

* A reasonable number of samples are assayed, without charge, for a prospector who makes application for free assays and who satisfies the Chief Analyst that prospecting is his principal occupation during the summer months. A form for use in applying for free assays may be obtained from the office of any Mining Recorder.

analysis and calorific value; one was a seepage of gas for identification; two were samples of mine air for complete analysis; two were samples of petroleum for identification; and seven were petroleum seepages for identification.

The measurement of resistivity of formation waters was instituted on a routine basis. A more accurate method for measuring the pH of formation waters was studied and then adopted for routine use.

Police and Coroners' Exhibits

For the Attorney-General's Department and various police forces, sixty-four cases of a chemico-legal nature were undertaken. They involved a scientific examination of 155 exhibits.

Two of the sixty-four cases required analysis for narcotics under the " Opium and Narcotic Drug Act "; twenty were toxicological analyses for possible poisons in human viscera, and four were similar analyses on animal viscera; thirteen were determinations of the alcoholic content of blood and body fluids; four were determinations of both the alcoholic content and the carbon monoxide content of blood; two were determinations of only the carbon monoxide content of blood. Eight cases involved the determination of the alcoholic content of exhibits seized under the " Indian Act," the " Government Liquor Act," and the " Excise Act." Seven samples of gasoline required the identification of marker dyestuff in gasoline, for the " Coloured Gasoline Tax Act." In three cases, fibres and glass were examined in connection with investigations of breaking and entering. Clothing was examined in one hit-and-run case. Evidence was not presented in Court in 1956.

Miscellaneous Samples

For the Purchasing Commission, specification tests were made on nine samples of anti-freeze, on four samples of fibre and cloth, on three samples of soap, on six samples of carbon paper, and on one sample of jelly powder.

For the Taxation Branch of the Department of Finance, six samples of gasoline were analysed for marker dyestuff. The dyestuff in three packets was weighed for calibration purposes. Two different marker dyestuffs were compared with respect to their suitability as gasoline markers.

For the Department of Agriculture, two samples of limestone were analysed for lime.

For the Department of Lands and Forests, a study was made of the effect of a certain kind of rock chips on the acidity of water in contact with the chips.

For the Department of Health and Welfare, one sample of a water deposit was analysed by spectrographic means.

For the British Columbia Research Council, two samples were analysed by spectrographic means.

For the Department of Geology and Geography, University of British Columbia, a mineral of the Helvite-Danalite series was analysed by chemical and by X-ray spectrographic means.

X-ray Installation

In co-operation with the Mineralogical Branch, a North American Philips X-ray Diffractometer and Spectrograph were installed in May. This equipment is used by the Mineralogical Branch to study and to identify minerals, and by the Analytical and Assay Branch to assay ore samples for base metals. A member of the staff from the latter Branch was assigned to operate the instrument, so that no increase in staff was necessary.

All personnel in the X-ray laboratory wear badges that contain special monitoring film provided by the Occupational Health Division of the Department of National Health and Welfare, Ottawa.

Research

An accurate method was developed for determining the lead and the zinc content of ores by using the X-ray spectrograph. This method is now in routine use in the laboratory. The effect of variations in the particle size of the powdered ore required very careful study before the development work was successfully concluded.

A short experimental and theoretical study was made of some factors that can affect the pH of slurries prepared from Granduc ore.

Examinations for Assayers

Provincial Government examinations for certificates of competency and licence to practise assaying in British Columbia were held in May and in December. In May four candidates were examined; two passed and two failed. In December four candidates were examined; one was granted a supplemental examination in fire assaying, another was granted a supplemental examination in wet assaying, and two failed. In addition to these examinations, one application was received for a licence under section 11, subsection (2), of the " Department of Mines Act "; a licence was not granted.

INSPECTION BRANCH

Organization and Staff

Inspectors and Resident Engineers

H. C. Hughes, Chief Inspector	Victoria
Robert B. Bonar, Senior Inspector of Mines	Victoria
L. Wardman, Electrical Inspector of Mines	Victoria
J. A. Mitchell, Senior Inspector of Mines	Victoria
J. W. Patterson, Inspector and Resident Engineer	Lillooet
Robert B. King, Inspector and Resident Engineer	Vancouver
A. R. C. James, Inspector and Resident Engineer	Prince Rupert
J. E. Merrett, Inspector and Resident Engineer	Cranbrook
E. R. Hughes, Inspector and Resident Engineer	Princeton
J. W. Peck, Inspector and Resident Engineer	Nelson
D. R. Morgan, Inspector and Resident Engineer	Fernie

The Inspectors are stationed at the places listed and inspect coal mines, metalliferous mines, and quarries in their respective districts. They also examine prospects and mining properties.

J. A. Mitchell supervised the Department's roads and trails programme and grubstakes until he resigned on June 13th, 1956. He was replaced by E. R. Hughes, who was moved to Victoria on October 1st, 1956.

Instructors, Mine-rescue Stations

Arthur Williams	Cumberland Station
T. H. Cunliffe	Princeton Station
Joseph J. Haile	Fernie Station
H. W. Aitchison	Nelson Station

H. W. Aitchison resigned on November 21st, 1956.

Board of Examiners for Coal-mine Officials

H. C. Hughes, Chairman	Victoria
Robert B. Bonar, Secretary	Victoria
E. R. Hughes, Member	Princeton

Upon assuming his duties as supervisor of the Department's roads and trails programme and grub-stakes, E. R. Hughes resigned from the Board of Examiners for Coal-mine Officials and was replaced by A. R. C. James.

R. B. Bonar, E. R. Hughes, or A. R. C. James and the Inspectors for the district in which an examination is being held form the Board for granting certificates of competency to coal-miners. In the absence of the Inspector, the mine-rescue instructor is authorized to act in his stead.

An Inspector is empowered to grant provisional certificates to coal-miners for a period not exceeding sixty days between regular examinations.

MINERALOGICAL BRANCH

Field work by officers of the Mineralogical Branch includes geological mapping and examination of mineral deposits, and studies related to ground-water and engineering geology. The results are published partly in the Annual Report of the Minister of Mines and partly in a series of bulletins. The Mineralogical Branch supplies information regarding mineral deposits and the mineral industry, in response to inquiries received in great number. The activities of the Branch also include identification of rock and mineral specimens submitted by prospectors and others, including, if required, the identification of rocks and minerals submitted by prospectors to the Analytical Branch. Since April 1st, 1953, the Mineralogical Branch has been responsible for preparing and logging samples representing the bit cuttings from wells drilled for petroleum and natural gas and cores from the wells. Those responsibilities were assumed by the Petroleum and Natural Gas Conservation Branch in the autumn of 1956.

Professional Staff

On December 31st, 1956, the professional staff included the following engineers classified as geologists or mineral engineers: H. Sargent, Chief of the Mineralogical Branch; M. S. Hedley, S. S. Holland, W. R. Bacon, J. W. McCammon, N. D. McKechnie, G. E. P. Eastwood, J. T. Fyles, A. Sutherland Brown, J. M. Carr, H. W. Nasmith, A. F. Shepherd, C. G. Hewlett, and J. E. Hughes.

Technical editing of the Annual Report of the Minister of Mines and of other publications was directed by M. S. Hedley. Copy for printing was prepared under the direction of Mrs. C. C. Savage, who serves as editor for English. Messrs. Hedley and Holland assisted in directing and supervising field work. Most of the other members of the professional staff are assigned to mapping the geology of the selected areas and of mineral deposits. The following have special assignments: J. W. McCammon, industrial minerals and structural materials; H. W. Nasmith, ground-water and engineering geology; A. F. Shepherd, records and library.

Staff Changes

W. R. Bacon resigned, effective December 31st, 1956.

J. M. Carr joined the staff as acting associate geologist in May.

S. S. Cosburn was transferred to the Petroleum and Natural Gas Branch in the autumn.

J. E. Hughes was granted leave in October to undertake postgraduate studies at McGill University.

Field Work

Thirteen field assistants were employed for the 1956 season to work under members of the professional staff who had the following assignments.

W. R. Bacon visited the Granduc property northwest of Stewart early in the season, and devoted most of the field season to a study of iron-ore occurrences in the Coastal and Tulameen areas.

A. S. Brown did geological mapping in the northeastern Cariboo district from Quesnel Lake to Bowron Lake game reserve and east to Isaac Lake. He briefly examined two mining properties near Quesnel and Williams Lake.

J. M. Carr did geological mapping in the copper-bearing region south of Kamloops. At the end of the season he spent two weeks in the Highland Valley preparatory to a programme of mapping in 1957.

S. S. Cosburn visited wells being drilled in the Fort St. John area and logged core there.

G. E. P. Eastwood continued geological mapping in the Lardeau in the general vicinity of Trout Lake and spent some time mapping surface and underground at the Spider mine on Poole Creek.

J. T. Fyles and C. G. Hewlett made detailed studies of the lead-zinc deposits near Salmo as a concluding phase of the mapping programme of the past five years. Geological investigations of a regional nature were made as a preliminary to possible future mapping between Ymir and Procter (east of Nelson) and at various points on Kootenay and Duncan Lakes.

S. S. Holland spent about three weeks in the Kamloops and Highland Valley area studying the general progress of exploration. He also examined prospects in the Omineca area, and with Mr. Nasmith made studies of the approaches to the Peace River bridge of the Pacific Great Eastern Railway, and of the Moran dam-site on the Fraser River.

J. E. Hughes completed the mapping of stratigraphy and structure in the area traversed by the John Hart Highway between Commotion Creek and the West Pine bridge.

J. W. McCammon studied the limestone deposits of Vancouver Island, Texada Island, and the lower Mainland in preparation for a revision of the bulletin on "Calcareous Deposits of the Georgia Strait Area."

N. D. McKechnie examined copper deposits near Cowichan Lake and near Jordan River, Vancouver Island.

H. W. Nasmith spent three-quarters of the season in continuing glacial geology and ground-water investigations in the Okanagan Valley. He also made or participated in special studies of foundations for the Pacific Great Eastern Railway in the Peace River region and at Moran dam-site on the Fraser River.

PETROLEUM AND NATURAL GAS CONSERVATION BRANCH

Staff

J. D. Lineham, Chief Petroleum Engineer .... Victoria
S. S. Cosburn, Mineral Engineer (Geology) .... Victoria
R. R. McLeod, Senior Petroleum Engineer .... Victoria
T. A. Mackenzie, Engineering Assistant .... Victoria
W. L. Ingram, Petroleum Engineer .... Dawson Creek
R. E. Anderson, Petroleum Engineer .... Dawson Creek
P. K. Huus, Engineering Assistant .... Dawson Creek

This Branch is responsible for the administration of the regulations, under the "Petroleum and Natural Gas Act, 1954," governing conservation and the drilling and production of oil and gas wells. It was established on April 1st, 1956, although it has functioned, nominally under the Inspection Branch, since April 1st, 1953.

The field staff had headquarters at the government office building in Pouce Coupe. During the year three Pan Abode three-bedroom housing units were constructed in Dawson Creek to provide accommodation for the staff and temporary office space. Two of these dwellings were occupied in October by the engineers. The third unit will be used as combined office and bachelor quarters when it is ready for occupancy in early 1957. In addition to an auxiliary office to be available in the new government building in Fort St. John, it is expected that a permanent office will be erected in Dawson Creek adjoining the residences.

Drilling activity increased considerably during 1956, necessitating an increase in staff. R. R. McLeod, formerly in charge of the field office, was transferred to Victoria in July to organize the reservoir engineering section. He was replaced by W. L. Ingram, who joined the Department in Dawson Creek on May 1st. Another engineer, R. E. Anderson, was employed, beginning June 18th, to assist with the expanding field work. P. K. Huus transferred from the Central Records Office to the Branch on April 1st, and after receiving four months' training in Alberta at several field offices of the Alberta Petroleum and Natural Gas Conservation Board, he was posted to the Dawson Creek office as an engineering assistant. T. A. Mackenzie, a former drilling engineer with broad experience in industry in both North and South America, commenced work in Victoria on November 1st as an engineering assistant. S. S. Cosburn, mineral engineer, was transferred from the Mineralogical Branch late in the year to assume charge of the geological section. Essential clerical and stenographic personnel were taken on staff, while the excess work was done by the stenographic pool.

GRUB-STAKING PROSPECTORS

Under authority of the "Prospectors' Grub-stake Act," as amended in March, 1944, the Department of Mines has provided grub-stakes each year since 1943 to a limited number of applicants able to qualify. The maximum grub-stake is $300, but an additional amount up to $200 may be added for travelling expenses to and from the prospecting area.

To qualify at the present time the Department requires that the applicant shall be a physically fit male British subject, holder of a valid free miner's certificate, who has been resident in the Province during the year preceding his application for a grub-stake, or who has been honourably discharged from Her Majesty's services, who is between the ages of 18 and 70, and who can identify common rocks and minerals.

It is required that in order to obtain the maximum grub-stake, he agree to spend at least sixty days actually prospecting for lode occurrences in one area of his choice in British Columbia considered favourable by officers of the Department of Mines. If he prospects a lesser time, the grant will be reduced proportionately. In the past, rebates have been recovered from grantees to whom payments have exceeded the proper amount for the time and effort devoted to prospecting.

The grantee must not accept pay from any other source for services rendered during the period credited to the grub-stake. At the end of the season he shall provide the Department with a diary and maps outlining his activities while working under the grub-stake. Any discoveries made, staked, and recorded are exclusively his own property.

Statistical information covering the grub-stake programme since its inception is given in the following table:—

GRUB-STAKE STATISTICS

Field Season	Approximate Expenditure	Men Grub-staked	Samples and Specimens Received at Department Laboratory	Mineral Claims Recorded
1943	$18,500	90	773	87
1944	27,215	105	606	135
1945	27,310	84	448	181
1946	35,200	95	419	162
1947	36,230	91	469	142
1948	35,975	92	443	138
1949	31,175	98	567	103
1950	26,800	78	226	95
1951	19,385	63	255	137
1952	19,083	50	251	95
1953	17,850	41	201	141
1954	19,989	48	336	123
1955	21,169	47	288	183
1956	20,270	47	163	217

Samples and specimens received from grub-staked prospectors are spectrographed, assayed, and tested for radioactivity. Mineralogical identifications are made on request.

Of the forty-seven grantees in 1956, twenty-three were given grants for the first time, and only five of these proved unsatisfactory. Five grantees who had received previous grub-stakes were also struck from the list for unsatisfactory work. Six grantees, who for various reasons were unable to fulfil the terms and conditions of the grant, returned the whole or part of the grub-stake. Generally speaking, however, the 1956 season was satisfactory and more claims were located than in any previous season. Several new discoveries were recorded, and the claims located by one group in the northern part of the Province were optioned by a major Canadian company and exploration work was started on them.

D. H. Rae again gave able service in interviewing applicants and supervising grantees in the field. The following notes have been largely compiled by Mr. Rae from information provided in the diaries of the grantees, and from his own observations while in the field.

Atlin Mining Division.—A small amount of work was done between Telegraph Creek and Tulsequah. Nothing of interest was reported.

Liard Mining Division.—A short distance east of Tootsee Lake, and roughly 90 air miles southwest of Watson Lake, intensive prospecting was done by a group of four men on an important discovery made late in 1955. A wide gossan area was thoroughly investigated, numerous trenches and open-cuts were put in, and the ground was later optioned to a mining company. A large northeast-striking fault or shear zone in limestone close to a granite-limestone contact appeared responsible for the mineralization. High assays in silver and lead were obtained in the unoxidized vein material throughout the zone.

More work was done close to the Little Rancheria River, where feldspar-pegmatite dykes were encountered in coarse granite. A small amount of prospecting was done on the chromite discovered during the 1955 season near the headwaters of Blue Creek.

Some inconclusive work was done east of Dease Lake. Near Rainbow Lake a wide pegmatite dyke cutting coarse granite was investigated, and some encouraging mineralization was reported along a granite-limestone contact. At King Lake stringers of short, brittle fibre asbestos were found in a belt of serpentine. Some ground was prospected along the divide between the Racing and Toad Rivers. This area merits further work.

In the Iskut River area some claims were located where considerable galena float was found. Some heavily stained zones along Porcupine River 10 miles north of the mouth of the Iskut were prospected. Inconclusive work was carried out in the watershed of the Anuk and in the upper part of the basin of Porcupine River.

Skeena Mining Division.—Considerable work was done northeast of the Toric mine at Alice Arm. Along the west fork of the Kitsault River some gossan zones were prospected where much green copper stain was in evidence. Very little primary copper mineralization was encountered.

Two men were flown in and established a base camp at Shishilabet Lakes, about 25 miles northeast of Alice Arm; Illiance Mountain, south fork of Latte River, and the watershed of Tchitin River were prospected; gossan areas showing some green copper stain, and considerable pyrite were discovered and sampled, but the values obtained were disappointing. In the Shishilabet Lakes area, shear zones, fault zones, and extensive pyrite mineralization were encountered, but the results of sampling were disappointing.

Along the coastline, some work was done at Shearwater Bay, where low values in copper were reported; at Smith Inlet, where considerable copper stain was found; and at South Bentinck Arm, where a pyritic iron capping showed very low values in gold and copper. Copper showings of a very scattered nature were reported from the north end of King Island. A fairly large deposit of graphite at Elcho Harbour will be further investigated. Some inconclusive work was done in the Kynoch Inlet area.

Omineca Mining Division.—Some prospecting was done near Endako and on the north side of Francois Lake in search of extensions of the radioactive rhyolite dykes discovered in 1955; none of interest were found. Ultrabasic rocks on the east shore of Stuart Lake and in the area near Ogston, Whitefish, and Grassham Lakes were prospected without success.

Claims were located on a new find of cinnabar on the Fort St. James–Pinchi Lake road. The west end of Germansen Lake and the east side of Wolverine Lake near Manson Creek received some attention. Copper float was found in the vicinity of Gaffney Creek, and ground near Blue Lake and on Mount Gillis was prospected for a short time. Some free gold and stibnite were found near Twenty Mile Creek.

Some claims were located in the Finlay River area near the mouth of Ingenika River, and on Chowika Creek.

Near Humphrey Lake basic dykes carrying low values in nickel were discovered, and some work done on the find. At the west end of Pinchi Lake toward Tezzeron Lake some work was done along the Pinchi fault; nothing of importance was found.

A large area of country embracing Mount Ogden, Ogden Creek, Ogden Lake, and Mitchell Range was investigated. Outcrops of granite, gabbro, and serpentine were observed; mariposite and magnetite were found associated with the serpentine. Commercial values in copper were found in a wide shear zone in dunite-peridotite near the Axelgold Range.

In the vicinity of Wasi and End Lakes south of the Osilinka and in the Thane Creek watershed, prospecting was continued close to the granodiorite-volcanic contact. Considerable copper stain and some molybdenite were found along fracture zones in a buff-coloured granodiorite. Fairly good assays in titanium were obtained from samples taken from a dark-green basalt. A small gossan-covered area was also investigated.

Near Eutsuk Lake, at Pondosy Arm, and around Pondosy Bay, the main granite contact was prospected without success.

Quesnel Mining Division.—An outcrop of copper mineralization was investigated at Mile 13 on the Quesnel–Wells road, and some work was done on a granodiorite-argillite contact a few miles to the northwest. Some inconclusive work was done between Horsefly River and Crooked Lake.

Clinton Mining Division.—Intensive prospecting was carried out near Franklin Arm of Chilko Lake, where encouraging showings of chalcopyrite and scheelite occur in altered limestone near stocks of granodiorite close to the main batholith. Commercial values were found in some samples taken here.

Work was done at Taseko and Tsuniah Lakes and on Mount McClure, Battlement Ridge, and Lord River, where heavily stained volcanic rocks were sampled. Nothing of economic interest was found.

Lillooet Mining Division.—Along Anderson Creek, 6 miles above its confluence with Upper Hat Creek, a small amount of work was done to try to locate reported copper showings. Some unsuccessful prospecting was also done close to Pavilion Lake.

Kamloops Mining Division.—From a base camp near Eagle Lake, pyrrhotite showings near the old Lakeview property west of Little Fort were prospected. Some work was done near Azure and Clearwater Lakes and at the headwaters of Goat Creek.

Nicola Mining Division.—Near Aspen Grove, copper occurrences in volcanic rocks were prospected; and some old pits were cleaned out to permit better sampling.

Similkameen Mining Division.—Discouraging results were obtained from an area about 20 miles west of Peachland.

Osoyoos Mining Division.—Some work was done on the west side of Okanagan Lake near Summerland. Nothing of interest was found.

Vernon Mining Division.—Twelve miles east of Vernon, quartz veins in mica schist were prospected for possible beryllium.

Thirty-two miles from Enderby, at the headwaters of Kingfisher Creek, some inconclusive prospecting was done.

Greenwood Mining Division.—A small amount of prospecting was done along the Kettle River northwest of Greenwood, also on Brown and Pass Creeks along Granby River, and on Hardy Mountain. Nothing of interest was reported.

Nelson Mining Division.—On Mount Kelly, and in the basin of Kelly Creek near Fruitvale, an unsuccessful attempt was made to locate the source of some zinc float. Claims were located in the Kokanee Creek area. Some pegmatite dykes close to the old Molly Gibson mine were investigated. Narrow quartz veins and dykes near Whitewater Creek were found to be of no interest.

Considerable work was done on the west side of Kootenay Lake, starting 12 miles due west of Wynndel and extending north to Midge Creek. This work followed approximately along the western contact of the main body of granite with the Horsethief Creek series. Some previously discovered copper showings were investigated and some new discoveries were made. This area merits further work.

Slocan Mining Division.—On Snow Creek, close to Burton Creek, further prospecting was done on a series of felspathic dykes which showed some radioactivity. Samples did not show values of importance. Some work was also done along Ice Creek, Mineral Creek, Blue Grouse Creek, Caribou Creek, Rodd Creek, and Burton Creek. Samples from showings discovered high up on Burton Creek assayed well in tungstic oxide. Nothing further of interest was found.

Fort Steele Mining Division.—An area roughly 10 miles due west of Kootenay River between Flagstone and Waldo received some attention. This area was accessible by way of logging-roads. The valleys of Bloom, Warren, and Gold Creeks were prospected. Much of the exposed rock was unaltered limestone. Nothing of interest was found.

New Westminster Mining Division.—On the east side of the Fraser River at Yale, some time was spent in the divide area between Anderson River and Ladner Creek. No finds were made.

Vancouver Mining Division.—Along the coast, in the Redonda Bay area, along Filer Creek and Toba River, considerable prospecting was done. The stream sands here were found to contain a large amount of magnetite. A large pegmatite dyke was found, cutting across Montrose Creek valley; this showed some green and blue copper stain and a little bornite, but assays of samples were low. Some inconclusive work was done in the Brem River area.

West of the Pacific Great Eastern at Brandywine, some prospecting was done from the old Price property to Callaghan Lake, along Edna Creek and in the valley of Callaghan Creek, and in the Dority Creek watershed. Several well-mineralized zones were uncovered, and interesting assays were obtained from some of the samples taken. Further work should be done in this area.

Alberni Mining Division.—Some work was done close to Zeballos. In the Mooyah Bay area and in Tahsis Inlet, granite contacts were investigated. Interesting copper float was found near the J.C. group on Muchalat Arm. A heavy iron-stained capping containing considerable arsenopyrite was uncovered along the Brennan River valley.

A base camp was established on Muchalat Lake, and some prospecting was done in the adjacent area. Copper float was found on the Oktwanch River. Heavy timber in the area made field work difficult.

Nanaimo Mining Division.—A small amount of work was done in the Cameron Lake area near Mount Arrowsmith. Heavy overburden was encountered and no information was obtained.

Victoria Mining Division.—Considerable work was done west of Chemainus in the Mount Brenton area. Several mineralized zones containing pyrite and scattered chalcopyrite and zincblende were found associated with shear zones around Mount Hall, and Boulder, Sally, and Jones Creeks. Several interesting assays were obtained from the samples taken.

MUSEUMS

The Department has a large exhibit of mineral rock specimens in the Douglas Building, Victoria; collections are also displayed in the joint office in Vancouver and in the offices of the Inspectors of Mines in Nelson and Prince Rupert.

Information regarding collections of specimens of rocks and minerals available to prospectors and schools in British Columbia will be found on page 235.

Specimens from the collection in Victoria, accumulated in a period of nearly sixty years, are displayed in cases on the fourth floor of the Douglas Building. The collection includes specimens from many of the mines and prospects in the Province, and also specimens of type rocks and special minerals from British Columbia and elsewhere.

British Columbia material includes specimens collected by officers of the Department of Mines and specimens donated by property-owners. The collection also includes type specimens purchased from distributers. Other valued specimens or groups of specimens have been donated or loaned to the museum.

PUBLICATIONS

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 231 to 236.

Publications may be obtained from the offices of the Department in Victoria and elsewhere in the Province. They are also available for reference use in the Department's library (Mineralogical Branch) at Victoria, in the joint office in Vancouver, and in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in public libraries listed on page 237.

MAPS SHOWING MINERAL CLAIMS, PLACER CLAIMS, AND PLACER-MINING LEASES

From the details supplied by the locators, the approximate positions of mineral claims held by record and of placer-mining leases are shown on maps that may be inspected in the Central Records Offices of the Department of Mines in Victoria and in

Vancouver. Copies of these maps may be obtained on request. The boundaries of surveyed claims and leases are shown on the reference maps and other maps of the British Columbia Department of Lands and Forests.

JOINT OFFICES OF THE BRITISH COLUMBIA DEPARTMENT OF MINES AND THE DEPARTMENT OF MINES AND TECHNICAL SURVEYS, CANADA.

The Provincial Department's Inspector and Resident Engineer, the Gold Commissioner and Mining Recorder for the Vancouver Mining Division, and the officers of the Federal Geological Survey occupy one suite of offices. All official information relating to mining is now available to the public in the one suite of offices in Vancouver.

The services offered to the public include technical information on mining, the identification of mineral specimens, distribution of Federal and Provincial mining publications, a reference library, a display of rocks and minerals, and a central records office.

Topographic Mapping and Air Photography

During 1956, topographic mapping and air photography were carried on by the Surveys and Mapping Branch of the British Columbia Department of Lands and Forests and by the Canadian Government Departments of Mines and Technical Surveys and of National Defence.

In addition, the Legal Surveys Division of the British Columbia Surveys and Mapping Branch was responsible for cadastral surveys of all Crown lands in the Province, and during the field season carried out surveys of 14,000 acres in the Peace River District for settlement purposes, surveyed the rights-of-way of new highways in the vicinities of Cranbrook, Rock Creek, Spences Bridge, Williams Lake, Macalister, and Vanderhoof, also various lots and subdivisions for alienation and reserve totalling fifty-one parcels. In the course of such work, 368 old lot corners were replaced by permanent monuments.

The Air Division of the British Columbia Surveys and Mapping Branch continued its programme of compiling interim maps at a scale of 2 inches to 1 mile showing planimetry, watershed boundaries, and cadastral surveys, and completed a total area of 37,400 square miles, with a further 29,100 square miles in hand at the end of the year.

The Air Division also flew 26,500 square miles of new photography at various scales, adding 10,873 photographs to the Air Photo Library. The total number of air photographs (Federal and Provincial) now on hand in the Air Photo Library at Victoria is 420,754.

The Topographic Division of the British Columbia Surveys and Mapping Branch extended horizontal ground control into the unsurveyed country south of the Peace River Block, between the Alberta boundary and the Rockies, for the purpose of co-ordinating permits located under the "Petroleum and Natural Gas Act, 1954." Some eighty-seven marked stations were established in the area, which comprises 3,600 square miles, and sufficient vertical control was obtained to permit topographic mapping at a scale of 40 chains to 1 inch.

Another party obtained triangulation control in the Homathko and Southgate River valleys, extending through the Coast Range to the valleys of Chilko and Taseko Lakes, on behalf of the British Columbia Power Commission, whilst a small party on the Salmon Glacier (near Stewart) carried a triangulation net into the Leduc Valley to establish control for a tunnel proposed by Granduc Mines.

The Geographic Division of the British Columbia Surveys and Mapping Branch produced thirteen lithographed maps, of which six were in the 1-inch-to-2-miles series. The latter are six-colour contoured sheets compiled from interim and topographic manuscripts with the aid of field culture checks.

The Canadian Government Departments of Mines and Technical Surveys and of National Defence, working in close co-operation with Provincial agencies during 1956, completed the field work for 111 half-sheets of the National Topographic 1:50,000 series in the Province.

The 1956 Annual Report of the Deputy Minister of Lands contains key maps indicating coverage by air photographs and by topographic and interim maps. Further information concerning these or the corresponding Federal mapping may be obtained from the Director, Surveys and Mapping Branch, Department of Lands and Forests, Victoria, B.C.

Department of Mines and Technical Surveys

The Canadian Government Department of Mines and Technical Surveys, created by an Act of Parliament introduced in November, 1949, took over most of the branches and functions related to mining of the former Department of Mines and Resources. The Mines Branch, Geological Survey of Canada, and Surveys and Mapping Branch are the three branches of the Department of the most direct interest to the mining industry. Brief reference to the work of the Surveys and Mapping Branch in British Columbia is made in the preceding note headed " Topographic Mapping and Air Photography." A note on the Geological Survey of Canada follows this paragraph and is followed by a note on the Mines Branch.

GEOLOGICAL SURVEY OF CANADA

By an arrangement made at the time the Province of British Columbia entered Confederation, geological investigations and mapping in the Province are carried on by the Geological Survey of Canada. Several geological parties are in the field each year. Many excellent reports and maps covering areas of British Columbia have been issued by the Geological Survey of Canada, and they have made available a great amount of information that has been of much benefit to the mining and prospecting activities in British Columbia.

A branch office of the Geological Survey of Canada is maintained in Vancouver. Maps and reports on British Columbia can be obtained there. J. E. Armstrong is in charge of this office.

Field Work by the Geological Survey of Canada in British Columbia, 1956

E. F. Roots, officer in charge of helicopter-assisted Operation Stikine, completed the geological mapping of about 25,000 square miles in northwestern British Columbia (104 A, B, G, H, I, and J) adjacent to the proposed Stewart–Cassiar road. In addition to the officer in charge, the party included the following officers of the Geological Survey staff: J. A. Roddick, J. A. Souther, H. Gabrielse, R. L. Christie, L. H. Green, and W. D. McCartney. Although the work was completed in sufficient detail for publication of preliminary maps on the scale of 1 inch to 4 miles, some additional ground mapping will be done in 1957 to fill in gaps and to resolve critical geological problems.

J. G. Fyles commenced mapping the surficial deposits of the coastal lowland of eastern Vancouver Island between latitude 49° 30′ and 50°. This work is being done for publication on the scale of 1 inch to 2 miles.

E. C. Halstead continued his study of the ground-water resources of the Lower Fraser Valley and completed his work within Maple Ridge and Mission Municipalities.

G. B. Leech completed the geological mapping of the Canal Flats 1-mile map-area (82 J/4), and commenced geological mapping of the west half of the Fernie 4-mile map-area (82 G, W. ½).

H. W. Little completed the geological mapping of the east half of the Kettle River 4-mile map-area (82 E, E. ½).

J. E. Reesor continued the geological mapping of the Lardeau 4-mile map-area (82 K, E. ½).

H. W. Tipper continued the geological mapping of the Anahim Lake 4-mile map-area (93 C).

H. Frebold continued a detailed study of the Jurassic fauna and stratigraphy of southern British Columbia, examining sections in the Nelson, Salmo, and Harrison Lake districts.

W. L. Fry continued a detailed study of the Tertiary palæobotany and stratigraphy of southwestern and south central British Columbia. Particular attention was paid to the Princeton and Coalmont areas, but reconnaissance was done in several adjacent districts preparatory to future detailed studies.

E. J. W. Irish continued the geological mapping of the Charlie Lake 4-mile map-area (94 A).

R. A. Price commenced the geological mapping of the east half of the Flathead North 1-mile map-area (82 G/7, E. ½).

B. A. Latour continued to collect data necessary for estimating the coal reserves of Canada, spending part of the field season in southern British Columbia.

In addition, J. E. Armstrong, E. C. Halstead, and E. Hall, of the British Columbia office, undertook various incidental field tasks, including assistance to the Department of Northern Affairs and National Resources with geological problems concerning potential dam-sites and other features of the Columbia River and related projects, advice to the Department of Public Works concerning rock required for a break-water on Vancouver Island, co-operation with the British Columbia Department of Agriculture in soil investigations, and ground-water investigations for the Federal and Provincial Departments of Agriculture, and the Federal Departments of Citizenship and Immigration, and Health and Welfare.

Publications of the Geological Survey

The following reports relating to British Columbia published by the Geological Survey were received by the British Columbia Department of Mines during 1956:—

- National Advisory Committee on Research in the Geological Sciences, Sixth Annual Report, 1955–56.
- Paper 56–5: A Bibliography on the Occurrence of Uranium in Canada and Related Subjects, by J. W. Griffith.
- Economic Geology Series No. 7: Prospecting in Canada.
- Geophysics Paper 304: Aeromagnetic Coverage to 1955, Canada.
- Map 900A: Canada, Principal Mineral Areas.
- Map 1039A: Alberta and Northeastern British Columbia, Showing Oil and Gas Fields.
- Map 1045A: Geological Map of Canada.

MINES BRANCH

The Mines Branch has branches dealing with mineral resources, mineral dressing and process metallurgy, physical metallurgy, radioactivity, and fuels and explosives. Publications of the Mines Branch pertaining to British Columbia received in 1956 included tabular pamphlets dealing with coal mines, gold mines, stone quarries, petroleum refineries, and milling plants in Canada, and the reports listed below:—

- Mines Branch No. 846: The Granite Industry of Canada, by G. F. Carr.
- Mines Branch No. 857: The Canadian Mineral Industry, 1954.
- Memorandum Series 132: Interim Report on Hardness of Major Canadian Water Supplies, by J. F. J. Thomas.
- Memorandum Series 133: Power and Population: Canada's Present Electricity Requirements and the Long-term Outlook, by C. E. Baltzer and John Convey.
- Technical Paper No. 10: Electronic Concentration of Low Grade Ores with the Lapointe Picker, by A. H. Bettens and C. M. Lapointe.
- Technical Paper No. 15: Studies on the Precipitation of Sodium Polyuranates from Solutions of Sodium Uranyl Tricarbonate, by H. J. Herbst.
- Technical Paper No. 16: Master Sieves at the Mines Branch, by J. Brannen and L. E. Djingheuzian.

Information Circular No. M.R. 17: A Survey of the Iron Ore Industry in Canada during 1955, by W. Keith Buck.

Information Circular No. M.R. 18: A Survey of Developments in the Titanium Industry during 1955, by W. Keith Buck.

Information Circular No. M.R. 19: A Survey of the Petroleum Industry in Canada during 1955, by R. B. Toombs.

Information Circular No. M.R. 20: A Survey of the Natural Gas Industry in Canada during 1955, by R. B. Toombs.

Topical Reports, Radioactivity Division, No. TR-134/56: Experiments on the Possible use of Radioactive Dynamite in Mines, by G. G. Eichholz, A. O. Smith, and A. Bauer.

The Mineral Dressing and Process Metallurgy Division investigates the milling of ores and industrial minerals from many deposits and also tests clays and other ceramic materials. The British Columbia Department of Mines has received the following report on work performed by the Mineral Dressing and Process Metallurgy Division, in 1956, on British Columbia ores:—

Investigation No.	Title
MD3152.	Concentration Tests on a Sample of Lead-Zinc-Silver Ore from Silver Tip Gold Mines Limited, Victoria, British Columbia.

Lode Metals

CONTENTS

GENERAL REVIEW

The average prices of all principal metals except gold were higher in 1956 than in 1955. Gold was valued at 9 cents per ounce less in Canadian funds. The price of silver varied only slightly during the year and averaged 1½ cents per ounce higher than in 1955. The United States price of export copper rose from 45.57 cents at the start of the year to a record high of 49.121 cents on March 21st, and sank to 33.58 cents at the year-end. The average price of copper in Canadian funds was 1½ cents per pound higher than in 1955. The prices of New York lead and East St. Louis zinc were steady for the greater part of the year, being 16 cents per pound and 13.5 cents per pound respectively; these represented increases above the average 1955 prices of approximately 0.8 cent for lead and approximately 1.2 cents for zinc.

Gold, silver, copper, lead, and zinc produced at British Columbia lode mines in 1956 had a gross value of $135,113,813. Miscellaneous metals, including iron ore, tungsten, tin, and minor metals recovered at the Trail smelter, had a gross value of $14,327,010. The total quantity of ore mined at all lode mines amounted to 8,824,440 tons and came from seventy mines, of which forty produced 100 tons or more. The average number employed in the lode-mining industry in 1956, including mines, concentrators, and smelters, was 9,846.

In 1956 thirty mills were operated, twenty-one of them throughout the year. Three mills were reopened, one of them being the Silbak Premier mill, which operated at capacity only five days before it was destroyed by fire. The others were the Van Roi and Cronin mills. Two new mills came into production—one at the old Velvet mine near Rossland and the other at the Silver Hill property on Tulameen River. Four mills accepted custom ore; two of these had no regular source of ore. The magnetic concentrator of Texada Mines Ltd. was modified to effect wet separation and the production of a copper concentrate in addition to the magnetite concentrate.

The Trail smelter recorded custom receipts of 1,008 tons of crude ore, 9,832 tons of lead concentrates, and 6,049 tons of zinc concentrates from properties in British Columbia. Totals of approximately 31,000 tons of lead concentrates and approximately 81,000 tons of zinc concentrates were shipped out of the country for smelting. Copper concentrates and ores, and dross from the Trail smelter were shipped to the Tacoma smelter. Concentrated iron ore was shipped to Japan. Tungsten concentrates were sold to the United States Government under contract.

Gold production was sharply reduced, largely in consequence of the closing of the Nickel Plate mine in 1955. In 1956 there were only three producing gold mines left—Cariboo Gold Quartz, Bralorne, and Pioneer. The French mine, which had been worked as a small seasonal operation in conjunction with the Nickel Plate, was purchased from Kelowna Mines Hedley Limited by The Cariboo Gold Quartz Mining Company Limited. To operate the mine, French Mines Limited was formed, the first new gold-mining company in several years.

Silver, lead, and zinc were mined and sought for at a satisfactory rate. The Silbak Premier reopened after being shut down since 1952, but unfortunately the mill was destroyed by fire after only a few days of capacity operation. Exploration at the Kootenay Florence at Ainsworth reached a stage that promised production. Investigation began of the Ferguson mine on Ingenika River. A discovery of silver-lead was made on Tootsee Lake on the Alaska Highway, and of silver-lead-zinc near Revelstoke.

Copper deposits and copper-bearing areas were investigated throughout the Province. At Rainy Hollow copper-silver ore was shipped from the Maid of Erin; at Granduc, shaft-sinking commenced; at Greenwood, a 1,000-ton mill was under construction, and several ore zones known from former operations were diamond drilled; on Vancouver Island, investigation of ore zones continued. One dissident note was the decision by the

Granby Company to suspend operations at Copper Mountain. The outstanding event was the start of drilling of the Bethlehem Copper property in Highland Valley by American Smelting and Refining Company, and although no official statement was made by the end of 1956 regarding tonnage, production at some future time was assured.

Low-grade but extensive copper mineralization in south central British Columbia was the object of much activity. A total of 7,324 mineral claims were located in Kamloops Mining Division, and about 6,000 of these were in the Highland Valley-Kamloops-Merritt area. A record number of 26,170 claims was located in the Province in 1956, a number four and a half times the last ten-year average.

Much exploration was conducted with the aid of geophysical and geochemical surveys. This was most evident in the case of copper deposits in south central British Columbia, but was true of other metals and other areas. Modern techniques permitted reappraisal of many showings which had been known for years but which apparently did not warrant physical work being done on them.

A discovery of nickel ore was made north of Telegraph Creek, and cinnabar was found on the Pinchi Lake fault zone near Fort St. James. Drilling of the Boss Mountain deposit near Lac la Hache indicated considerably more molybdenite than was previously recognized there.

The Iron Hill magnetite deposit became exhausted, although clean-up work continued and plans were made to open the Iron River deposit near by. Diamond drilling at Tasu Sound showed a considerable quantity of chalcopyrite-bearing magnetite. The Provincial Government conducted air-borne magnetometer surveys on Texada Island and in the general vicinity of Campbell River. The resulting magnetic maps were made available to the public in 1957.

Exploration activity in the north, which has been gradually increasing with modern means of air transport, was spurred by the prospect of a road from Dease Lake to the British Columbia coast south of the Alaska panhandle. The Geological Survey of Canada in 1956 performed a history-making exploit by geologically mapping in one season 25,000 square miles at a scale of 1 inch to 4 miles. Helicopter-assisted Operation Stikine was conducted by E. F. Roots and six other field officers, and will make available an unprecedented amount of basic information in a very short time. Company exploration activity greatly increased, and many Provincial and Canadian companies were engaged in prospecting and the examination of showings over a wide area. The greatest general concentration of activity was in Stikine River drainage.

NOTES ON METAL MINES

RAINY HOLLOW*

Copper, Silver

Maid of Erin (St. Eugene Mining Corporation Limited) (59° 136° N.W.) Company office, Suite 401–5, 402 West Pender Street, Vancouver. Allan J. Anderson, president. Capital: 3,000,000 shares, $1 par value. The St. Eugene Mining Corporation owns the Maid of Erin and thirteen other Crown-granted claims and four full and two fractional recorded claims. The property is on the southwestern slope of Mineral Mountain, 3 miles west of the hairpin bend in the Haines road at Rainy Hollow. This area, in the extreme northwest corner of the Province, is accessible from the Alaska Highway via the Haines cut-off road 100 miles west of Whitehorse, or from the south via Haines, Alaska.

The showings on the Maid of Erin claim consist of flat-lying bornite-chalcopyrite replacement deposits associated with skarn and marble. The claim was originally located in 1903 and was Crown-granted in 1910. Development work was done at intervals from 1907 to 1928, and the showings were explored by an incline, several open-cuts, a vertical shaft, two short adits, and four diamond-drill holes. Sorted ore totalling 157 tons was shipped in the years between 1911 and 1922.

The present company began work on the property in 1955 when a 4-mile road from Mile 53 on the Haines road to the property was partly completed. Work in 1956 was started on May 25th and continued until October 6th. The road to the property was completed, and a total of 3,463 tons of copper-silver ore was mined by open-pit methods. The ore was hauled by truck from the mine to tidewater at Haines, a distance of 56 miles, and from there was shipped by scow to the Tacoma smelter. Five short holes were diamond drilled, totalling 260 feet. A crew averaging ten men was employed under the supervision of C. M. Campbell, Jr.

[Reference: Watson, K. de P.: The Squaw Creek-Rainy Hollow Area, Northern British Columbia, *B.C. Dept. of Mines,* Bull. 25, pp. 42–47.]

McDAME*

Mount Haskin (59° 129° S.E.)

Lead-Zinc

Northwestern Explorations, Limited Company office, 402 West Pender Street, Vancouver. Capital: 5,000 shares, $100 par value. This property comprises forty claims optioned in May, 1956, from R. L. McKamey, Glen Hope, and J. W. Thompson, and sixty-nine claims held by record. The property is on Mount Haskin, 14 miles east of Cassiar and 4 miles north of McDame Creek. The showings are reported to be of lead-zinc mineralization occurring at a contact between limestone and chert of the Atan group of rocks. The best exposures are reported to occur on the west-dipping limb of an anticline, where mineralization ranges in thickness from a few inches to as much as 20 feet.

A jeep-road 4.3 miles long was built from the Cassiar road to the property, and some trenching was done by D8 bulldozer. Four holes were diamond drilled, totalling 1,128 feet. Surface exposures of mineralization were mapped and sampled.

[Reference: *Geol. Surv., Canada,* Preliminary Map 54-10, McDame, British Columbia, 1954.]

Reed (The Consolidated Mining and Smelting Company of Canada, Limited).— This property is 15 miles east of Cassiar and comprises fifteen located claims optioned from J. Reed. The principal showing is reported to consist of a vein mineralized with lead

* By A. R. C. James.

and zinc that cuts limestone and quartzite of the Atan group of rocks. A crew of seven men was employed under the supervision of R. A. Dunsworth from June 6th to September 17th. An access road 1½ miles long was built and five holes were drilled, totalling 1,498 feet. It is reported that the option has been abandoned.

TAKU RIVER*

Gold-Silver-Copper-Lead-Zinc

Big Bull, Tulsequah Chief (Tulsequah Mines, Limited)

(58° 133° N.W.) Company office, Trail; mine office, Tulsequah. J. J. McKay, property superintendent; R. M. Mattson, mine superintendent; O. I. Johnson, maintenance superintendent; E. N. Doyle, mill superintendent. Capital: 3,000,000 shares, $1 par value. In 1956 this company, a subsidiary of The Consolidated Mining and Smelting Company of Canada, Limited, operated the Big Bull and Tulsequah Chief mines. Ore from both mines is treated at the Polaris Taku concentrator, which is operated under lease. The mines are situated a few miles from the confluence of the Taku and Tulsequah Rivers, 5 miles from the International boundary and 50 miles east of Juneau, Alaska. The Tulsequah Chief mine, the mill, and the camp are in the Tulsequah River valley, and the Big Bull mine is in the Taku Valley. Access to the property for personnel and light freight is by charter aircraft from Juneau. All heavy freight and outgoing concentrates are transported on the Taku River by shallow-draught barges plying between the company wharf and tidewater, about 30 miles downstream. River freighting is only possible during the summer months.

Production, ore milled: 203,688 dry tons. Concentrates totalling 34,291 dry tons were shipped to the Tacoma and Trail smelters. The concentrator has throughout the year been milling over 530 tons per day of gold-silver-copper-lead-zinc ores produced mainly from the Tulsequah Chief mine. Separate copper, lead and zinc concentrates are produced by selective flotation based on the primary bulk flotation of copper and lead followed by conventional zinc flotation. The primary bulk copper-lead concentrate, after two stages of cleaning, is refloated, with depression of the copper minerals by cyanide additions. All concentrates produced after the end of the Taku River navigation season are stockpiled at the camp until the following May.

The Tulsequah Chief mine was brought into production in 1951. The orebodies are mainly pyritic sulphide stringer lodes and replacement bodies. The principal ore minerals are galena, sphalerite, chalcopyrite, and tennantite-tetrahedrite, with appreciable amounts of gold and silver; the gold occurs partly in association with the copper mineralization, and the silver occurs mainly with the tetrahedrite. The orebodies so far developed are known respectively as the Upper orebody and the A, B, C, D, and E orebodies. The original discovery and early development was at the outcrop of the Upper orebody, above the present 6500 adit level, at an elevation of 1,600 feet, on the steep rocky slopes of Mount Eaton, on the east side of the Tulsequah River valley. This orebody extends about 700 feet vertically below the surface and narrows out above the present 5900 level. The A, B, C, D, and E orebodies occur several hundred feet deeper and, so far as is known, do not outcrop on the surface. These latter orebodies were first developed from the 5400 adit level and, within the past year, have also been developed from the 5200 adit level. The general method of mining all the orebodies is by shrinkage stopes. Pillars in the A orebody have been mined by long-hole blasting. At the end of 1956 approximately 45 per cent of the ore produced was from the lower levels, mainly from the 52-A stope in the A orebody.

The mine is at present developed from nine levels—the 6500, 6400, 6200, 6100, 5900, 5700, 5500, 5400, and 5200. An internal two-compartment vertical shaft, 1,017 feet long, serves all levels from the 5400 to the 6400 adit level. Broken ore from the

* By A. R. C. James.

upper levels is passed down via the ore-passes to the 5400 adit level, which is a main haulage level. A considerable amount of the broken ore from the lower orebodies is now being loaded into cars at the 5200 adit level, which in 1956 was established as a second main haulage level. On October 25th a Ruston 48-horsepower diesel locomotive was put into operation on this level, together with a train of nine 90-cubic-feet-capacity Granby cars.

The following is a summary of development work completed at the Tulsequah Chief mine in 1956: Drifting, 2,044 feet; crosscutting, 1,343 feet; subdrifting, 1,301 feet; raising, 4,423 feet; underground diamond drilling, 25,384 feet.

The Big Bull mine was brought into production in 1951. The orebodies are similar in mineral content to those of the Tulsequah Chief and occur as steep west-dipping sulphide stringer lodes in a zone of altered rocks adjacent to a north-trending fault. The ore-shoots lie in a shallow zone which does not extend more than 300 feet below the surface. The mine has been developed from an open pit and three underground levels—the 5000 adit level, the 4850, and the 4700 levels. In 1956 mining was mainly confined to the recovery of broken ore from old stopes above the 5000 level. A total of 7,228 tons of ore was recovered by a crew averaging six men. This work was begun on July 19th and was completed on November 13th. A surface diamond-drilling programme was carried out from March 10th to May 31st, and a total of 3,194 feet was drilled. It is understood that the Big Bull mine is now to be permanently abandoned. The total ore milled from the Big Bull from 1951 to the end of 1956 was 389,465 tons.

Additions to the main camp in 1956 included a bowling-alley extension to the Geigerich Recreation Hall and the addition of extra bedrooms to some of the homes. Eight houses were moved over from the Big Bull to the main camp. Improvements on other parts of the property included the construction of a new freight dock at the Polaris Landing on the Taku River and the building of two new bridges on the road between the camp and the airstrip. A twice-weekly mail service via Atlin was inaugurated in 1956 and has proved very satisfactory.

The total crew (including staff) employed in December was as follows: Tulsequah Chief mine, 127; mill, 28; other surface, 79; total, 234. A shortage of labour was experienced throughout the summer and fall, and many of those who presented themselves at the mine for work were found to lack skill and experience. Turnover of labour was very heavy, amounting to 388 men during the year.

The year 1956 has been a most unhappy one in regard to accidents. There were forty lost-time compensable accidents, and three fatal accidents occurred on the property during the year. The first fatality was on August 6th, when Harry M. Stanley, a truck-driver, was drowned in the Tulsequah River. The other two fatalities occurred on November 25th, when George Ludwick and Thomas Royko, both miners, were killed in a blast in the Tulsequah Chief mine. A full-time safety engineer is employed, and a safety committee meets regularly and carries out monthly inspections of the property. A real effort is made at this property to maintain a high standard of safety consciousness, but probably the high turnover of labour in 1956 has contributed to a high accident rate. A resident doctor is available at the camp to give immediate attention in case of injuries or illness, and serious cases are usually evacuated by air to hospitals at Juneau or Vancouver.

The annual "Tulsequah Flood," a remarkable feature of this locality caused by the sudden draining of Tulsequah Lake through a channel in the glacier ice, began on August 29th, reached a peak about midnight on August 31st and dropped back to near normal by September 1st. At the crossing to the Tulsequah Chief mine, approximately 375 feet of bridging was rebuilt after the flood, and at the Big Bull crossing about 175 feet of bridging was rebuilt.

STIKINE*

Copper

Callison Copper (Brikon Explorations Limited)

(58° 131° S.W.) Company office, 1158 Melville Street, Vancouver; field office, Whitehorse, Yukon Territory. J. D. Mason, president; A. Allan, geologist. Capital: 100,000 shares, $1 par value. This property includes four adjoining claim groups, comprising eight claims held under option and 192 claims held by location. The claims are situated in the Hackett River valley between Kennicott Lake and Sheslay and are about 30 miles northwest of Telegraph Creek. The showings are reported to consist of irregular patches of chalcopyrite, pyrite, and pyrrhotite mineralization, occupying fractures and fissures in basic volcanics. A few patches of fine-grained disseminated chalcopyrite were found in the granodiorite near the eastern margin of the Coast Range batholith.

Work was begun on the property in the middle of May and continued until August. A crew averaging eight men was employed under the supervision of A. Allan. Two holes totalling 286 feet were diamond drilled, and approximately 2,000 cubic yards of trenching and open-cutting was done. The Telegraph Creek trail was rehabilitated, and about 6 miles of new trail was made to the various showings.

The company reports that the deposits appeared to be too erratic and too low in grade to be of commercial interest at this time.

BUY and HAB (Hudson Bay Exploration and Development Company Limited)

(57° 131° S.W.) Company office, 500 Royal Bank Building, Winnipeg, Man.; mine office, Flin Flon, Man. R. H. Channing, president. The BUY group, consisting of forty-eight claims, and the HAB group of 105 claims were located by the company in 1956. They are in mountainous country about 8 miles east of the Stikine River between the Scud and Porcupine Rivers, approximately 60 miles downstream from Telegraph Creek. The claim groups cover parts of Saddlehorn Mountain, Mount Scotsimpson, and the headwaters of Galore Creek, a tributary of Scud River, Anuk River, and Split Creek, a tributary of the Porcupine River. The showings are reported to consist of finely disseminated chalcopyrite associated with pyrite in a complex of volcanic fragmental rocks intruded by feldspar porphyry and later narrow dykes.

The work done on this property formed part of a wide exploration programme carried out by the company in northern British Columbia in 1956. A total of twenty-five men, including prospectors, diamond drillers, air transport personnel, geologists, and geophysicists were employed under the supervision of Russel T. McIntosh. On the BUY and HAB groups forty-five holes totalling 1,253 feet were drilled. Twenty-one cubic yards of trenching was done on the HAB No. 9 and No. 20 mineral claims. The work was begun on June 20th and completed on September 28th. All transportation to the showings was by helicopter.

Windy (Conwest Exploration Company Limited)

(57° 129° N.W.) Company office, Suite 1001, 85 Richmond Street West, Toronto; British Columbia office, 901 Royal Bank Building, Vancouver. F. M. Connell, president. Capital: 3,000,000 shares, no par value. This property, consisting of thirty claims held by record, is approximately 3 miles northwest of Cluea Lake, near the headwaters of the Iskut River system. The showings are reported to consist of a large oxidized area with small amounts of azurite and malachite. Under the supervision of A. E. Storey, a crew of six men did a limited amount of open-cutting and pack-sack drilling. The company reports that the results of this work were not encouraging.

* By A. R. C. James.

UNUK RIVER*

Copper

Granduc (Granduc Mines, Limited) (56° 130° S.E.) Company office, Room 307, 1111 West Georgia Street, Vancouver; mine office, Stewart. L. T. Postle, president; J. J. A. Crowhurst, manager; J. M. Parker, superintendent. Capital: 4,000,000 shares, $1 par value. This company holds sixteen Crown-granted and 183 recorded claims at the head of the Leduc River. The property is 25 miles north 35 degrees west of Stewart, and the outcrops of the orebodies are at elevations between 3,260 and 4,800 feet on the mountain slope on the north side of the Leduc Glacier. The extensive copper orebodies at present being developed are in the Coast Mountains about 2 miles north of a large mass of the Coast intrusions. They occur in siliceous sediments that strike slightly east of north and dip steeply, generally westward. The mineralized zones are essentially conformable with the sediments and consist mainly of chalcopyrite, pyrrhotite, and pyrite. There are two main ore zones, known respectively as the A (or West) and the B (or East) zones. At the 3250 level the A orebody is from 25 to 50 feet wide and the B orebody is from 50 to 150 feet wide, the average grade of the ore being a little over 1.60 per cent copper. Near the 3250 portal the two zones are over 400 feet apart, but this distance soon narrows in a northerly direction to 150 feet and less. At approximately 1,700 feet from the portal the two zones merge. At the 3250 level, drifting and diamond drilling have indicated that the ore zones extend over a strike distance of 3,200 feet. Vertical continuity of ore zones has been established at five points, as follows:—

Explored Dip Length	Distance from Uppermost Ore Intersection to Surface
1,700 feet	
1,850 „	
1,500 „	400 feet
700 „	1,050 „
300 „	1,900 „

The ore zones are still open above and below these explored dip lengths, except for the first two that reach surface. The orebodies are open to the south, beneath the south fork of the Leduc Glacier. At the north end of the 3250 level, drifting and drilling have disclosed continuity of the favourable quartzite beds, but economic mineralization has not been encountered. Further exploration to the north is currently under way.

The development of this important property, begun in 1953, was continued throughout 1956. The principal operation in 1956 was the sinking of a shaft to explore the ore zones at depth. This is an internal shaft, collared at the 3250 level in the footwall sediments east of the B orebody and about 1,200 feet from the portal. It is a three-compartment vertical shaft, 8 by 22 feet, each compartment being 6 feet square inside the timbers. Preliminary work was begun early in the year. The first 220 feet of the 3250 adit level was slashed out to 10 by 10 feet, and 250 feet of drifting and 750 feet of crosscutting was completed to the site of the hoistroom. An additional 470 feet of crosscutting was completed to the site of the shaft waste-chute. The hoistroom, 30 by 40 feet, was cut out east of the shaft collar. The shaft was raised 90 feet for the headframe installations, and was connected to the hoistroom by a rope raise 120 feet long. The hoist was installed in August; it is a Coeur d'Alene hoist with two 62-inch-diameter tandem drums, electrically powered by two 200-horsepower 2,300-volt 3-phase 60-cycle G.E. slip-ring motors. It is fitted with Lilly controls and hydraulically operated post brakes.

Shaft-sinking was begun on September 15th, 1956, by the Pogue Exploration Company under contract. By the end of the year the shaft was 363 feet deep, and the first two stations had been cut at 150 and 300 feet from the collar, respectively. Progress

* By A. R. C. James, except as noted.

was delayed by a continuous heavy inflow of water, making it necessary to drill ahead of the shaft-bottom and pump cement grouting under pressure to seal off breaks and fissures in the rocks. It is understood that the shaft is to be sunk to a depth of 1,200 feet. It is interesting to note that a Cryderman shaft mucker is being used in the sinking, the first time one of these machines has been used in British Columbia. The machine is equipped with a 40-cubic-foot bucket and operates from the west compartment of the shaft. In the Granduc shaft it can muck at the rate of about a ton a minute and leaves very little rock to be hand-mucked.

Other underground development work in 1956 included the driving of an exploration drift 508 feet at the north extremity of the 3250 level; the level is now 3,468 feet long. Five diamond-drill crosscuts totalling 94 feet were driven from this drift. No work was done at the 3750 level in 1956. Nineteen holes were diamond drilled, totalling 6,980 feet; of this total, 871 feet comprised drilling for grouting prior to shaft-sinking.

A new power-house was built at the surface at the 3250 level portal to house diesel engines and compressors. New equipment installed in 1956 included one 550-cubic-feet-per-minute electrically driven Joy Sullivan air compressor and three 150-kilowatt Caterpillar diesel generator sets, together with the necessary switching and transformer gear, to supply 2,300 or 440 volts (a.c.). Oil-tanks with a total storage capacity of 176,000 gallons were installed in 1956.

A crew averaging thirty-five men (reaching a maximum of fifty in the middle of the summer) was employed at the property. In addition, an average crew of twenty was employed by the Pogue Exploration Company on the shaft-sinking. The men are housed in a small camp consisting of prefabricated plywood buildings on the north side of the Leduc Glacier. Owing to the danger of snowslides the camp has to be established on the glacier for the winter months, and in the summer is moved back to the hillside near the 3250 level portal. In 1956 the camp was moved to the hillside in the last half of May and on to the glacier in the first half of November.

An attempt was made during the year to test the thickness of ice on the glaciers at various points over possible haulage routes. Nine holes totalling 13,297 feet were drilled with special electrical hot-point drilling equipment. Six of the holes were drilled in the west arm of the Salmon Glacier, which is about 1¼ miles wide. Some difficulty was experienced when moraine gravels were encountered, but one hole in the centre of the glacier penetrated 2,365 feet of ice. One hole was drilled in the snowfield at 5,000 feet elevation between the head of the Leduc Glacier but remained unfinished at the end of the year at a depth of 770 feet. Two holes were drilled on the north fork of the Leduc Glacier.

A crew averaging six men was employed in the summer on a survey of a proposed access road up the Unuk River valley.

The problem of transporting heavy equipment to a large property like Granduc is exceptionally difficult, situated as it is in a region of changeable and often severe climatic conditions and surrounded on all sides by rugged mountains, glaciers, and snowfields. In 1956 the company again obtained the services of the Patricia Transportation Company, a firm with much experience in tractor transportation over snow and ice. Between February 3rd and April 20th this company transported 2,096 tons of equipment and supplies to the property. The materials were taken by road for a distance of 11 miles from Stewart to a point near the foot of the Salmon Glacier and there transferred to sleighs and hauled by tractors up the Salmon Glacier and over the high glaciers and snowfields to the property, a distance of about 23 miles.

Routine servicing of the property and transportation of personnel and light freight were carried out by aeroplane. A Piper Super Cub, a de Havilland Beaver, and a Fairchild 82 were used for this purpose, and an experienced pilot was employed on a full-time basis. In winter and spring the Beaver and the Super Cub land with ski landing-gear on an improvised airstrip on the snow-covered glacier. In the summer a 1,200-foot airstrip built in 1955 on the northwest flank of Granduc Mountain is used. A total of 345 tons of light freight was taken in by aeroplane during the year. The year was marred by two serious flying accidents; one on June 27th resulted in the death of the pilot, W. Kellough, and the total loss of a new aircraft, and the other on July 30th resulted in serious injuries to the passenger in the aircraft.

The mine office is at present established in Stewart, and communication with the camp is maintained by two-way radio. Seven new houses were built by the company and two others were purchased in Stewart for managerial and supervisory employees.

Working conditions were found to be satisfactory considering the location of the property. A safety committee was established in the latter part of 1956, and at the year-end a safety engineer was appointed. There were ten compensable accidents in 1956. The only ones classified as serious were the two flying accidents mentioned above.

[Reference: Bacon, W. R.: Preliminary Map, Granduc Area, *B.C. Dept. of Mines* (1956).]

Copper

South Leduc (Northwest Ventures Ltd.)*

(56° 130° S.E.) This property consists of thirty claims on the southwestern side of the south fork of Leduc Glacier. The claims adjoin on the south the property of Granduc Mines, Limited. The South Leduc property is under option to Jaye Explorations Limited, of Toronto. During the 1956 season 3,770 feet of diamond drilling was done, of which 1,715 feet was through ice.

The drilling was done near the base of a steep hanging glacier, tributary to the south fork of Leduc Glacier. Its purpose was to investigate the assumed prolongation of the Granduc ore structure. According to drill logs supplied by Northwest Ventures Ltd., the rocks intersected by the holes are sediments similar to those occurring on the Granduc property. Pyrite, pyrrhotite, chalcopyrite, and sphalerite were encountered in a number of the holes.

As far as is known, the key ground lies beneath the hanging glacier. Extensive surface exploration of this ground is virtually impossible because the steep rock walls on both sides of the glacier do not afford natural sites for drill set-ups.

[Reference: *B.C. Dept. of Mines,* Preliminary Map of the Granduc Area, 1956.]

PORTLAND CANAL†

Salmon River (56° 130° S.E.)

Gold-Silver-Lead-Zinc

Silbak Premier Mines Limited

Company office, 572 Howe Street, Vancouver; mine office, Stewart. A. E. Bryant, president; G. W. McCool, resident manager; P. Kindrat, mine superintendent; O. C. Gilroy, surface superintendent. Capital: 3,000,000 shares, $1 par value. After remaining idle for two years, development work on this well-known property was resumed in 1955 under the technical direction and management of Henry L. Hill & Associates, of Vancouver. This work was continued in 1956, and rehabilitation of the surface plant was begun late in May. The plant was in partial operation by September, and the property was placed in full production in mid-November. On November 20th a disastrous fire totally destroyed the concentrator, compressor plant, and all the service buildings west of the No. 4 level portal. No work has been done since the fire, but it is understood that a resumption of operations is planned for 1957.

Approximately 10,000 tons of ore was mined in the Silbak workings. Stoping was concentrated in 9F and 9H stopes on the 940 level, 10A stope on the 1060 level, and

* By W. R. Bacon.
† By A. R. C. James.

79B stope on the 790 level. No stoping was done in the Premier Border section of the mine, but 30 feet of drifting and 10 feet of raising were done. Production: Ore milled, 5,580 tons. Of the 470 tons of lead and 564 tons of zinc concentrates produced, 177 tons of lead and 355 tons of zinc concentrates were shipped to the smelter at Kellog, Idaho, the balance being left at the property. Gross content of concentrates shipped: Gold, 89 oz.; silver, 5,021 oz.; lead, 395,568 lb.; zinc, 373,455 lb.

During the reconstruction period the crew averaged approximately seventy men. With the resumption of production in September the crew averaged thirty-two men underground and sixty-five men on the surface.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1947, pp. 74–82; *Geol. Surv., Canada,* Mem. 175, pp. 161–166 (1935).]

Silver-Lead-Zinc

Silver Tip (Silver Tip Gold Mines Limited)

Company office, 303 Times Building, Victoria. K. C. Drury, president. This property is on Silver Creek, on the south slope of Mount Dilsworth, 21 miles north of Stewart. From the old Big Missouri mine at Joker Flats, a trail 1½ miles long leads to the Silver Tip cabin at an elevation of 3,450 feet. Development work has been done intermittently on this property for nearly forty years, and descriptions of it have been published in previous Annual Reports. In 1956 a crew of two men was employed in the summer months under the supervision of Hunter Smith. Approximately 100 feet of drifting was done on the Blind vein on the May P.J. claim.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1950, pp. 77–78.]

AMERICAN CREEK (56° 129° S.W.)

Copper

Argentine (Canadian Exploration Limited)

Company office, 1100 Royal Bank Building, Vancouver. G. A. Gordon, general manager; J. A. Mitchell, exploration manager for western division. This property comprises twenty-four recorded claims held by Messrs. McLeod, Bugnello, and Jokanovitch, of Stewart. It is 20 miles north of Stewart on the west side of American Creek at 3,800 feet elevation. The showings are reported to consist of disseminations and streaks of chalcopyrite in andesitic breccias which are intermingled with flow rocks. The present company took an examination option in September and did 300 feet of diamond drilling. A crew averaging four men was employed under the supervision of H. Priske. It is reported that the results of the drilling were not encouraging, and the option was dropped.

MAPLE BAY (55° 130° S.E.)

Copper

Maple Bay Copper Mines Limited

Head office, Room 906, 357 Bay Street, Toronto; British Columbia office, 315 Credit Foncier Building, 850 West Hastings Street, Vancouver; mine office, P.O. Box " W," Stewart. W. J. Lawson, president. Capital: 3,500,000 shares, $1 par value. The company holds twenty-two Crown-granted claims, twenty-four recorded claims, and sixteen fractions near Maple Bay on the east side of Portland Canal, 37 miles south of Stewart. The showings consist of a series of quartz veins mineralized with chalcopyrite and pyrrhotite. The vein on the Star claim is exposed above an elevation of 375 feet, and the remainder of the showings are mainly at elevations of 2,400 feet and higher. Access to the property is by charter boat from Stewart to Maple Bay, or arrangements may be made with Pacific Western Airlines for their scheduled flight to call at Maple Bay. A camp has been established at the beach. A half-mile truck-road has been made to the adit portal on the Star claim, while the upper showings are reached by means of a 3-mile pack-trail. An upper camp was established in the summer of 1956 at an elevation of 2,400 feet near the Anaconda showings.

Some drilling and development work have been done on the Maple Bay group in previous years, particularly by Granby Consolidated Mining Smelting and Power Company Limited. On the Eagle and May Queen claims a large vein was diamond drilled. On the Star claim a 650-foot adit was driven, and in 1916, 4,000 tons of copper ore was shipped. On the neighbouring Outsider group a copper-bearing quartz vein was mined from 1906 to 1907 and from 1922 to 1926; a total of 138,854 tons of ore was produced.

Work by the present company began in June, 1955 (*see* 1955 Annual Report). In 1956 work was started again in June and continued until December 1st. A crew averaging twelve men was employed under the supervision of the late Frank L. Smith. At the upper showings, most of the diamond drilling was done on the Anaconda and Princess veins, but some packsack drilling was done on the Lizzie vein. Sixteen EX holes were drilled, totalling 3,400 feet, and eleven short holes were drilled into the outcropping for core sampling.

One-half mile of road was constructed from the beach camp to the Star adit portal. The old adit was rehabilitated and track laid to the face. Three underground diamond-drill holes totalling 400 feet were drilled to pick up the Star vein and explore for parallel fissures. The Star adit was driven a further 165 feet on the vein, a total length of 815 feet.

A camp to accommodate a crew of twenty men, and comprising a cook-house, bunk-house, and office, was erected at the beach at Maple Bay.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1921, p. 59; *Geol. Surv., Canada,* Mem. 175, p. 100.]

ALICE ARM*

Silver

Toric (Torbrit Silver Mines Limited)

(55° 129° N.W.) Registered office, 309 Royal Bank Building, Vancouver; executive office, 44 King Street West, Toronto; mine office, Alice Arm. R. W. Burton, manager; A. M. Cormie, mine superintendent; A. R. Johnson, mill superintendent. Capital: 3,000,000 shares, $1 par value. The Torbrit mine camp and mill are at an elevation of 1,000 feet on the west side of the Kitsault River, 17 miles by road from Alice Arm. The portal of the 1,000-foot or main haulage level of the mine is on the opposite side of the river, half a mile north of the mill. The mine and the mill are connected by an extension of the mine haulage system. Five miles farther up the Kitsault River valley, near the mouth of Clearwater Creek, the company operates a hydro-electric power plant of 1,600 horsepower capacity.

Production: Ore milled, 134,652 tons. Flotation concentrates amounting to 1,713 dry tons were shipped to the smelter, and additional silver amounting to 289,933 ounces was sold as bullion. Gross contents of concentrates and bullion shipped: 1,562,437 ounces of silver and 1,051,376 pounds of lead. The greater part of the silver is recovered with the galena as a bulk concentrate, which is shipped to the lead plant at Trail. The native silver is recovered by cyanidation of the flotation tailings and is refined and shipped as bullion. The milling capacity is between 400 and 450 tons a day.

The ore occurs in shoots in a quartz-barite-hematite-jasper replacement deposit within a country rock consisting of agglomerates and tuffs of the Hazelton group. The important ore minerals are galena, ruby silver, and native silver. Most production is at present obtained from three levels of the mine at 1,000, 900, and 800 feet elevation respectively; in 1956, 94 per cent of the ore production was from the 800 level, 5 per cent from the 900 level, and 1 per cent from the 1000 level. The method of mining is by long blast-hole and conventional shrinkage stopes. The 1000 level is the main haul-

* By A. R. C. James.

age level. A vertical shaft driven from the surface provides access to the lower levels. Development of reserves below the 800 level was carried out at the beginning of the year when a 16-degree winze was driven in the footwall for a distance of approximately 500 feet to the 700 level. Ventilation of the mine is mainly natural, but assistance in ventilation of the lower workings is provided at the 800 level by a Canadian Sirocco Vanaxial fan powered by a 15-horsepower electric motor; this fan circulates approximately 30,000 cubic feet of air per minute.

A crew averaging 118 was employed. A mine safety committee carried out regular inspections of the mine and mill and holds monthly meetings. Sixteen compensable accidents occurred in 1956, eleven of which took place in the mine, one in the mill, and four on other surface operations. One of these accidents resulted in the death on August 29th of Keith Kavanagh, a mucking-machine operator. The remainder of the accidents were not classified as serious.

There were no important additions to the camp buildings or surface plant in 1956. The winter of 1955–56 was the most severe experienced in seven years of operation. Production was curtailed for twenty days in April, when it appeared that the stored water for the hydro-electric plant might not be sufficient to last until the spring thaw.

The following is a summary of mining operations:—

Ore Broken	Tons
Stoping	142,751
Stope raises and stope drifts	7,255
Level development	1,350
Total	151,356

Waste Broken	Tons
Level development	3,420
Stope raises and stope drifts	4,503
Winze	2,103
Total	10,026

Development in Linear Feet	Ft.
Drifts and crosscuts	671
Sublevel drifts and boxholes	2,423
Winze-sinking	388
Total	3,482

	Ft.
Underground diamond drilling	5,612
Long-hole drilling with tungsten carbide bits	87,096

On the Moose and Lamb claims of the Toric group, a total of 2,933 feet of diamond drilling was done from the surface. The company reports that sufficient encouragement was obtained to justify further drilling in 1957. On the North Star claim, a total of 2,885 feet of diamond drilling was done from surface sites. Further drilling is planned on this claim in 1957. In addition to the diamond drilling, a geological and topographic survey was carried out on these properties and some adjoining ground, in more detail than any earlier work. Both the drilling and the mapping programmes were aided by the use of a helicopter, which was chartered intermittently over a period of three months.

Copper

Boulder (Torbrit Silver Mines Limited)
(55° 129° N.W.) This property, on the east side of Kitsault River, 3 miles south of the Torbrit mine, comprises eleven claims located in 1955 by Torbrit Silver Mines Limited. The property is characterized by the presence of a number of very large boulders composed of volcanic rock locally mineralized with pyrite and chalcopyrite. A geophysical (resistivity) survey and a limited amount of diamond drilling were done in 1955. In 1956 the property was mapped and some trenching was done, followed by a total of 1,370 feet of diamond drilling. It is reported that the results of this work were not encouraging and no further work is planned.

Kinskuch, Reina Blanca (Northwestern Explorations, Limited)
(55° 129° N.W.) Company office, 402 West Pender Street, Vancouver. Capital: 50,000 shares, $100 par value. This property consists of eight claims held under option from W. McLean and associates, of Alice Arm, and ten claims held under option from Gunn Fiva, of Alice Arm, together with an additional twenty-four claims held by record. It is on the southeast side of Kinskuch Lake, approximately 15 miles in a direct line north-northeast of Alice Arm. Kinskuch Lake is at 3,700 feet elevation in mountainous country east of the Kitsault River, and drains into the Nass River via the Kinskuch River.

The writer was unable to visit the property and is indebted to C. S. Ney, engineer in charge, for the following description of the showings:—

" There are several showings of copper mineralization in the area covered by the claims. Work was done in two localities—on a peninsula of bare rock at the southeast corner of the lake, and on a mineralized outcrop adjacent to the glacier, a mile east of the lake and 1,000 feet above it. The first showing is essentially a stockwork of pyrite-chalcopyrite veinlets outcropping over an area 200 by 400 feet. The second showing is characterized by areas of minute fracturing sparsely mineralized with chalcopyrite, with some veinlets of chalcopyrite in addition. The host rocks are volcanics of intermediate composition affected over a wide area by chloritization, and more locally by carbonate alteration."

The company did some preliminary work on the property in the fall of 1955, including 500 feet of sample drilling with a packsack drill. In the early months of 1956, diamond-drilling equipment, fuel, and lumber for camp buildings were taken into the property in a ski-equipped Junkers aircraft operating out of Terrace. Transportation of men and supplies from Alice Arm was accomplished by Bell helicopter from May 15th until July 9th, when the lake became open for float aircraft. A camp was occupied at Kinskuch Lake from May 15th to October 9th. A crew averaging twelve men was employed under the supervision of C. S. Ney. Fourteen AX holes totalling 6,300 feet were diamond drilled. Eleven holes totalling 964 feet were drilled with a packsack drill.

OBSERVATORY INLET*

Copper

Anyox (The Consolidated Mining and Smelting Company of Canada, Limited). (55° 129° S.W.) This property is on the east side of Observatory Inlet and comprises sixty-five Crown-granted claims, three leased claims, and eighteen recorded claims, all held by The Consolidated Mining and Smelting Company of Canada, Limited. The company has been carrying out geological investigations in this area for several seasons. In 1956 a crew averaging sixteen men under the supervision of L. Coulter worked on the property from May 15th to September 28th. Twelve AX holes totalling 11,740 feet were diamond drilled to explore an area south and west of the old Hidden Creek mine workings. Approximately 5 miles of tractor-road was built and additional geological mapping was done.

* By A. R. C. James.

Double Ed (The Consolidated Mining and Smelting Company of Canada, Limited).—(55° 129° S.W.) This property, comprising fifteen located claims, is on Bonanza Creek, 3 miles west of Anyox. The showings are reported to consist of chalcopyrite, pyrrhotite, and pyrite disseminated in volcanics near an argillite contact. In recent years the company has carried out drilling, open-cutting, and geological mapping on this property. In 1956 a start was made on the construction of a truck-road from the dock at Granby Bay to a proposed adit-site. This work was carried out by a contracting company between August 15th and December 15th. One and a half miles of road was completed, and the dock at tidewater was repaired. A crew averaging twelve men was employed. C. Smith was the engineer in charge for the company.

MORESBY ISLAND*

Copper

Swede (New Jersey Zinc Explorations Company (Canada) Ltd.) (52° 131° N.W.) Company office, 606, 525 Seymour Street, Vancouver. The property is on Swede Peninsula, near the entrance of Lockeport Harbour on the east coast of Moresby Island. It consists of sixteen claims held under option from W. A. Rutledge and L. P. Kenwood, of Vancouver. The showings have been described in previous Annual Reports and comprise an extensive area of low-grade copper mineralization consisting of chalcopyrite and bornite disseminated in small bunches and veinlets through a host rock of greenstone. The original claims were first located in 1907, and a limited amount of development work was done about forty years ago. Two adits were driven; one was driven 170 feet and another farther north was driven 80 feet.

The present company began work on the property on July 15th, 1956. E. Livingston and an assistant carried out geological mapping and sampled the existing adits and underground workings. A crew of two men drilled three X-ray diamond-drill holes totalling 326 feet.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1907, p. 69; 1929, p. 57.]

Iron, Copper

McMillin (Silver Standard Mines Limited) (52° 131° S.E.) Company office, 609, 602 West Hastings Street, Vancouver. R. R. Wilson, president. Capital: 3,500,000 shares, 50 cents par value. The property is in the vicinity of Harriet Harbour at Jedway Bay in the southern part of Moresby Island. It consists of twenty-one Crown-granted claims held under option agreement and one claim held by record. The showings include bodies of magnetite containing some copper mineralization. The present company began work on the property on July 30th and continued until November 30th. A crew averaging seven men was employed under the general supervision of W. St. C. Dunn. Twenty-five holes were diamond drilled, totalling 3,539 feet. Twenty-two trenches were cut, totalling 900 linear feet, and 5 miles of trail was cleared. The property was serviced by chartered boats and by aeroplane.

Tassoo.—(52° 132° N.E.) This property on Tasu Sound is described on page 125.

BELLA COOLA*

Copper

Torger Copper (Silver Standard Mines Limited) (52° 126° N.W.) Company office, 609, 602 West Hastings Street, Vancouver. R. R. Wilson, president. The property, consisting of four Crown-granted claims held by option agreement and eight claims held by record, is on the east side of the Salloomt River, 12 miles north of Hagensborg. It is reported that a series of dykes

* By A. R. C. James.

ranging from quartz biotite granite to quartz feldspar porphyry intrude a large mass of andesite and that the dykes are mineralized in places with chalcopyrite. Work on the property was started on May 24th and was continued until July 3rd. A crew of four men was employed under the general supervision of W. St. C. Dunn. Nine holes totalling 299 feet were drilled with a packsack drill. Ten trenches were cut, totalling 560 linear feet. It is reported that insufficient mineralization was found to warrant continuance of the work.

PORCHER ISLAND*

Iron

Star (Utah Co. of the Americas) (54° 130° S.E.) Company office, Room 1502, 736 Granville Street, Vancouver. A. D. Christiansen, president. Capital: 250,000 shares, no par value. The property consists of ten Crown-granted claims and one claim and several fractions held by record. It is on the northeast coast of Porcher Island opposite Chismore Passage, 22 miles by sea from Prince Rupert. Topographic relief is low and elevations range from sea-level to 250 feet. Sporadic magnetite replacement of schist occurs over a strike length of nearly 3 miles. Investigations to date indicate that most occurrences are a few hundred feet in length with barren areas between. Some magnetically anomalous areas have outcrops and others have none. The magnetite deposits have been known for many years, but no previous work has been done on them. The present company established a camp on the property in October, 1955, and carried out a programme of work which included topographic and magnetometer surveys, diamond drilling, and sampling. The work was completed by March 5th, 1956. A crew of seven men was employed under the supervision of J. T. Lafranier. A total of 2,285 feet of diamond drilling and 245 feet of surface sampling of outcrops was done. (*See also* p. 129.)

HAZELTON*

Silver-Lead-Zinc-Cadmium

Silver Standard (Silver Standard Mines Limited) (55° 127° S.W.) Company office, 602 West Hastings Street, Vancouver; mine office, New Hazelton. R. R. Wilson, president; H. B. Gilleland, manager; A. C. Ritchie, general superintendent; N. G. Cornish, mine superintendent. Capital: 3,500,000 shares, 50 cents par value. The property is on Glen Mountain, 5½ miles north of Hazelton, the mill and camp being located on the northwest side of the mountain at an elevation of 1,300 feet. In 1956 the mine was in operation 280 days, and 13,879 man-shifts were worked. Total ore production was 20,352 tons. The mill, which remained closed for the first few months of 1956, resumed operation on May 2nd. It was operated on a 5½-days-per-week basis until November 1st and continuously from then until the end of the year. A total of 13,762 tons of ore was treated by selective flotation, the remainder being sorted out as waste. The indicated mill recovery was 94.5 per cent of the gross metal content of the ore. The mill capacity is from 60 to 75 tons per day.

Until 1956 all the ore was mined from shoots in a series of parallel quartz veins. These veins range in width from a fraction of a foot to 12 feet. Most of them strike northeast and dip from 40 to 80 degrees southeast. Sixteen such quartz veins are known on the property, named respectively the Discovery vein, Nos. 00, 0, and 1 to 12 veins; the distance from No. 00 vein to No. 12 vein is about 1 mile. In 1955 a new vein was discovered to the south of Nos. 9 and 11 veins. This vein strikes north 37 degrees west (at right angles to the other veins) and dips from 25 to 50 degrees east. As far as is known, it is a blind vein with no surface outcrop. The vein is cut by a large fault and is divided into two main segments known as No. 11 cross-vein and No. 10 cross-vein

* By A. R. C. James.

respectively, No. 11 being the easterly segment and No. 10 the westerly segment. Important oreshoots were found in both segments in 1955 and 1956 and are now being mined.

The country rock at the Silver Standard property consists mainly of tuffaceous sandstones of the Hazelton group. A small granitic intrusion cuts the Hazelton group about 900 feet south of the mine portals and lies just to the south of most of the major oreshoots. On the east side of the property a post-vein fault which dips 40 degrees to the west divides the property into an east and a west block. This fault extends for a known distance of 2,000 feet and has an indicated normal dip slip of 250 feet.

The mine has been developed by two crosscut adits driven southeastward on the 1500 and 1300 levels, cutting Nos. 4 to 11 cross-veins and Nos. 1 to 11 cross-veins respectively, and by a 510-foot vertical three-compartment shaft from the 1300 level with crosscuts on the 1150, 1000, and 850 levels. Nos. 1, 4, and 6 veins have been worked from these lower levels. By the end of 1956 all known ore had been extracted from below the 1300 level, and the shaft was abandoned and allowed to flood.

The following is a summary of work done underground:—

Work Done	Advance (Ft.)
Drifting—	
1500 level	551
1300 level	256
Total	807
Raising—	
1500 level	331
1300 level	438
Total	769
Subdrifting—	
1500 level	491
1300 level	27
1250 level	101
1000 level	5
Total	624
Crosscutting—	
1500 level	417
1300 level	1,000
Total	1,417
Diamond drilling—	
Underground	11,279
Surface	13,958
Total	25,237

	Ore Broken (Tons)
Stoping and development—	
No. 4 vein	306
No. 6 vein	422
No. 7 vein	402
No. 8 vein	437
No. 11 vein	625
No. 10 cross-vein	6,261
No. 11 cross-vein	8,104
Ore-passes	121
Development	3,674
Total	20,352

A considerable amount of exploration and development was done during the year to develop known or indicated ore reserves and to try to find new reserves.

In 1955 No. 11 cross-vein was intersected by a crosscut driven south from the 1500 level, and the vein was followed by drift for 178 feet. In 1956 a further 199 feet of drifting was done on this vein. Over a considerable length of this drift the vein was of ore grade but very narrow. Three raises driven from the 1500 drift intersected good ore 70 feet above the rail. The bottom of this ore was followed by subdrift for 458 feet; three stopes opened up have produced 40 per cent of the ore mined in 1956.

The 1500 crosscut was driven 417 feet from No. 11 cross-vein drift to intersect the faulted segment of this vein on the west side of the main fault. This segment, called No. 10 cross-vein, was followed by drift for 352 feet, and good ore was found over widths ranging from 1.5 to 2 feet. Three stopes opened up in this vein have produced 31 per cent of the ore mined in 1956.

The 1300 level crosscut was extended 246 feet to intersect No. 11 cross-vein, and 256 feet of drifting was done. The vein at this elevation is narrow and, although mineralized, is not of ore grade.

A crosscut was driven from 1308 drift south for 754 feet to develop the downward extension of 1510 drift oreshoot in No. 10 cross-vein. A steep raise was driven from this crosscut to intersect the vein just above and on the east side of the major fault. This raise cut the vein, which was 4 feet wide and of marginal grade, at the end of the year. A raise is to be driven up dip on the vein for 200 feet to the 1510 cross-drift.

A total of 5,000 feet of surface stripping by bulldozer was done in the area overlying Nos. 10 and 11 cross-veins. No new oreshoots were uncovered in the course of this work.

Thirty-six holes totalling 13,958 feet were drilled on the surface, and forty holes totalling 11,279 feet were drilled underground. Apart from some good intersections in Nos. 10 and 11 cross-veins, the results of this drilling were largely negative. All known ore has now been mined from the parallel veins, and the only ore reserves are in Nos. 10 and 11 cross-veins.

The company carried out exploration work on the following outside properties: Erie (Mohawk), Three Hills, Topley, McMillin, and Torger. This work is described under the respective headings elsewhere in this Report.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1950, pp. 87–95.]

Copper

Three Hills (Silver Standard Mines Limited) (55° 127° S.W.) Company office, 602 West Hastings Street, Vancouver. This property consists of six claims optioned by Silver Standard Mines Limited from A. LeToile, D. R. Willemar, and E. H. Harbottle, and thirty-two claims held by record. The claims are between South Hazelton and Skeena Crossing on the east side of the highway, 2¼ miles south of Seeley Lake. The property was described in the 1955 Annual Report. In 1956 a crew of two men, under the supervision of A. C. Ritchie, did 2,150 feet of stripping with a D-8 bulldozer and drilled one hole 75 feet in length. The results of this work are reported to be discouraging, and no further work is planned.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1955, p. 24.]

Silver-Lead-Zinc

Erie (Silver Standard Mines Limited)

(55° 127° S.W.) Company office, 602 West Hastings Street, Vancouver. This property, also known as the Mohawk mine, consists of four old Crown-granted claims on the south side of Four Mile Mountain, about 5 miles by road from Hazelton. Briefly, the showings consist of several veins of banded quartz and siderite, for the most part sparsely mineralized but containing a number of small oreshoots which were mined about thirty years ago. The ore minerals are jamesonite, sphalerite, galena, and tetrahedrite with high silver content. The veins occur in altered sediments intruded by granitic rock. There are approximately 1,500 feet of underground workings, now inaccessible.

A crew of two men was employed in May under the general supervision of A. C. Ritchie. A total of 2,500 feet of trenching was done by D-8 bulldozer. It is reported that no new oreshoots were found.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1928, p. 158; 1950, p. 98–99. *Geol. Surv., Canada,* Mem. 223 (Revised Edition), pp. 40–43 (1954).]

SMITHERS*

Silver-Lead-Zinc

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

(54° 127° N.E.) Company office, 609, 602 West Hastings Street, Vancouver. R. R. Wilson, president. The Duthie mine is on the southwest slope of Hudson Bay Mountain and is about 16 miles by road from Smithers. The principal mine workings are between elevations of 3,200 and 4,500 feet on the Raven, Raven Fraction, Henderson, Hummingbird, and Canary claims of the Henderson group, which also includes the Galena Queen, Dome, Dome Fraction, White Swan, Pacific, and Vancouver Crown-granted claims.

The mineralized zones were discovered in 1908, and the area was prospected by trenches. The Henderson zone was found in 1921, and, starting in 1922, this zone was developed by several drift-adits at the 3600 (Compressor) level, 3800 (McPherson) level, and 3850 (Thompson) level, and selected ore was shipped. A mill was built in 1927 and operated until 1930, when work stopped. Shipments of ore were made by lessees in 1939–42. In 1946 and 1947 Duthie Mines (1940) Limited built a new diesel power plant, carried out a diamond-drilling programme, and extended the drift on the 3800 level. Sil-Van Consolidated Mining & Milling Company Ltd. took over the property in 1950, did further development work, and built a new mill. Between July, 1953, and April, 1954, a total of 41,369 tons of ore was milled. Production was then suspended due to unfavourable prices of lead and zinc. Total production of ore since the property was discovered has been nearly 80,000 tons.

The property is underlain by rhyolite, dacite, and andesite flows and flow breccias. The mineral deposits occupy four main fault zones, known as the Henderson, Ashman, Fault-plane, and Dome. Of these, the Henderson zone has been the most widely developed and has been traced on the surface for 3,500 feet, from an elevation of 3,500 feet to 4,500 feet. These mineralized fault zones strike northeastward and range in dip from 50 degrees southeast to 70 degrees northwest. They are sliced, sheared, and brecciated zones along which occur sulphide veins and replacement deposits, the latter associated with

* By A. R. C. James.

some vein quartz and carbonate. The most important ore minerals are galena and sphalerite. The mine has been developed by five adit levels known respectively as the 3300 (Mill) level, 3600 (Compressor) level, 3800 (McPherson) level, 3849 (Thompson) level, and 4100 (Hummingbird) level. Mining has been carried out in the Henderson vein from the 4100 level down to a level 100 feet below the 3300 level; mining has been more limited in the Ashman and Fault-plane veins.

In the fall of 1956 the company entered into an agreement with Silver Standard Mines Limited whereby the latter undertook to expend the sum of $32,000 on development work by January 1st, 1957. The immediate object of this work was to develop sufficient additional ore reserves to warrant further expenditures in 1957, and ultimately to develop sufficient ore reserves to justify a resumption of production. A contract for the development work and diamond drilling was let to S. Homenuke, of Hazelton, and a crew of seven men commenced work on October 17th. The work was mainly on the Hummingbird and Canary claims. By the year end the 3800 F. raise had been driven 135 feet, the 3950 footwall drift had been driven 93 feet, and the 3950 subdrift 48 feet. The diamond drilling had not been started. The work was under the general supervision of A. C. Ritchie and N. G. Cornish, general superintendent and mine superintendent respectively of Silver Standard Gold Mines Limited.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1948, pp. 82–85; *Geol. Surv., Canada,* Mem. 223 (Revised Edition), pp. 103–111 (1954).]

Silver-Lead-Zinc-Cadmium

Cronin Babine (New Cronin Babine Mines Limited)

(54° 126° N.W.) Company office, 744 West Hastings Street, Vancouver; mine office, Smithers. L. C. Creery, president; F. Robinson, property superintendent; W. Robinson, mine superintendent. The company owns the Sunrise No. 7 Crown-granted claim and holds under option from the Babine Bonanza Mining & Milling Company Limited the following Crown-granted claims: Lucky Strike, Homestake, Bonanza, Eureka, Babine Chief, Bulkley Pioneer, Sunflower, and Sunflower fraction. The property is on the east slope of Cronin Mountain between elevations of 4,750 and 5,250 feet, and is about 30 miles by road northeast of Smithers.

The orebodies are at the northeast end of a large body of rhyolite, at its contact with surrounding argillites. In the underground workings the three known mineralized veins range up to 5 feet wide and are either at or near the rhyolite-argillite contact. They strike northeastward and dip from 40 to 60 degrees north-northwestward. The ore minerals are galena, sphalerite, boulangerite, and tetrahedrite, with appreciable amounts of silver.

The showings were discovered in the early years of the century, and development work on the property has continued intermittently since 1909. In 1952 a 40-ton mill was completed and 3,510 tons of ore was milled. Operations ceased in November, 1952, due to low base-metal prices, and the mine remained idle until 1956. The property has been explored by several shafts and raises and by three adit-drifts at elevations of 4,775 feet, 5,000 feet, and 5,065 feet respectively. The No. 5 level at 4,775 feet elevation is the main level.

In 1956 work on the property was resumed under the direction of Henry L. Hill & Associates, of Vancouver. Work was started on June 9th and continued until November 19th. Production: Ore milled, 4,200 tons.

The following work was done underground: No. 323 stope was driven through to No. 2 (5,065-foot) level, 2,000 tons of ore was mined between the 421 sublevel and No. 3 (5,000-foot) level, and a 25-foot raise was driven in ore from the top of this stope to the 421 sublevel. A crew averaging twenty men was employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 94–98.]

TOPLEY*

Gold-Silver

Topley Richfield (Silver Standard Mines Limited)

(54° 126° N.E.) Company office, 602 West Hastings Street, Vancouver. This group of eighteen claims was optioned in 1955. The property is about 7 miles north of Topley, a small settlement between Smithers and Burns Lake. A considerable amount of development work was done in 1926 and 1927, and work has been done intermittently since that time.

In 1955 the company drilled two diamond-drill holes, but difficulties in drilling due to caving rock stopped the first hole at 293 feet and the second at 243 feet. In 1956 a crew of four men was employed from March 5th until April 15th under the general supervision of W. St. C. Dunn. The second drill-hole mentioned above was lengthened to 361 feet. Another hole was drilled to 301 feet. It is reported that caving rock forced abandonment of the holes before reaching the ore zone.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1926, pp. 138–143; 1927, pp. 140–147; 1937, pp. C26–27.]

FRASER LAKE*

Uranium

Abe, Babs, Ike, Pat, Zeke, Wow (American Standard Mines Limited)

(53° 124° N.W.) Company office, 711, 525 Seymour Street, Vancouver. H. T. James, president. This property, comprising thirty recorded claims, was optioned by the company from C. S. Powney, E. A. Floyd, and partners, of Fort St. James, in December, 1955. The claims are at an elevation of 3,500 to 4,000 feet on the northern slope of Nithi Mountain and are reached by about 9 miles of road from Fraser Lake P.O.

The area south of Fraser Lake, including the vicinity of the claims, is underlain by a coarse-grained pink granite. On the claims the granite is intruded by a rhyolite porphyry dyke that has been traced on the surface by a series of shallow trenches for a length of 670 feet and over an average width of 100 feet. This dyke strikes generally north and dips from 35 to 70 degrees to the west. Low-grade mineralization consisting of the secondary uranium minerals autunite, torbernite, and sabugalite occurs in small random fractures at and near the surface in the rhyolite porphyry. No primary uranium mineralization was observed.

Under the supervision of J. S. Ives, a crew of four men worked on the property from June 6th to July 13th. A jeep-road 1½ miles long was constructed to the claims from the end of the logging-road. One thousand two hundred feet of trenching was done, and four diamond-drill holes were drilled, totalling 333 feet. It is reported that the results of this work indicate that the uranium mineralization does not extend more than a few feet beneath the surface exposures and is thus insufficient to be of economic interest at the present time.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1955, p. 28.]

* By A. R. C. James.

OMINECA*

Babine Lake (54° 126° N.E.)

Copper

McDonald Island (The Granby Consolidated Mining Smelting and Power Company Limited)

Head office, 1111 West Georgia Street, Vancouver. L. T. Postle, president. This property consists of a group of thirty-five recorded claims, some of which are held under option agreement, and is on McDonald Island (also known as Copper Island) in the northern section of Babine Lake at the mouth of Hagan Arm. The property may be reached by boat from Topley Landing or by float-plane. Low-grade copper mineralization was discovered here in the early years of the century, and prospecting and exploration have been carried on intermittently since then, especially in 1929 when The Consolidated Mining and Smelting Company of Canada, Limited, took an option on the property and did some diamond drilling. Mineralization appears to be extensive but of low grade, and consists of chalcopyrite and small amounts of bornite disseminated and in fractures in volcanic rocks. A central knoll about 250 feet above the level of the lake carries the principal showings.

The Granby Company began work on the property in 1955, when a diamond-drilling programme was started. This programme was continued in 1956. Crews and equipment were taken over the lake ice in March and a tent camp was established. The work was continued until August. A crew averaging twelve men was employed under the supervision of L. R. Haggard. Forty holes were diamond drilled, totalling 11,158 feet, and some test-pits were put in to the west of the ore zone by hand work.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1913, pp. 113–114; 1927, pp. 149–150; 1929, pp. 180–181; 1940, p. 78; 1946, p. 89; 1955, p. 29.]

French Peak (55° 126° S.W.)

Silver-Lead

Rio Canadian Exploration Ltd.

Company office, 1001, 335 Bay Street, Toronto; Vancouver office, 9, 515 Granville Street, Vancouver. D. R. Derry, president. This property consists of twenty-four claims held by location and is on French Peak, about 8 miles west of the north end of Babine Lake. The property is reached from the head of Babine Lake by 8 miles of tractor-road. The showings were discovered in 1955 and are reported to consist of narrow silver-lead mineralization in two subparallel shear zones in bedded volcanic rocks of the Hazelton group. A crew averaging ten men was employed under the supervision of H. B. Johnston and H. S. Lazenby from June 1st to September 15th. Mineralized structures were investigated over a length of 1,200 feet by about 4,500 linear feet of bulldozer trenches and 1,737 feet of diamond drilling.

Fort St. James (54° 124° S.E.)

Mercury

D.A. (Canadian Exploration Limited)

Company office, Royal Bank Building, Vancouver. J. A. Mitchell, exploration manager. The property consists of sixteen claims which were located in 1956 by D. Rottacker and are now held by record by Centennial Mines Ltd. It is 6 miles east of Fort St. James on the Fort St. James–Manson Creek road and is on the west side of Murray Ridge on the general line of the Pinchi fault zone. It is reported that the showings include occurrences of cinnabar in highly altered volcanic rocks associated with the ultrabasic intrusive of Murray Ridge. A crew of about sixteen men was employed by

* By A. R. C. James.

Canadian Exploration Limited on this property in the summer of 1956, and ten holes were diamond drilled. It is reported that the results of the drilling were inconclusive, but that heavily faulted ground was disclosed. The work was under the general direction of J. A. Mitchell. Further work is planned for 1957.

INGENIKA RIVER*

Lead-Zinc

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

(56° 125° N.E.) This property includes thirty-two Crown-granted and twenty-two recorded claims held under option from Ingenika Mines Limited. It is on the south side of the Ingenika River, 21 miles west of Fort Grahame. The showings consist of lead-zinc replacement in limestone and were originally discovered about 1925. From 1926 to 1930 some development work, including the driving of crosscut tunnels, was carried out by Ingenika Mines Limited; since that time no further development work has been done on the property. In 1956 The Consolidated Mining and Smelting Company of Canada, Limited, sent a geological party of nine men into the area. The work was begun on June 15th and continued until September 15th, with A. C. Taplin in charge. Geological and geophysical (electromagnetic) surveys were carried out and geochemical testing was done. Two miles of trail was made and the old workings were reopened. Transportation to the property was by float-plane to Delkluz Lake, which is close to the showings.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1926, pp. 155–157; 1928, pp. 182–185.]

Swannell (The Consolidated Mining and Smelting Company of Canada, Limited.—(56° 125° N.E.) This property consists of a group of thirty-four recorded claims on Swannell River, a tributary of the Ingenika River, and is 20 miles west of Fort Grahame. The showings are reported to consist of lead-zinc replacement in limestone. In 1956 The Consolidated Mining and Smelting Company of Canada, Limited, optioned the property from Gust Ola. A crew of three men under the supervision of A. C. Taplin did geological and geophysical work from June 15th to September 15th. Transportation was by float-plane to Delkluz Lake, near the property, and by small gasoline-driven tractor on the property.

UPPER FRASER RIVER*

Hansard (54° 121° S.W.)

Copper

Rio Canadian Exploration Ltd.

Company office, 1001 335 Bay Street, Toronto; Vancouver office, 9, 515 Granville Street, Vancouver. D. R. Derry, president. In 1956 this company held under option from Desoto Mines Limited a property consisting of seventeen claims and fractions on Mine Creek, a tributary of McGregor River. The property is reached from Hansard station on the Canadian National Railway by boat down the Fraser and up the McGregor River to Mine Creek, and thence by 1 mile of trail. It is reported that the showings consist of scattered chalcopyrite mineralization in a silicified zone in argillites and limestones. A crew of about six men under the supervision of D. Calimente worked on the property from June 21st to August 1st. Two holes were diamond drilled, totalling 495 feet, and some soil-testing work was done.

* By A. R. C. James.

HUTTON (53° 121° N.W.)

Rio Canadian Exploration Ltd. Company office, 1001, 335 Bay Street, Toronto; Vancouver office, 9, 515 Granville Street, Vancouver. D. R. Derry, president. In 1956 this company held under option from Desoto Mines Limited a property consisting of eighteen claims and fractions straddling the Fraser River about 3 miles west of Hutton station on the Canadian National Railway. The copper showings, which were discovered many years ago, are on the west bank of the river. A crew of six men under the supervision of D. Calimente worked on the property from May 12th to June 24th. The showings were stripped by bulldozing and sluicing, exposing about 2,500 square feet of bedrock. One hole, 148 feet long, was diamond drilled, but core recovery was poor. Soil testing was done on the claims.

CARIBOO*

WELLS-BARKERVILLE (53° 121° S.W.)

Gold

Aurum and Cariboo Gold Quartz (The Cariboo Gold Quartz Mining Company Limited).—Company office, 1007 Royal Bank Building, Vancouver. W. B. Burnett, president; A. Shaak, general manager; M. Guiguet, general superintendent; J. Stone, mill superintendent. Capital: 2,000,000 shares, $1 par value. The Cariboo Gold Quartz and Aurum mines operated by this company are adjacent to the town of Wells, which is 51 miles by road from Quesnel on the Pacific Great Eastern Railway.

* By J. W. Patterson.

Work done underground at the two mines was as follows:—

Work Done	Zone	Mine	Advance	Ore	Waste
Level development—			Ft.	Tons	Tons
1700 level	Rainbow	C.G.Q.	38	28	113
1800 level	Rainbow and Tailings	C.G.Q.	212	124	729
1900 level	Rainbow and Tailings	C.G.Q.	866	1,116	2,060
2000 level	No. 1	C.G.Q.	59	17	174
2100 level	No. 1 and Tailings	C.G.Q.	904	2,078	2,258
3500 level		Aurum	121	145	560
3375 level		Aurum	156	86	526
3250 level		Aurum	26	60	148
3125 level		Aurum	251	19	1,169
3000 level		Aurum	205	......	516
2850 level		Aurum	488	2,425	288
2550 level		Aurum	244	......	886
Totals			3,570	6,098	9,427
Sublevel development—					
1600 level	Rainbow	C.G.Q.	64	......	131
1800 level	Rainbow	C.G.Q.	28	......	53
1900 level	Tailings	C.G.Q.	146	105	87
2100 level	Tailings	C.G.Q.	171	180	......
3625 level		Aurum	29	......	88
3500 level		Aurum	14	......	32
3375 level		Aurum	259	344	443
3125 level		Aurum	81	......	188
3000 level		Aurum	112	135	161
2550 level		Aurum	68	24	114
Totals			972	788	1,297
Diamond drilling—					
1700 level	No. 1 and Rainbow	C.G.Q.	373	......	......
1800 level	Tailings and Rainbow	C.G.Q.	1,021	......	......
1900 level	Tailings	C.G.Q.	1,194	......	......
2000 level	Tailings	C.G.Q.	349	......	......
2100 level	No. 1 and Tailings	C.G.Q.	2,195	......	......
3750 level		Aurum	372	......	......
3500 level		Aurum	508	......	......
3375 level		Aurum	1,195	......	......
3125 level		Aurum	1,154	......	......
3000 level		Aurum	560	......	......
Total			9,221	......	......
Stoping—					
1100 level	Saunders	C.G.Q.	......	211	......
1600 level	No. 1	C.G.Q.	......	1,063	......
1700 level	Rainbow	C.G.Q.	......	753	......
1800 level	Tailings and Rainbow	C.G.Q.	......	9,966	......
1900 level	Tailings and No. 1	C.G.Q.	......	22,356	......
2000 level	No. 1	C.G.Q.	......	400	......
2100 level	Tailings and No. 1	C.G.Q.	......	10,870	......
4000 level		Aurum	......	1,911	......
3625 level		Aurum	......	570	......
3500 level		Aurum	......	2,305	......
3375 level		Aurum	......	6,973	......
3250 level		Aurum	......	297	......
3125 level		Aurum	......	1,385	......
3000 level		Aurum	......	11,713	......
2850 level		Aurum	......	13,905	......
2550 level		Aurum	......	3,132	......
Total			......	87,810	......

Except for two holes drilled to determine the bottom of Jack of Clubs Lake, all diamond drilling was done to check for possible extensions of known orebodies and for geological and mineralogical information in ground not explored previously.

Production: Ore mined, 94,696 tons; waste mined, 10,724 tons; ore milled, 94,721 tons. Of the ore mined, 45,429 tons was from the Aurum mine.

The average number of men employed was 210, of which 135 were employed underground.

Due to greater stress being placed on accident prevention by the company, the accident-frequency rate was reduced by approximately 70 per cent from that of the previous year.

QUESNEL*

YANKS PEAK (52° 121° N.E.)

Gold

Jim

The Jim group of mineral claims is near Yanks Peak, about 11 miles by road from Keithley Creek P.O. The claims are held by F. H. M. Codville, of Duncan, who, with two partners, W. E. Edwards and G. Burgleman, did 50 feet of crosscutting, a small amount of diamond drilling, and hauled 50 tons of ore by truck to the pilot mill on the adjoining Midas property. Changes in the milling process are contemplated, as gold recovery was considered unsatisfactory.

[Reference: *B.C. Dept. of Mines,* Bull. 34, 1954, pp. 65–68.]

MOUSE MOUNTAIN (53° 122° S.E.)

Copper

Mouse Mountain Nos. 1 to 15†

This property is 13 miles from Quesnel on the road to Wells. It includes fifteen claims located in 1955 by C. M. Fuller, J. MacGowan, and D. Pearson. The main showing at the side of the road exposes greenish intermediate volcanic rocks for an area of about 110 by 30 feet. Beyond the exposure is deep alluvium. About half the exposure is mineralized in some degree by chalcopyrite, bornite, and malachite. The chalcopyrite and bornite replace the volcanic rock and the malachite occurs chiefly in small slickensided fractures that strike on the average north 40 degrees east and mostly dip about 35 degrees northwest. There is no obvious control of the primary mineralization.

During the autumn of 1955 and spring of 1956, exploration consisted of stripping the showing, hand-sorting a carload of ore which reportedly assayed 5½ per cent copper, and diamond drilling about 8,500 feet by Harrison Minerals Ltd., which had the property under option.

WILLIAMS LAKE‡

MCLEESE LAKE (52° 122° S.E.)

Copper

Iron Mountain

This property includes 130 claims that extend eastward from a line joining McLeese and Cuisson Lakes. The showings are about 3 miles northeast of McLeese Lake and may be reached from the Cariboo Highway at McLeese Lake by a branch from the dirt road that follows Sheridan Creek. The original nucleus of claims, the Iron Mountain group, was located in 1952 by S. Pearson. Additional claims were located by C. M. Fuller, J. MacGowan, and others from 1954 to 1956. The groups were optioned and further claims were located by The Cariboo Gold Quartz Mining Company Limited in August, 1956. The main showings are on the Iron Mountain and Iron Mountain Nos. 1 to 7 claims.

The area of the showing is underlain by light-green schists with interbedded lenses and beds of marble that may be part of the Cache Creek group. Bedding and schistosity are parallel and strike eastward and dip about 30 degrees to the south. A contact with a granitic intrusion lies about 500 feet north of the showings and approximately parallel with the strike of the metamorphic rocks.

The showings consist of an aligned series of thin lenses of magnetite or specular hematite with chalcopyrite which, together with garnet, pyroxene, and epidote, replace the enclosing marble and schist. The lenses of iron oxides parallel the bedding and have been traced for over 5,000 feet. Specular hematite forms the lenses in the central

* By J. W. Patterson, except as noted.
† By A. S. Brown.
‡ By A. S. Brown, except as noted.

section of the showings, and magnetite those at either end. Individual lenses of iron oxides range between a few inches and 4 feet thick. The chalcopyrite occurs chiefly as disseminated blobs and grains within the iron oxide lenses, but malachite is widely distributed in small amounts in the surrounding schists, particularly on the footwall side of the lenses. The average copper content of the iron oxide lenses is about 2 per cent.

Old workings include three shallow prospect shafts and a number of pits and trenches. In general the area of the showings is moderately well exposed.

The exploration programme of Cariboo Gold Quartz Mining Company included a magnetometer survey, bulldozer trenching, and diamond drilling. The magnetometer survey revealed three anomalies—one over the outcrop zone and two farther south. Trenching proved the iron oxide lenses to be consistent but thin, and in addition proved a consistent, if low, copper content of the footwall schists. The X-ray drilling was inconclusive; only a total of 150 feet in five holes was completed before weather forced abandonment for the winter. Three holes on the main showings had extremely poor core recovery. Two holes on the southernmost anomaly showed it to be due to disseminated magnetite and that only traces of copper were present.

Nickel

Ni*

(52° 122° S.E.) The Ni group of eight claims, located by Frank Merryth in April, 1956, lies immediately south of the east end of Williams Lake. The claims cover a band of rusty-brown ankeritic carbonate alteration that outcrops in prominent bluffs about 1,000 feet above Williams Lake and is readily visible from the north side of the lake. A zone of brecciation as much as 400 feet wide and trending about west is almost completely replaced by ankeritic carbonate. The faint brecciation is still evident in a few outcrops. The ankeritic carbonate is crossed by narrow veinlets of chalcedonic quartz and in some areas contain small flakes of pale-green mariposite. Minute grains of millerite have been identified by Professor R. M. Thompson, of the University of British Columbia.

The locator of the claims reported having obtained assays as high as 0.7 per cent nickel from some samples of selected material. During the early summer a road was bulldozed to the foot of the ankerite bluff and three short drill-holes were put down by The Granby Consolidated Mining Smelting and Power Company Limited. This work had been completed by late July, and nothing further was done on the claims.

A sample of selected material assayed: Nickel, 0.23 per cent; chromium, 0.27 per cent.

LAC LA HACHE†

Takomkane (Big Timothy) Mountain (52° 120° S.W.)

Molybdenum

Boss Mountain (Climax Molybdenum Company)

British Columbia office, 718 Granville Street, Vancouver. In 1956 the Climax Molybdenum Company acquired by option 103 mineral claims, including the Adanac, Adanac Fraction, Adanac No. 1, Adanac No. 2, Blacky, Bonnie, Geraldine, Tip Top, Tooty Fruity, and Utoo Crown-granted claims. The Crown-granted claims, located at various times between 1928 and 1935 and the recorded claims located in 1956, are at present owned by H. H. Huestis, of Vancouver, and associates.

The claims are on both sides of a small eastward-flowing tributary of Molybdenite Creek. The headwaters of this tributary are on Takomkane Mountain, also known as Big Timothy or Boss Mountain. Takomkane Mountain is approximately 30 miles northeast of Lac la Hache. Access to the property can be gained by road from 100 Mile House through Forest Grove village and along Bradley Creek to the southern end of

* By S. S. Holland.
† By J. W. Patterson.

Murphy Lake and thence northeastward by pack-horse trail for about 20 miles. The last 22 miles of the road to Murphy Lake is suitable only for four-wheel-drive vehicles.

Between September 26th and October 14th, five holes totalling 1,714 feet were diamond drilled on the property.

[Reference: *B.C. Dept. of Mines*, Bull. 9, 1940, pp. 34–47.]

TASEKO LAKE*

Copper

Mohawk and Spokane (Canadian Exploration Limited)

(51° 123° S.E.) General access to these groups of mineral claims is most easily gained by float-equipped aircraft to Taseko Lake and thence by about 9 miles of jeep-road from the south end of the lake along the north side of Taseko River. From the end of this road there are branch tractor-roads to the Spokane group at the headwaters of McClure Creek and the Mohawk group on the east side of Granite Creek, a short distance from its mouth. The north end of Taseko Lake can be reached by 55 miles of road from Hanceville, which is about 40 miles southwest of Williams Lake.

In this area in 1956 Canadian Exploration Limited acquired by option 230 mineral claims from the Gadara Copper Syndicate, of Williams Lake, and G. N. Beattie, of Vancouver. G. N. Beattie owns the Mohawk group, while the Gadara Syndicate holds by record and option the remainder of the claims, including the Spokane group.

A D-7 bulldozer and a jeep were brought to the properties via the Hanceville–Taseko Lake road and by a circuitous route which is not recommended for general use, from the north end of the lake to its south end. Three short diamond-drill holes totalling 228 feet were drilled on the Spokane group; one hole, 507 feet deep, was drilled on a west tributary of Granite Creek, 2½ miles above the junction of Granite Creek with Taseko River; one hole was drilled 457 feet deep east of Granite Creek near its mouth. Surface mapping, sampling, and trenching were done on the Mohawk group.

In addition, the 9 miles of road from the south end of Taseko Lake along Taseko River was improved and tractor-roads were constructed to the Spokane and Mohawk groups.

An average of eleven men was employed under the direction of C. C. Rennie, field engineer.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1935, pp. F 22–26.]

CLINTON*

Poison Mountain (51° 122° S.W.)

Copper

Copper Nos. 1 to 4 (The Granby Consolidated Mining Smelting and Power Company Limited)

In March, 1956, The Granby Consolidated Mining Smelting and Power Company Limited recorded thirty-nine mineral claims on Poison Mountain around and adjacent to the Copper Nos. 1, 2, 3 and 4 claims. These four claims were located by H. Reynolds, of Lillooet, in 1955 and cover ground originally located in 1935. The entire group of forty-three claims is at the junction of Copper Creek with Poison Mountain Creek. Before staking the Granby Company had acquired an option on the four copper claims. Staking crews were transported to Poison Mountain from Lillooet by helicopter.

Poison Mountain is about 40 miles northwest of Lillooet and is near the headwaters of Yalakom River and Churn Creek. Access is by 36 miles of road from Big Bar ferry on the Fraser River. Thirty-two miles of this road was constructed by the Granby Company. It is suitable only for four-wheel-drive vehicles.

* By J. W. Patterson.

The principal sedimentary rocks underlying the property consist of interbedded sandstone and argillite overlain in several areas by pebble and boulder conglomerate, all of which have been intruded by a complex body of diorite porphyry and granodiorite. The sulphide mineralization, chalcopyrite and pyrite predominating, occurs as disseminations and fracture fillings in the porphyries, usually in greater amounts where the biotite content of the porphyries increases. As revealed by trenching, stripping, and diamond drilling, the most favourable zone is adjacent to and north of Copper Creek. Figure 1 shows this zone.

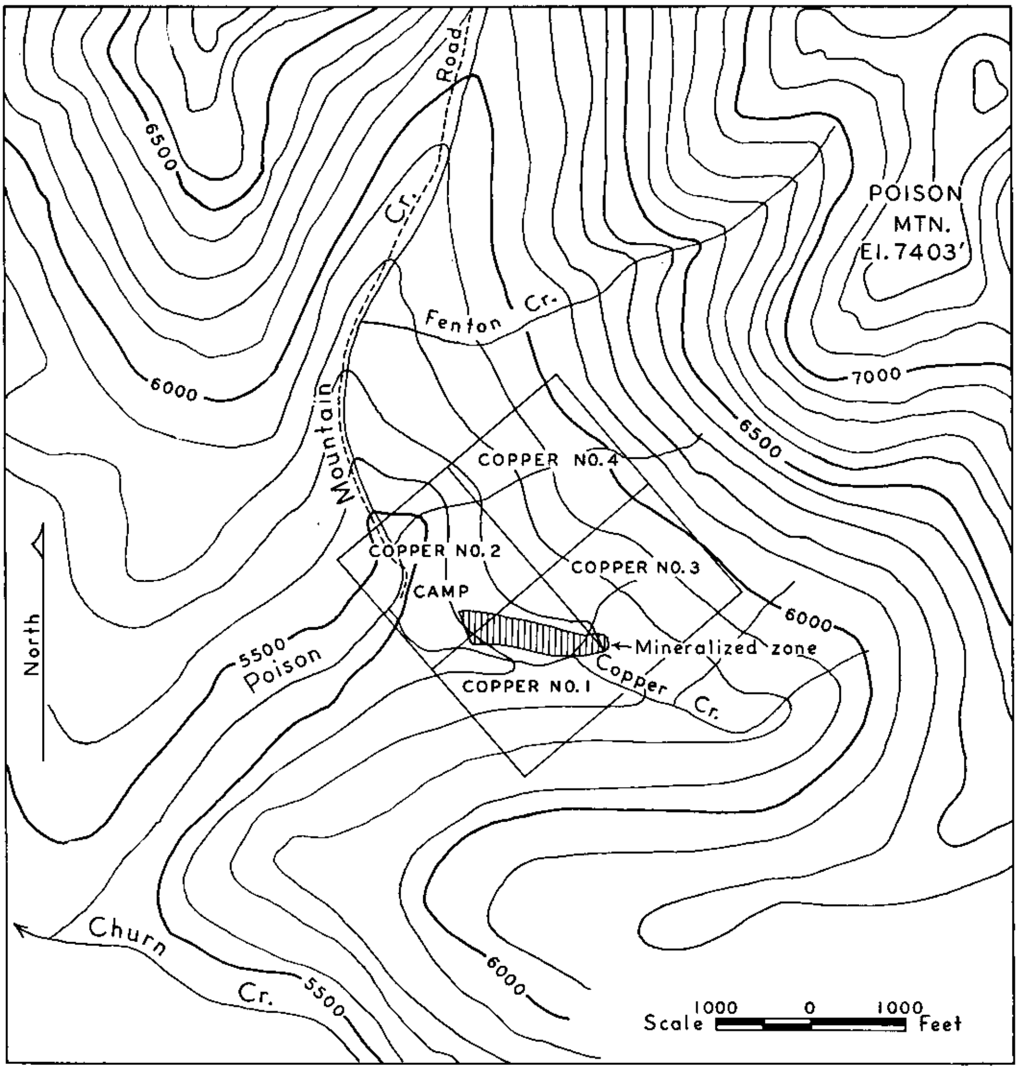


Figure 1. Poison Mountain area. Showing approximate position of the Copper group of mineral claims.

The average assay of samples taken by the Granby Company along the western end of this zone at 5-foot intervals over a continuous length of 250 feet was 0.60 per cent copper. The assays ranged from 0.07 to 2.60 per cent copper.

Another mineralized zone lies east of Poison Mountain Creek immediately south of Fenton Creek, one of its tributaries. Fenton Creek is about half a mile north of Copper Creek. Deep overburden separates the two zones.

In both zones, minor amounts of sphalerite and molybdenite occur with the copper and iron sulphides. The gold and silver content is small.

During the month of August 3,800 feet of bedrock was exposed by the removal of 25,900 cubic yards of overburden with a D-6 bulldozer, and ten holes totalling 1,973 feet were diamond drilled.

Six men were employed under the direction of W. C. Cheesman.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1946, pp. 101–102.]

LILLOOET*

Blue Creek (51° 122° S.W.)

Gold

Elizabeth

The Elizabeth group of four Crown-granted claims is north of Blue Creek, a tributary of Yalakom River. They are owned by Elizabeth U. White, of Vancouver, and T. W. Illidge, of Bralorne. Access to the property is by 48 miles of road from Lillooet. On this and adjoining ground, during the years 1941 and 1942 and 1946 to 1953, Bralorne Mines Limited did approximately 1,700 feet of stripping, 2,000 feet of crosscutting, 2,000 feet of drifting, 2,000 feet of diamond drilling, and 350 feet of raising.

In 1956 five men, supervised by T. W. Illidge, collared a crosscut on the Elizabeth No. 1 claim at 7,230 feet elevation and drove 466 feet at about north 70 degrees west to explore two quartz veins exposed on surface. Both veins, the Main vein and the West vein, were intersected by the crosscut at 110 and 455 feet from the collar respectively. Twenty-four feet of drifting was done on the West vein. Mining equipment consisted of one 384-cubic-feet-per-minute Sullivan compressor powered by a D-13000 Caterpillar diesel, two Copco jackleg drills, one 2-ton rocker side-dumping car, and one Eimco 12B overhead loader.

In addition to the underground work, the access road was repaired for 25 miles along Yalakom River and Blue Creek, and the former Bralorne camp was rehabilitated. Mining exploration was under the direction of W. H. White.

[Reference: *B.C. Dept. of Mines,* Bull. 32, 1953, pp. 46–50.]

Bridge River (50° 122° N.W.)

Gold

Bralorne Mines Limited

Company office, 555 Burrard Street, Vancouver; mine office, Bralorne. A. C. Taylor, president; M. M. O'Brien, vice-president and managing director; D. N. Matheson, general manager; C. M. Manning, general superintendent; C. D. Musser, mill superintendent. Capital: 1,250,000 shares, no par value. The Bralorne mine is on Cadwallader Creek, a tributary of Bridge River, and is 75 miles by road from Lillooet on the Pacific Great Eastern Railway.

* By J. W. Patterson.

A summary of underground development and exploration work follows:—

Work Done	Advance (Ft.)	
Drifting—		
1951 drifts east and west	602	
2002 drift west	384	
2579 drift west	42	
2793 drift east	133	
2877 hangingwall drift west	106	
2893 drift west	335	
2977 drifts east and west	1,187	
3077 drifts east and west	1,898	
3177 drifts east and west	486	
3277 drift east	133	
3279 drift east	28	
Total		5,334
Crosscutting—		
2002 hangingwall crosscut	292	
2677 No. 2 crosscut	80	
2977 crosscut	356	
2979 crosscut	73	
3277 crosscut	241	
3279 crosscut	253	
2900 and 3200 level tail tracks	114	
Total		1,409
Raising		2,170
Shaft-sinking—		
Queen shaft (19½ by 7 feet, four compartments)	56	
Crown shaft (14½ by 7 feet, three compartments)	122	
Total		178
Diamond drilling		5,972

Most of the development work was done below the 2600 level on the 77 and 93 veins. The levels below the 2600 level are serviced by the Queen shaft, the greater part of which was sunk in 1954. Other major development was on the 2000 level in the area below the old King mine and in the adjoining property of Taylor (Bridge River) Mines Limited.

Facilities are being provided in the Crown shaft for handling ore hauled from the Queen shaft on the 2600 level. The Crown shaft has been deepened 122 feet and the excavation of a loading-pocket has been started.

A new Ingersoll-Rand 72- by 58-inch double-drum electric hoist equipped with internal expanding jaw-type clutches has been installed on the 2600 level to service the Queen shaft.

Most of the diamond drilling was directed to locate the extensions of known veins on new development levels and to test the walls of veins on productive levels for possible parallel structures.

Production: Ore mined, 114,909 tons; waste mined, 19,781 tons; ore milled, 131,662 tons. At the end of 1956, 55 per cent of the ore mined was from the Queen shaft levels. Fill for the stopes on these levels was brought into the mine from the waste dump at the mill-site.

The average number of men employed was 370, of which 265 were employed underground.

Due mainly to the efforts of G. J. Lee, safety director, the accident-frequency rate was reduced by about 50 per cent from that of the previous year. Twenty-seven supervisors were trained in job safety and job instruction.

Pioneer Gold Mines of B.C. Limited Company office, 711 Yorkshire Building, 525 Seymour Street, Vancouver; mine office, Pioneer Mine. Victor Spencer, president; H. T. James, managing director; W. B. Montgomery, mine manager; J. C. Moore, mine superintendent; T. Bevister, mill superintendent. Capital: 2,500,000 shares, $1 par value. The Pioneer mine is on Cadwallader Creek, a tributary of Bridge River, and is about 78 miles by road from Lillooet on the Pacific Great Eastern Railway. The property adjoins that of Bralorne on the east.

The following is a summary of the work performed underground:—

Work Done	Advance	Ore	Waste
Drifting—	Ft.	Tons	Tons
20 level, 89 vein	827.0	624	3,491
27 level, 27 vein and 131 vein	83.0	434	56
28 level, 27 HW vein	44.0	114	-------
29 level, 27 vein	624.5	1,938	1,211
Totals	1,578.5	3,110	4,758
Crosscutting—			
20 level	1,977.0	25	8,832
25 level	57.0	-------	284
29 level	543.5	51	1,087
Totals	2,577.5	76	10,203
Raising—			
0 level, 40 vein (Taylor tunnel)	141.5	-------	207
22 level, waste pass	138.0	-------	293
26 level, 27 vein	152.0	338	-------
27 level, 27 vein	157.5	261	-------
28 level, 27 vein	209.5	687	47
29 level, 27 vein	154.0	445	-------
Totals	952.5	1,731	547
Stope development and production—			
20 level, Main vein	-------	13	29
22 level, 27 vein	-------	3,643	-------
23 level, 27 vein	165.0	9,953	-------
24 level, 27 vein	147.5	5,473	-------
25 level, 27 vein	-------	1,624	-------
26 level, 27 vein	130.0	32,881	31
27 level, 27 vein	119.5	27,466	41
28 level, 27 vein	25.5	6,969	17
29 level, 27 vein	138.0	823	-------
Mine general (clean-up, etc.)	-------	1,447	-------
Totals	725.5	90,292	118

Work Done	Advance	(Purpose)
Diamond drilling—		
10 level	221	Testing 27 vein.
15 level	407	Southward exploration in FW of Main vein.
20 level	6,193	Exploration and testing 89 and 92 veins.
25 level	800	Exploration of Main vein FW structures.
27 level	440	Testing 29 vein.
28 level	630	Testing 29 vein and HW of 27 vein.
29 level	5,111	Testing 27 vein on and below level, also HW structures.
29 level sump	50	Drainage holes to sump.
Total	13,852	

Exploration was concentrated on the 2000 and 2900 levels. Three hundred and sixty-four feet of marginal ore was exposed by drifting along the 89 vein on the 2000 level. On the 2900 level, drifting was continued to the north along the 27 vein. No new oreshoots were found.

The Taylor tunnel was reopened, and a raise was driven 141 feet on the 40 vein, the last 75 feet being in ore above average mine grade.

New construction consisted of a warehouse and a core-shed on the mill-site and a shed at No. 3 shaft headframe. Major repairs were made to the mill foundation, to the cribbing along Cadwallader Creek, and to the No. 2 pipe-line which supplies water to the hydro-plant.

Underground, new measuring hoppers were installed in No. 2 shaft in the 2000 level and 2600 level loading-pockets. Two loading-pockets were excavated at No. 3 shaft above the 2200 level and were equipped with measuring-hoppers. On surface a new sheave was installed in the No. 3 shaft headframe, and a 25-kva. 2,200–110/220-volt transformer was installed to improve domestic distribution of electricity. In the mill, No. 1 conveyor was replaced by a Syntron feeder.

Late in 1956 the number of tons milled per day was increased from 250 to 275. This increase was made possible by the introduction of Aerofloc 3000 to the mill circuit, which promoted settling of slimes in the thickeners.

Production: Ore mined, 95,209 tons; waste mined, 15,626 tons; ore milled (after sorting), 88,537 tons.

Due mainly to B. C. Murray's continuing efforts as safety director, the accident-frequency rate was reduced by 56 per cent from that of the previous year. A total of forty-one persons were trained in first aid, seven of whom received industrial certificates. Twenty-eight employees and two supervisors were trained in job safety and job instruction.

Cobalt-Gold-Uranium

Little Gem (Northern Gem Mining Corporation Ltd.)

Company office, 510 West Hastings Street, Vancouver. A. R. Allen, president; J. MacBeth, superintendent. This property, consisting of eight Crown-granted and twenty-six recorded mineral claims, is on Roxey Creek near its headwaters. Roxey Creek flows northeast into Gun Creek and is west of Gun Lake. The main ore-mineral occurrences are about half a mile east of and 700 feet above the mine camp on Roxey Creek. By road the camp is 3 miles from Gun Creek and 15 miles from the Bridge River road. The 3 miles of road from Gun Creek is suitable only for four-wheel-drive vehicles.

The mineral occurrences were discovered by W. Haylmore and W. H. Ball in 1934. J. M. Taylor acquired the claims in 1937, and in 1938 optioned them to the United States Vanadium Corporation. This option was relinquished in 1939 after the mineral occurrences had been explored by two adits at elevations of 6,192 and 6,250 feet. In 1940, for part of the year, Bralorne Mines Limited held an option, during which time the lower adit was extended and two short raises were driven from that level. No further extensive exploration was done until Estella Mines Limited drilled twelve diamond-drill holes from the lower adit. This company relinquished its option in 1953.

In 1956 Northern Gem Mining Company acquired an option on the Crown-granted claims and ownership of the adjoining Palang and Paul groups of recorded claims. Ten claims comprising the O.K. group were recorded in 1956. Work commenced on June 1st and continued until October 27th. The Gun Creek road and the road from Gun Creek to the mine camp were repaired. The latter road required rebuilding in places. A camp consisting of semi-permanent buildings of frame construction was established on the east bank of Roxey Creek. A cook-house, powder-house, blacksmith-shop, and a compressor-house were erected and four tents with wood floors and walls to house the crew. Equipment and materials were transported from the camp-site to the portal of the lower adit by truck and a jigback-single-track-cable tramway.

Four diamond-drill holes totalling 697 feet were drilled downwards from the lower adit. The upper adit was prepared for drifting and crosscutting.

The number of employees averaged eight.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1948, pp. 112–119.]

Cayoosh Creek (50° 122° N.W.)

Gold

Dry Gulch

The Dry Gulch group of five claims is owned by P. Meury, of Lillooet. The claims are adjacent to Cayoosh Creek and are about 1 mile above the mouth of Enterprise Creek. Four open-cuts, all within 1,000 feet of Meury's cabin, were examined. Three of the open-cuts exposed narrow quartz stringers for short distances; one open-cut was entirely in quartzite. Two chip samples taken of the quartz in two open-cuts assayed: Gold, *nil;* silver, *nil.*

Rusty Creek (50° 121° N.W.)

Copper

Copper King (Highland Valley Mining Corporation Ltd.)

Company office, 569 Howe Street, Vancouver. R. A. Brossard, president; C. W. S. Tremaine, consulting engineer. This property is at the headwaters of Rusty Creek, a tributary of Fountain Creek which flows north into the Fraser River. A jeep-road 3 miles long connects the property to the Fountain Valley road 5 miles from its junction with the Lillooet–Pavilion road. Work consisted chiefly of extending and sampling several of the old open-cuts. A 105-cubic-foot-per-minute compressor provided air for drilling.

Two miles of road suitable only for four-wheel-drive vehicles was built, and 1 mile of existing road was repaired and improved.

The work was done by a crew of four men supervised by A. Greenway, of Lillooet.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 114–115.]

HIGHLAND VALLEY*

The encouraging results of exploration work on the property of Bethlehem Copper Corporation Ltd. in Highland Valley in 1955 served to focus interest in the copper possibilties of that area, and of the Guichon Creek batholith in general. As a result, 7,324 mineral claims were located in the Kamloops Mining Division in 1956. Of these, more than 6,000 were in the Highland Valley and near vicinity.

The location of some groups of claims with relation to Highland Valley and to the holdings of Bethlehem Copper Corporation Ltd. are shown on the index map, Figure 2. Numerous other groups lying to the north and south are not shown.

Highland Valley is southeast of Ashcroft, about 30 miles distant by road. Alternatively it may be reached by the Tunkwa Lake road extending south from Savona or by the Mamit Lake road extending north from Merritt.

The Highland Valley is underlain by the Guichon Creek batholith and associated intrusives, which on Forge Mountain are unconformably overlain by mid-Tertiary basaltic lavas. The dominant rock of the Guichon Creek batholith is quartz diorite, but detailed geological work, especially that done by company geologists on the Bethlehem Copper property, has shown that the older quartz diorite is intruded by several distinctive younger quartz diorites and by several porphyries as well. Rocks instrusive into the older quartz diorite have been recognized on several of the other properties, but

* By Stuart S. Holland and E. R. Hughes.

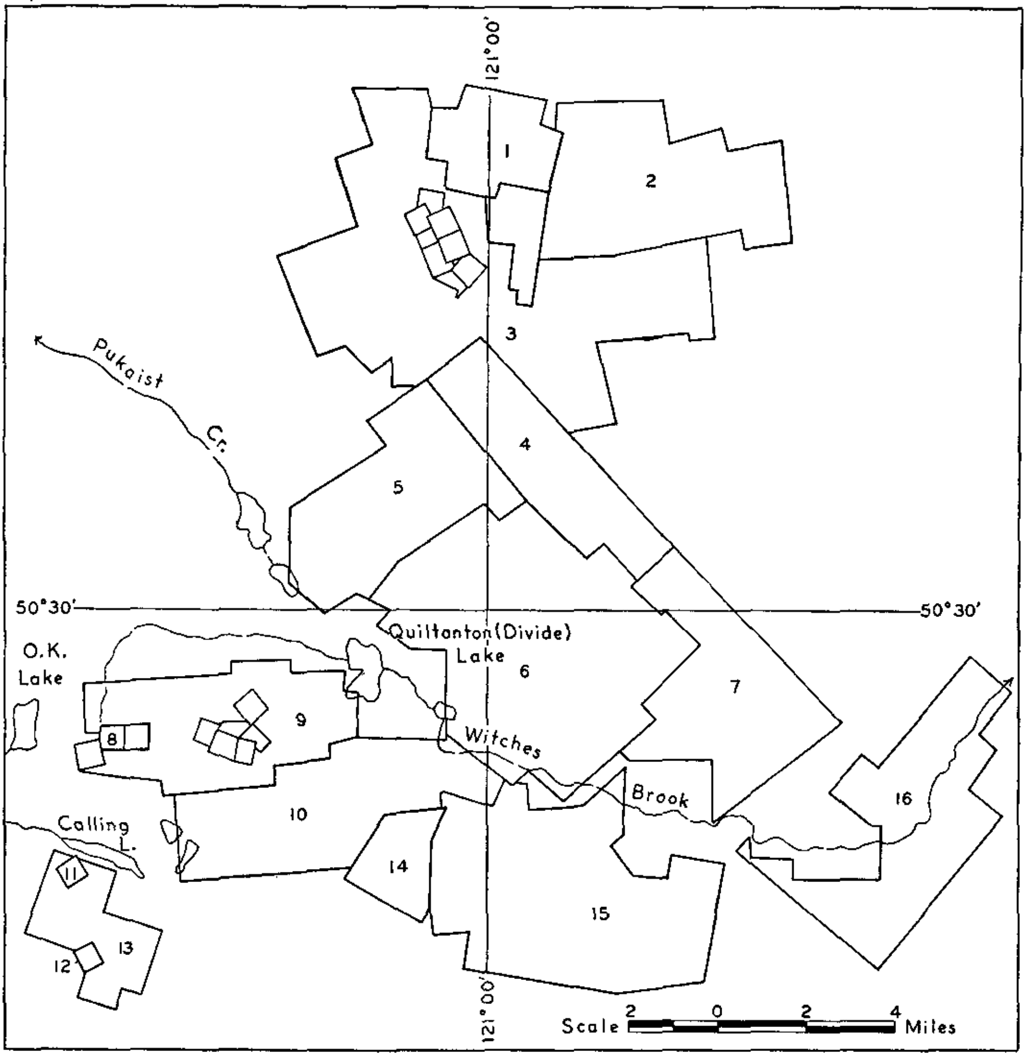


Figure 2. Index Map of some properties in Highland Valley.

1. Krain Copper Ltd.
2. Salmo Prince Mines Limited.
3. Trojan Consolidated Mines Ltd.
4. Northlodge Copper Mines Limited.
5. Farwest Tungsten Copper Mines Limited and Beaver Lodge Uranium Mines Limited.
6. Bethlehem Copper Corporation Ltd.
7. Outrider group (Farwest Tungsten and Beaver Lodge Uranium).
8. O.K. mine.
9. Bethsaida Copper Mines Limited, including the Crown-granted Tamarac and Osprey groups.
10. Graham Bousquet Gold Mines Limited.
11. Empire claim.
12. Kathleen claim.
13. Laco Mines Limited.
14. Skeena Silver Mines Ltd.
15. Sheba Copper Mines Limited.
16. Jericho Mines Ltd.

a considerable amount of petrographic work will be necessary in order to relate them to the Bethlehem Copper intrusive sequence.

On the Bethlehem Copper and Trojan properties there are areas of breccia composed of fragments of quartz diorite and porphyry. These may represent explosive volcanic vents that were associated with deep-seated instrusions represented by the several porphyries.

It is worth noting at this time that the breccia occurrences were recorded in the Annual Report for 1907, and that in the Annual Report for 1923 the Iona copper occurrence, on what is now Bethlehem Copper, was commended because of its resemblance to the porphyry copper occurrence at Bingham Canyon, Utah.

Primary copper mineralization consisting largely of chalcopyrite and bornite, with which some molybdenite may be associated, is in zones of fracturing or sheeting within the quartz diorites and breccia, or may be disseminated through a mass of hydrothermally altered rock.

Structural controls of mineralization seem to differ from one property to another, and no common denominator is yet apparent.

[References: Duffell, S., and McTaggart, K. C.: Ashcroft Map Area, *Geol. Surv. Canada,* Mem. 262, 1952. Cockfield, W. E.: Nicola Map Area, *Geol. Surv. Canada,* Mem. 249, 1948. White, W. H.: Bethlehem Copper, *Canadian Mining Jour.,* Vol. 77, No. 4, pp. 76–77, 1956.]

Krain Copper Ltd. (1)

(50° 121° N.E.) Company office, 1008, 850 West Hastings Street, Vancouver. President, D. F. Farris. This company holds twenty-one claims and fractions on the east side of the north peak of Forge Mountain adjoining the Transvaal group on the northeast. The main showing is 1 mile northeast of the Transvaal camp. The claims cover copper showings described in earlier Annual Reports under Keystone.

The old work was done in an area of quartz diorite containing malachite and underlying basaltic lavas which cap the north peak of Forge Mountain. Surface diamond drilling and bulldozer trenching have explored the zone of mineralized quartz diorite.

During 1956 exploratory work consisted of: Geochemical soil sampling on one claim, 34,000 lineal feet of line cutting for surveying and geological mapping, magnetometer surveying of six claims, and 6,478 feet of diamond drilling and 3,500 feet of bulldozer trenching in the mineralized zone.

The work was done by Farwest Tungsten Copper Mines Limited under the direction of W. M. Sirola, chief geologist, and G. E. Apps, engineer.

Camp buildings to accommodate sixteen men were constructed.

Salmo Prince Mines Limited (2)

(50° 120° N.W.) Company office, 108, 413 Granville Street, Vancouver. R. T. Blackmore, president. The company holds fifty-eight claims to the east of the Krain and about 1½ miles north of the Trojan camp. The claims were prospected, and under the direction of R. B. Stokes a geochemical soil survey was made of the property. This involved the cutting of 76 miles of picket line and the analyses of 4,000 soil samples.

An area of high copper content was found which subsequently was explored by 2,400 feet of bulldozer stripping in an area 2,500 feet long and 300 feet wide. Seven men were employed.

Trojan Consolidated Mines Ltd. (3)

Company office, 303 Williams Building, 413 Granville Street, Vancouver. A. J. McClellan, president; M. Hunt, resident engineer. On November 27th, 1956, Trojan Exploration Limited, Jackson Mines Limited, and Tri-Side Mining Corporation Limited went into voluntary liquidation and were merged as one company, Trojan Consolidated Mines Ltd. This company holds 110 claims east and southeast of Forge Mountain.

Trojan.—(50° 120° N.W.) The Trojan mine area lies between the Transvaal and Lodge groups and is about 3 miles northwest of Jersey Lake on the Bethlehem Copper Corporation ground. Old workings are on copper showings described in earlier Annual Reports under Albatross and Canopus.

The claims are underlain by quartz diorite of the Guichon Creek batholith. Breccia composed of fragments of quartz diorite and porphyry occupies an area 1,500 feet long and 800 feet wide. In some zones it it chloritized and tourmalinized, and mineralized with chalcopyrite and bornite and a variety of secondary copper minerals.

The breccia zone was under active exploration by stripping and diamond drilling. In 1956, 500 lineal feet of bulldozed trenches were dug and forty diamond-drill holes totalling 27,718 feet were drilled.

In November preparations were made for sinking a 250-foot 2-compartment shaft. At the end of the year the shaft was 40 feet deep and sinking was being continued. A camp to accommodate thirty-five men was built on a site about 1,000 feet from the shaft. Included in the camp buildings are three bunk-houses, washroom, cook-house, first-aid room, office, lighting-generator room, and warehouses. Twenty men were employed.

Transvaal.—(50° 121° N.E.) The Transvaal is one of the oldest groups in the area, having been located in 1899. It lies east of the south peak of Forge Mountain and about 1½ miles northwest of the Trojan.

Over the years a considerable amount of underground work has been done on the Transvaal veins, which are northerly striking fractures along which there has been intense tourmalinization of the quartz diorite and introduction of copper mineralization.

In 1956 the Nos. 1 and 2 levels of the old Transvaal shaft were cleaned out and a new headframe was erected. Underground work was discontinued after some sampling and diamond drilling had been done.

During the summer a small crew was employed prospecting and in making a detailed geological map of the holdings.

Tri-Side.—(50° 120° N.W. and 121° N.E.) A small crew was employed prospecting and making a geochemical soil survey. Copper anomalies were subsequently trenched by bulldozer.

Northlodge Copper Mines Limited (4)

(50° 120° N.W.) This company is jointly controlled by Farwest Tungsten Copper Mines Limited (company office, 206, 1178 West Pender Street, Vancouver; D. T. Farris, president) and Beaver Lodge Uranium Mines Limited. The company holds seventy-two claims, of which the main Northlodge group lies directly north of the Bethlehem Copper Corporation claims.

The Northlodge camp is 2½ miles north of Quiltanton (Divide) Lake and 1 mile south of the Trojan camp. The camp will accommodate thirty men.

The claims are very largely covered by overburden, and outcrops are extremely scarce. Prospecting consisted of a magnetometer survey on thirty-seven claims and geochemical soil sampling on eleven claims. In addition, 148,000 lineal feet of line was cut for surveying and geological mapping, and 424 feet of diamond drilling and 3,100 feet of bulldozer trenching were done.

The magnetometer survey showed an area of low magnetic flux about 4,000 feet long and 2,300 feet wide in the northwest part of the group. This anomaly underlies an area of drift cover too deep to be trenched by bulldozer, and exploration by drilling is planned. The work was done under the direction of W. M. Sirola, chief geologist, and G. E. Apps, engineer.

Beaver (5), **Outrider** (7), **and D.W.**

The Beaver (50° 121° N.E.), Outrider (50° 120° S.W.), and D.W. groups are jointly owned by Farwest Tungsten Copper Mines Limited and Beaver Lodge Uranium Mines Limited. These claims had no previously known showings on them and are very largely covered by overburden. A magnetometer survey of eighteen claims was made, and 230,000 feet of line was cut for geological mapping and geochemical soil sampling.

Four hundred feet of diamond drilling was done on the D.W. group.

The exploration work was done by Farwest Tungsten Copper Mines Limited under the direction of W. M. Sirola, chief geologist, and G. E. Apps, engineer.

Bethlehem Copper Corporation Ltd. (6)

(50° 120° S.W.) Company office, 402, 1111 West Georgia Street, Vancouver. H. H. Huestis, president. The company holds 112 claims to the northeast of Quiltanton (Divide) Lake. Exploration of the claims is being financed and directed by American Smelting and Refining Co. Ltd. by agreement and contract with the company. Engineer in charge of the Bethlehem Copper project is C. J. Coveney.

Exploration work done during 1956 included 33,975 lineal feet of bulldozer trenching and 22,928 feet of diamond drilling (predominantly NX core). The drilling was done by Boyles Bros. Drilling Company Ltd., using four diesel-powered drills. During the latter part of the year 1,000-foot vertical holes were being drilled, and the use of drilling mud had increased the core recovery to over 90 per cent.

The drilling was very largely concentrated on the Jersey zone near Jersey Lake. The greater depth of the vertical holes has materially increased the ore tonnage from the amount previously indicated by inclined holes which reached a vertical depth of about 400 feet. The company in December released the information that the estimated tonnage to date was: Iona zone, 25,000,000 tons; Jersey zone, 56,000,000 tons.

Bethsaida Copper Mines Limited (9)

(50° 121° S.E.) Company office, 206, 1178 West Pender Street, Vancouver. D. F. Farris, president; W. M. Sirola, chief geologist; G. E. Apps, engineer. The company holds sixty-four claims on the west side of Quiltanton (Divide) Lake. The located claims surround the old Tamarac and Osprey groups, where surface and underground work had been done before 1915.

During the summer fifty-one claims were prospected by means of magnetometer and geochemical soil surveys. This necessitated the cutting of 141,300 feet of line to enable soil samples to be taken at 200-foot intervals along lines 200 feet apart. The soil survey revealed a high copper anomaly in an area completely devoid of outcrop. A trench bulldozed to a depth of 5 feet and more for a length of 1,200 feet disclosed copper mineralization in the bedrock but of too low grade to warrant further exploration.

A total of 14,675 lineal feet of bulldozer trenching was done. Part of it was to explore a westerly striking zone of sheeting 15 to 20 feet wide in which narrow quartz stringers are mineralized with chalcopyrite and molybdenite. About 1,500 feet of surface diamond drilling was done on this zone before work was abandoned because of the generally low copper content.

Trenching on the eastern side of the claims revealed a small inclusion or pendant of quartzite within the Bethsaida quartz diorite. This is the sole inclusion of old rocks known in the area, and despite the fact that it is only 5 feet wide its intense mineralization with disseminated chalcopyrite should serve to direct attention to this type of occurrence.

Additional work included 1,000 feet of percussion drilling, 1,120 feet of trenching for bulk sampling of mineralized areas, channel sampling of veins exposed in trenches, and geological mapping of trenches and outcrops.

Graham Bousquet Gold Mines Limited (10)

(50° 121° S.E.) Company office, 1116, 85 Richmond Street West, Toronto. T. J. Day, president. The company holds a very large number of claims in the Highland Valley area. During the summer, work under the direction of H. Darling was concentrated on holdings south and east of the Bethsaida ground. The claims were prospected and surveyed, and a geochemical soil survey was made.

Laco Mines Limited (13)

(50° 121° S.E.) Company office, 602, 199 Bay Street, Toronto. J. C. L. Allen, president. The company holds sixteen claims south of Calling Lake. The old road between the O.K. mine and Calling Lake was made passable for cars, and a tent camp was established at the west end of the lake. From it three men prospected the claims.

In late August a few hundred feet of bulldozer trench was dug on copper showings near the west boundary of the Empire claim.

Victor (Skeena Silver Mines Ltd.) (14)

(50° 121° S.E.) Company office, 411, 850 West Hastings Street, Vancouver 1. S. S. Parker, president; C. Rutherford, consulting engineer; George Burdett, mine foreman. The company holds by record twenty-one claims and fractions, 2 miles southeast of Quiltanton (Divide) Lake on the old forestry trail to Gnawed Mountain, which lies to the southeast of Highland Valley. The property is a relocation of ground formerly covered by the Victor group.

Underground work at the Victor adit consisted of 420 feet of drifting and cross-cutting and 800 feet of diamond drilling. Surface exploration included 1,306 feet of diamond drilling and 3,075 feet of bulldozer trenching. A geochemical soil survey was made of the property. The camp consists of bunk-house accommodation for twelve men, a cook-house, and a dry-house. Eleven men were employed.

Jericho Mines Ltd. (16)

(50° 120° S.W.) Company office, Suite 204, 717 West Pender Street, Vancouver 1. R. Franklin Stibbard, president. The company holds forty claims and fractions straddling Witches Brook, about 8 miles east of Quiltanton (Divide) Lake, and about 5 miles west of the Mamit Lake–Savona road. Exploratory work included 1,100 feet of surface diamond drilling. Topographical, geological, and geophysical surveys were made. The geophysical work was completed late in November, and a bunk-house and cook-house, sufficient to accommodate twenty men, were erected.

MEADOW CREEK*

Copper

Dunmore Mines Ltd.

(50° 120° S. W.) Company office, Suite 401, 640 West Hastings Street, Vancouver. Thomas Moore, president. This property of seventeen claims is in the Meadow Creek area 35 miles from Kamloops, 45 miles from Merritt, and 3½ miles south of the Mamit Lake–Kamloops road. It includes ground formerly covered in part by the Bertha and Molly claims. Bulldozer exploration work consisted of three open-cuts totalling 5,428 cubic yards and stripping of overburden in areas totalling approximately 3 acres. Two miles of tractor-road and 2 miles of truck-road were constructed. Surface diamond drilling amounting to 2,000 feet was done in seventeen holes. At the camp-site is one 30- by 20-foot cabin. Two or three men were employed from April to November.

GUICHON CREEK*

Copper

Northwestern Explorations, Limited

(50° 120° S.W.) Company office, 402 West Pender Street, Vancouver. J. S. Scott, manager, Vancouver; P. E. Hirst, superintendent, Merritt. This company is a subsidiary of Kennecott Copper Corporation. In 1956 the company held by purchase and option 150 located and nine Crown-granted claims. The property straddles Guichon Creek 4 miles south of Mamit Lake, and includes the old Vimy and Aberdeen mines. Exploratory work started in May included surface diamond drilling, stripping of overburden, and soil sampling. Some magnetometer surveying was done. Three miles of road was built and a bridge was constructed across Guichon Creek. Two diamond drills were continuously employed from May to December, and a total of 10,428 feet of drilling was done in twenty-four holes. Low-grade disseminated copper is present in altered granitic rocks of the Guichon Creek batholith. Twenty men were employed, including the diamond-drill crew.

* By E. R. Hughes.

NICOLA*

Copper

Copperado (Western Copperada Mining Corporation) (50° 120° S.W.) Head office, Room 608, 1255 Phillips Square, Montreal; mine office, Merritt. D. W. Heller, president, Montreal; R. E. Parkes, general superintendent, Merritt. This mine is 5 miles by road northeast of Nicola. It was closed on November 23rd, 1951, and remained closed until reopened by Guichon Mine Limited in May, 1956, when the shaft was unwatered to the 250 level, and a raise was driven 50 feet in ore from the 100-foot level. Approximately 95 tons of ore was produced, and of this, 45 tons was shipped to the Tacoma smelter for test purposes.

The property was taken over on December 1st by Western Copperada Mining Corporation on a 99-year lease. The 450-foot shaft was unwatered and the underground workings were surveyed. At the end of the year eighteen men were employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 115–120.]

KAMLOOPS†

Copper

Deposits Associated with the Eastern Part of the Iron Mask Batholith near Kamloops

Introduction

The Iron Mask batholith is 3 miles southwest of Kamloops and extends for a distance of 18 miles in a northwesterly direction. It is partly overlain by Tertiary rocks. Associated with the batholith are numerous copper deposits, some of which carry appreciable values in gold and silver. Deposits of magnetite also occur. Despite a long history of exploration, only one important copper producer has been found, the Iron Mask mine.

Ten weeks were spent between June and September, 1956, examining the known mineral occurrences from the Iron Mask mine eastward. The area covered is about 40 square miles. Most of the workings, prospects, and showings are indicated on Figure 3, those of greater interest being identified by numbers as follows: 1, Python and Copper Head; 2, Orphan Boy; 3, Noonday; 4, Lost Chord; 5, O.K.; 6, Evening Star; 7, Lucky Strike; 8, Windsor; 9, Iron Mask and Erin; 10, Night Hawk (Larsen); 11, Ajax; 12, Wheal Tamar; 13, Monte Carlo; 14, Joker; 15, Amakua (Grey Mask); 16, Iron Cap; 17, Kimberley; 18, Kingpin; 19, Utopia; 20, Dewey.

No part of the area is more than 10 miles by motor-road from Kamloops. Precipitation is low and much of the mapped area is open grazing country, but Coal Hill, Sugarloaf Hill, and the southwestern margin of the batholith are well timbered. Vertical relief is moderate, with elevations lying between 2,000 and 3,600 feet. The only streams with all-year flow are Anderson Creek, Peterson Creek, and a tributary of the latter, Humphrey Creek. Consequently the only bodies of fresh water are Jacko and Edith Lakes, which are on Peterson and Humphrey Creeks. Many saline ponds occur, and in spring and early summer these may provide water for diamond drilling at most localities within the area. For mill operation the Iron Mask mine pumped water a vertical distance of 1,600 feet from Kamloops Lake.

The grain of the country trends northwest and has been emphasized by glacial scour. Outcrops are abundant on Coal Hill, Sugarloaf Hill, and the higher ground east of Jacko Lake. Outcrops are rare at the outer contacts of the batholith.

History

In 1896, the first year in which activity is recorded, over 200 claims were located. By 1900 underground work had been done at the Python, Noonday, Lucky Strike, Iron

* By E. R. Hughes.
† By J. M. Carr.

Mask, Wheal Tamar, Iron Cap, and Kimberley properties. Most of these properties have produced a few tons of selected ore. Exclusive of that from the Iron Mask and associated orebodies, the total production recorded from the area up to 1940 is 419 tons of copper-bearing material, mostly with low gold and silver content. West of the area the Copper King mine at Cherry Bluff produced 7,460 tons of material containing about 3 per cent copper and 0.14 ounce of gold per ton. The Glen mine, in the same area, from 1891 to 1904 shipped 16,000 tons of magnetite as flux to the Nelson and Tacoma smelters.

The Iron Mask and Erin are the largest known orebodies. The approximate average grade of 182,494 tons milled and shipped from both bodies was 1.47 per cent copper, 0.02 ounce per ton of gold, and 0.08 ounce per ton of silver. Production lasted with some breaks from 1904 until 1928, and was from the Iron Mask and partly from the Erin and smaller orebodies in the vicinity.

In 1916 the Granby Mining and Smelting Company optioned the Python, Evening Star, and Wheal Tamar groups and carried out diamond drilling, but the results of this work are not recorded.

Recent exploration has included geophysical surveys followed by diamond drilling. In 1951 and 1952 Berens River Mines Limited held 113 mineral claims and drilled twenty-two holes totalling 5,497 feet. Also in 1951 and 1952 Kennco Explorations (Canada) Limited made an electromagnetic survey of fifty-eight claims in the Pothook area, 3 miles west of the Iron Mask mine, and put down fourteen diamond-drill holes of a total length of 4,555 feet. This work indicated a large tonnage of submarginal material. In 1956 a geophysical survey was carried out on behalf of Graham Bousquet Gold Mines Limited over 118 claims which include the area surveyed by Kennco and which extend west of Sugarloaf Hill.

Mineral claims covered most of the area in 1956. The Consolidated Mining and Smelting Company of Canada, Limited has been active in the area since 1954. Including work done in 1929, this company has diamond drilled a total length of over 16,000 feet on the Ajax-Monte Carlo group. Other companies have extended old workings on the Night Hawk, Python, Copper Head, and Evening Star claims. Closely spaced diamond drilling has been done in 1955 and 1956 at two adjacent prospects in the extreme southeast part of the exposed batholithic area.

Rock Types

Four principal types of rock have been recognized within the batholith (*Geol. Surv., Canada,* Mem. 249, pp. 17–18, and unpublished thesis by W. H. Mathews); namely, an intermediate type (diorite, gabbro), a more acid type (syenite and monzonite), a basic type (pyroxenite), and a hydrothermally altered type. Only pyroxenite was mapped separately. Peridotite noted southeast of Jacko Lake was thought to be part of the batholith.

In this report, only two divisions are made of the batholithic rocks. They are made on the basis of field appearance and fabric rather than of composition. The rocks of one division are sufficiently different from those of the other that they may be considered to have distinct modes of origin. Altered rocks fall within either division and are described separately. The coarser-grained batholithic rocks are typically plutonic and possess a mean grain size greater than 1½ mm. Among them diorite and gabbro show rapid variation to much coarser grain sizes. The finer-grained batholithic rocks possess a mean grain size less than 1½ mm. and are more uniform in appearance. Some were previously mapped as Kamloops volcanics.

Cache Creek Rocks.—Grey glassy andesite and black, laminated, tuffaceous argillites that outcrop on the Merritt highway are assumed to belong to the Cache Creek group, of pre-Triassic age.

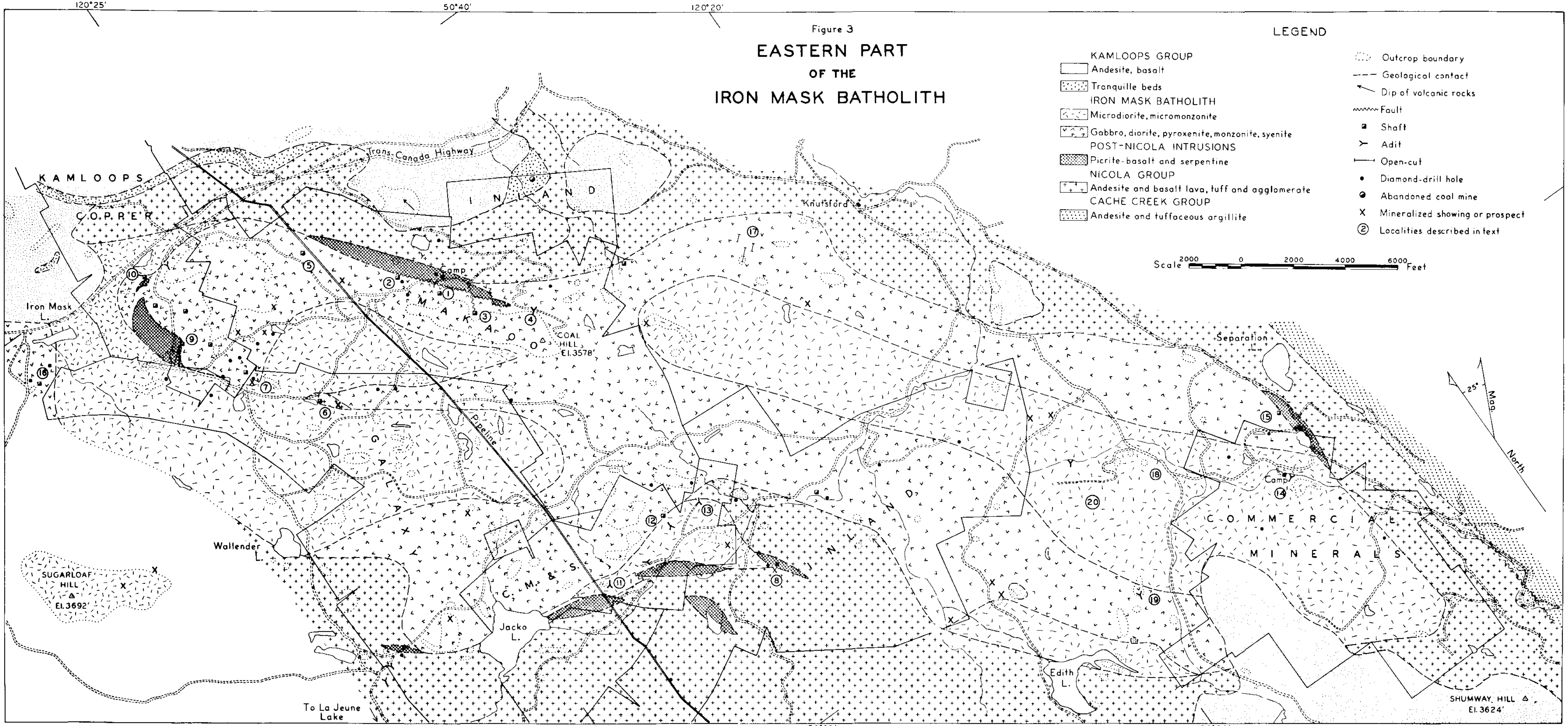


Figure 3
EASTERN PART
OF THE
IRON MASK BATHOLITH
LEGEND
KAMLOOPS GROUP
Andesite, basalt
Tranquille beds
IRON MASK BATHOLITH
Microdiorite, micromonzonite
Gabbro, diorite, pyroxenite, monzonite, syenite
POST-NICOLA INTRUSIONS
Picrite-basalt and serpentine
NICOLA GROUP
Andesite and basalt lava, tuff and agglomerate
CACHE CREEK GROUP
Andesite and tuffaceous argillite
Outcrop boundary
Geological contact
Dip of volcanic rocks
Fault
Shaft
Adit
Open-cut
Diamond-drill hole
Abandoned coal mine
Mineralized showing or prospect
Localities described in text
Scale 2000 0 2000 4000 6000 Feet
120°25'
50°40'
120°20'
50°35'
KAMLOOPS
COPPER
INLAND
AFTON
GALAXY
C. M. & S.
COMMERCIAL
MINERALS
Trans-Canada Highway
Pipeline
Knutsford
Iron Mask L.
Camp
COAL HILL El. 3578'
Separation L.
Wallender L.
SUGARLOAF HILL El. 3692'
Jacko L.
Edith L.
To La Jeune Lake
SHUMWAY HILL El. 3624'
25°
Mag.
North

Nicola Rocks.—Rocks of the Triassic Nicola group are all volcanic. Limestone is recorded 1 mile southwest of Sugarloaf Hill (Kamloops map-sheet, 1896), but no sedimentary material of Nicola age is known in the present area.

The Nicola rocks differ in character from place to place around the batholith. The northern outcrops are of strongly altered andesite, red, green, or grey in colour. Some are porphyritic. Epidote disseminations and veinlets are usual, and in places the rocks are sparsely mineralized.

Near Knutsford the principal representative is a grey feldspathic andesite showing vesicularity and a mild alteration involving epidote. Pyroclastic types, predominantly of basaltic composition, are usual in the southern part of the area. Bedded and massive tuffs occur between Jacko and Edith Lakes. Mottled dull-green agglomeratic tuff is widespread parallel to the contact with Cache Creek rocks, where it is much sheared and broken. The same rock also outcrops west of the Monte Carlo workings. It is exposed underground in the Star workings, in association with grey volcanic rocks.

In places a distinction between Nicola and Kamloops volcanic rocks has to be based upon the degree of hydrothermal alteration shown and is hard to achieve in the field.

Picrite-Basalt.—Although occurring as intrusions within the batholith, this rock is not batholithic. The unaltered rock is known only at two places; namely, in an adit at 2,519 feet elevation on the Copper Head mineral claim, and southeast of Jacko Lake. Although it has been called peridotite, the unaltered rock possesses a glassy matrix and is similar to picrite-basalt north of Kamloops Lake. It is a greenish-black dense rock of conspicuously porphyritic appearance. Closely spaced crystals of serpentinized olivine range in size to as much as one-fifth of an inch. Both when fresh and when altered, the rock is for the most part appreciably magnetic.

Coarser-grained Batholithic Rocks.—Pyroxenite is known only in the Jacko and Edith Lakes area. It is a heavy grey-green rock of crystalline appearance and is strongly magnetic. It consists almost wholly of pyroxene, hornblende, and magnetite. Dioritic or gabbroic rocks rich in pyroxene occur in the same region, and will be termed pyroxenic diorite.

Gabbro and diorite are not separately recognizable except under the microscope, and diorite will be used as a general term. The rock has a variable appearance because of common changes in grain size and in the proportion of light- to dark-coloured components. In slightly weathered outcrop it is dark brown to light grey. On the broken surface the rock is uniformly dark grey-green or is white and dark speckled, according to whether the feldspar is somewhat altered or is fresh. Biotite is a usual component and shows as glistening flakes that may be light coloured by alteration. The rock is commonly magnetic. An inconstant banding is developed in places, and inclusions of dark fine-grained rock are quite usual.

Monzonite principally underlies an area along the northeast margin of the batholith, eastward from the Lost Chord working. It occurs locally in several other places, notably at the Iron Cap mine. The rock is more uniform than diorite, from which it is distinguished by the pink colour of much of the feldspar, which includes orthoclase. In part at least, monzonite is an alteration product of diorite. It may be relatively non-magnetic, as at the Iron Cap mine.

Finer-grained Batholithic Rocks.—These rocks may be termed microdiorite and micromonzonite, to distinguish each from its coarser-grained counterpart of similar composition. Microgranodiorite also occurs. These varieties probably do not form separate bodies, but instead grade into each other. Processes of alteration and recrystallization appear to be responsible for some of the existing differences.

All the rocks are grey, white, or pinkish in colour. The mean grain size is 1 mm., but a porphyritic tendency is usual. There is commonly a perceptible foliation, marked by bladed crystals of pyroxene and hornblende and by flaky ones of biotite where this mineral is sufficiently abundant. Sparse chloritic inclusions of some other rock type do not exceed 1 inch in length. At one locality, 3,000 feet southeast of Coal Hill, somewhat larger inclusions of altered diorite were observed.

Microgranodiorite is a whiter rock than microdiorite and in places contains visible quartz. It mainly occurs south and east of the Lucky Strike workings, but is also present in the vicinity of the Ajax workings.

Microdiorite is light grey and speckled on the weathered surface, and a uniform darker grey on the fresh surface. Like the associated rocks, it is commonly cut by epidote veinlets. In general it is a rather even-grained rock, but it may grade into a conspicuously porphyritic type.

Micromonzonite is distinguished from microdiorite by its prevalent pinkish coloration, which is due to orthoclase or microcline. The rock may contain a small amount of quartz. Micromonzonite and monzonite may locally converge in character so that the one is difficult to tell from the other, probably because both are altered varieties of dioritic rocks.

Porphyritic microdiorite is a distinctive rock, yet is not easy to separate from microdiorite in the field because of complex intergradation. It contains abundant elongate hornblende crystals, set more or less parallel to one another in a dark-grey crystalline matrix. The rock is thus commonly foliated. Porphyritic microdiorite occupies most of Sugarloaf Hill, occurs in the Ajax-Monte Carlo vicinity, and outcrops in the southeasternmost part of the batholith. In all of these places it is slightly mineralized. Rather similar rock is seen a short distance south of the Python shaft in unknown relationship to the surrounding diorite. Certain dykes cutting diorite, Nicola volcanics, and picrite-basalt resemble porphyritic microdiorite.

Kamloops Volcanic and Sedimentary Rocks.—The Tranquille beds are very poorly exposed. At the filled-in shaft of an abandoned coal mine on Guerin Creek, debris of altered lava with copper stain confirms that here the beds rest directly on Nicola rocks, as mapped in 1895 (Kamloops map-sheet). The beds are reported to be 50 feet thick at this locality, with several coal seams totalling 30 inches. They are much broken up (Ann. Rept., 1924).

The volcanic rocks have been dated as Miocene or earlier (Mem. 249, p. 39). Agglomerate occurs in the extreme north of the area. Elsewhere comparatively fresh andesite and basalt lavas give indications of low dips. Direct evidence of basalt lava resting on the batholithic rocks exists north of Edith Lake.

Agate of poor quality weathers out of the volcanic rock, west of the Merritt highway and three-quarters of a mile from its junction with the Trans-Canada Highway.

Dykes.—Excepting those cutting Tertiary volcanics near the Trans-Canada Highway, no post-mineral dykes are identified. Dykes are scarce or absent in the heart of the batholith. Andesite dykes, some of which resemble porphyritic microdiorite, occur within diorite in the Iron Mask and Python vicinities. They were intruded prior to alteration of the diorite.

Rock Alteration

The batholithic rocks are strongly altered near zones of structural weakness. White rocks and pink rocks are produced, each representing a distinct kind of alteration. Distribution of the two kinds is overlapping, and since there is no evidence as to which was first, they may be related in origin. The alteration occurred subsequently to dyke intrusion and prior to mineralization. It was presumably effected at fairly high temperatures.

White alteration, which has been named albitization (*Geol. Surv., Canada,* Mem. 249, pp. 104–105), causes progressive elimination of dark minerals and results in speckled rocks which are whiter the more intense the alteration they represent. Any previous coarseness of grain is preserved as seen under the microscope, but in the field a rather fine-grained appearance is universal. Calcite and epidote are commonly disseminated and in veinlets, and may be accompanied by minor amounts of pyrite. Magnetite content is low, the iron having been absorbed into new chlorite, epidote, and pyrite.

White rocks produced by alteration of diorite and gabbro are partly albitites, and partly rocks that are otherwise identical but contain feldspar more calcic than albite. The difference seems, from the present study, to bear no relation to proximity of mineralization and cannot be recognized in the field. The bodies of altered rock are unsymmetrical but dyke-like, with relatively sharp outlines against less-altered diorite. The trend is irregular and the size ranges from a few feet to many tens of feet in least dimension. Most of the altered diorite shows no copper mineralization. The principal areas in which these altered diorite bodies occur are between the Iron Mask mine area and the summit of Coal Hill, and north of the Monte Carlo workings. Near the boundary of the strongly altered areas, diorite is altered to white rock in a net pattern along intersecting sealed fractures.

The white alteration of the finer-grained batholithic rocks is less noticeable because of the light colour and fine grain of the unaltered rock. In the Ajax-Monte Carlo area at least, the white altered rocks are albitites. The alteration commonly affects numerous narrow sections of the rock rather than the whole mass. However, in the vicinity of the Ajax tunnel, where mineralization is strong, large masses of microdiorite are fairly uniformly albitized. Veinlets of analcite and albite traverse the altered sections, but in some instances similar veinlets are of a more calcic feldspar. The strongly albitized rock is generally non-magnetic; it rarely contains lenses of solid magnetite up to 6 inches wide.

Pink alteration is most obvious between the Iron Mask mine and the Noonday shaft, where replacement veins of pink orthoclase feldspar are very abundant. The pink veins occur sparsely in diorite and monzonite elsewhere along the margin. They have not been observed in the interior of the area, nor are they well developed in the finer-grained rocks. The veins vary from massive and persistent to narrow and diffuse. In the immediate vicinity of the Python mineralized zone the pink veins form a replacement breccia (that is, a breccia bonded by replacement veins). Adjacent to the veins, diorite is changed to monzonite. Individual veins frequently contain one or more of the following minerals: Calcite, epidote, albite, biotite, magnetite, and chalcopyrite. Calcite and epidote are the most common, and at least a trace of chalcopyrite usually accompanies them. Biotite may be somewhat earlier than the other minerals, whose crystallization partly occurred after the veins were fractured. All the above minerals may occur within the adjacent altered diorite rather than in a vein.

Monzonite at the Iron Cap mine and east of the Lost Chord claim almost certainly represents altered diorite; it contains slender pink veins and the mineral assemblage just noted. Magnetite is abundant as lenses and veins, but the rock itself is impoverished in magnetite.

Although well-defined pink veins do not occur in the finer-grained rocks, orthoclase and microcline have undoubtedly been introduced within some of the rocks classed as micromonzonites.

Overlapping of the pink and white alterations is evident at several localities. On the Ajax claim, both unaltered and albitized microdiorites contain vague stringers and patches of pink feldspar. In the Python and Iron Mask areas, similarly vague pink veins occur in whitened diorite. Near the Lucky Strike shaft, albitized diorite contains much introduced quartz and orthoclase.

Picrite-basalt in structurally weak zones is mostly altered to a hard uniformly dark-green rock in which the altered porphyritic crystals appear as vague rounded black shapes. Where the rock is fractured, the fracture planes are smooth and pass with equal facility through altered crystals and matrix. Microscopic examination shows that the original, partly serpentinized olivine crystals are reduced to talc, serpentine, and magnetite, and that the glassy matrix and small pyroxene crystals are replaced by a fine dense aggregate of tremolite, chlorite, and magnetite. The altered rock corresponds very closely to the third Carabine Creek specimen described in Memoir 249 (p. 24).

Picrite-basalt is altered in this manner at its contact with diorite on the Copper Head claim, but has suffered only talcose alteration of the porphyritic crystals at its contact with altered Nicola volcanics. The more fully altered rock may break down to a slippery green sand, from which reddish hematized pellets can be picked by hand. This later alteration was probably effected during faulting, for the disintegrated rock appears along the strike of the Copper Head shear zone.

At the Larsen workings and near the Iron Mask shaft, picrite-basalt is converted to a black rock glistening with abundant finely disseminated biotite and traversed by talcose slips. The outlines of the altered olivine crystals cannot be distinguished, and the rock consists largely of pyroxene, hornblende, and biotite. Under the microscope, narrow veinlets of these minerals with brown garnet are seen. This alteration is a high-temperature kind and probably involved addition of material.

Basaltic tuff at the Star shaft and olivine-basalt at the Monte Carlo workings are altered to talc-chlorite rocks.

Structure

Evidence concerning the structure of this part of the batholith is insufficient to allow firm conclusions to be drawn. The following is, therefore, a discussion of the structural setting in which mineralization has occurred.

Two or three intrusive episodes preceded consolidation of the batholith; two if the coarser- and finer-grained rocks be considered contemporaneous, three if they be considered distinct. The picrite-basalt bodies are structurally a part of the batholith, and imply a phase of intrusion after emplacement of the coarser-grained rocks, because lenses of diorite are enclosed by picrite-basalt in the Larsen crosscut. There is no direct evidence of the age of picrite-basalt relative to the finer-grained batholithic rocks, but the following relationships appear significant.

Sections of micromonzonite occur well inside picrite-basalt in drill-hole No. 23 south of the Mars tunnel, and resemble dykes rather than inclusions. Porphyritic microdiorite occurs as dykes cutting picrite-basalt and diorite. Picrite-basalt at the Larsen workings has apparently been altered at high temperatures and with addition of magnetic components, presumably from near-by later micromonzonite. These indirect lines of evidence suggest that the finer-grained rocks are later than picrite-basalt.

The finer-grained rocks should therefore be later than the coarser-grained rocks, but no firm evidence has been found. Alteration has obscured the original relationships, and on surface no precise contact between large masses of the two rocks has been seen. In the Ajax drill cores the contact is interfingering, with diorite retaining its coarseness of grain at all of the many individual contacts with the finer rock. The relationship is certainly not gradational, and the finer-grained rocks seem to have intimately penetrated the previously consolidated diorite.

The sequence of intrusion may be: (*a*) Coarser-grained rocks, (*b*) picrite-basalt, and (*c*) finer-grained rocks.

A probable pre-Cretaceous age has been assigned to the batholith, and rocks at Carabine and Watching Creeks that correspond closely with picrite-basalt of the present area have been dated as post-Cretaceous (Mem. 249, pp. 18, 29). A cursory examination made by the writer in the Carabine Creek area failed to indicate that the picrite-basalt was part of the bedded tuff succession, to which a post-Cretaceous age applies. Consequently the picrite-basalt may not be post-Cretaceous, and the earlier age of the Iron Mask batholith can be accepted.

Zones of recurring fracture were active early in the history of the batholith. Portions of the zones are recognized where picrite-basalt or Nicola tuffs are in contact with batholithic rocks. Three early zones are partly identified—one at each batholithic margin and the third within the batholith between the Evening Star and Iron Mask localities. Unlike the marginally situated zones, the third zone is apparently strongly arcuate. The zones may have partly determined the early batholithic contacts, which date from the first intrusive episode. In a second episode the zones were invaded by individual bodies of picrite-basalt. In a third episode, intrusion of the finer-grained batholithic rocks tended to follow the fracture zones and to obliterate them. These successive events have determined the dominant northwesterly trend of the intrusive contacts.

No through-going faults have been identified within the batholith. Faulting is chiefly observed at and near the contacts of batholithic rocks with picrite-basalt or altered tuffs. In the Python, Iron Mask, and Ajax areas, alteration of the batholithic rocks was preceded by intensive brecciation within 600 feet of picrite-basalt contacts. Coincidence of the later zones of dislocation with parts of the early fracture zones does not necessarily imply reactivation of the early zones throughout their whole original length; on the contrary, movement was probably restricted to the immediate vicinity of the altered incompetent picrite-basalt and basaltic tuffs.

Post-mineral faulting is probably widespread but may involve no large displacements. It is evident in the Python mineralized zone and is reported at the Iron Cap mine. Southeast of the Monte Carlo workings, Tertiary lava is probably faulted against Nicola rocks.

Discussion of the Mineralization

The copper deposits are veins, stockworks, and disseminations of replacement origin and mesothermal type. Chalcopyrite is the principal copper-bearing mineral and is accompanied by pyrite in widely varying proportion. Partial oxidation of sulphide minerals may extend to 150 feet depth but is unpredictable in occurrence. Gold and silver values are generally low and, if anything, decrease with increasing proportion of pyrite. Native copper and chalcocite occur at two localities and are probably of primary origin. Other native copper disseminations lie west of the area. Bornite is important at the Copper King mine at Cherry Bluff.

Altered wallrock is the chief gangue. In the northern deposits it contains much pink orthoclase feldspar. Magnetite is associated with this pink material as veins, lenses, and strong disseminations. One small magnetite vein, intersected by a diamond-drill hole east of the Lost Chord claim, contains apatite, and in that respect resembles iron deposits to the west of the present area. In this and other cases the magnetite is earlier than the chalcopyrite. Calcite and epidote are invariably closely associated with the sulphides. Gangue minerals of more restricted distribution include gypsum, ankerite, specular hematite, and quartz. Fluorite, prehnite, and zeolites occur in the northern part of the area.

Rock alteration and mineralization in batholithic rocks are as a rule adjacent to structurally weak masses of picrite-basalt and altered tuffs. Mineralization occurs at some of these contacts and as much as 1,000 feet from them. Stockworks such as that of the Python locality are mineralized zones of brecciation. Veins, on the other hand, are mineralized faults and locally exhibit a uniformity of attitude, such as that shown by the Iron Mask mine plans and as may exist in the Ajax area.

Intense rock alteration is a general guide to the likelihood of strong or widespread mineralization. In the coarse-grained rocks, pink replacement breccia represents structural conditions conducive to mineralization. Monzonite with few pink veins may be host to disseminated sulphides. White rock alteration of diorite is probably too widely distributed to indicate orebodies. Among the finer-grained rocks, better mineralization may be indicated by a greater intensity of white alteration.

Geophysical exploration assumes special importance in view of the poorly exposed nature of many critical areas. Electromagnetic methods have been widely used, and, despite the drilling of many non-mineralized conductors, probably remain the most satisfactory. Resistivity methods have been employed to a limited extent in the Python area, but are suspect because of the rapidly varying thickness of cover. Magnetic methods have received little attention, yet may have some use in view of the possible lowering of magnetic susceptibility by white alteration of the rocks. Pink alteration, in the form of replacement breccia, or monzonite, is accompanied by a rise in magnetic susceptibility.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1896–1930, 1940, 1951, 1952, 1955; *Geol. Surv., Canada,* Report, Kamloops Map Sheet, 1895; *Geol. Surv., Canada,* Mem. 38, 1915, pp. 140–141; *Geol. Surv., Canada,* Econ. Geol. Series No. 3, 1926; *Geol. Surv., Canada,* Mem. 249 (Nicola Map-area), 1948.]

Makaoo Development Company Limited

(50° 120° N.E.) Head office, 1208 Vancouver Block, Vancouver; mine office, Kamloops. W. I. Nelson, president and general manager, Kamloops. This company holds seventy-five mineral claims in a block whose boundaries are shown in Figure 3. Five of the claims are Crown granted. Exploration work has been done by the present company on the Python and Copper Head zones in the Python group (1),* on the Lost Chord claim (4), Orphan Boy shaft (2), and the old O.K. workings (5). Earlier activity was principally on the Python group of four Crown-granted claims, some of which were located as early as 1896. Prior to the First World War, the Python workings consisted of the Python adit, 525 feet in length, the Python shaft, 123 feet deep, and the Noonday (3) shaft, about 100 feet deep. The position of these workings is shown on Figure 3. In 1899, 30 tons of material containing about 8 per cent copper was shipped from the Python group.

The group was held by Canadian Mining and Smelting Company for a short time in 1954, when selected areas were covered by electromagnetic survey.

In 1955 the Makaoo Company reclaimed the Python adit and renamed it the 2825 level. In the course of this work the adit was shortened from 525 to 460 feet. During 1956 the Copper Head and Python zones, upon which much of the early exploration work had been done, were further developed. Underground work at this level consisted of 295 feet of drifting and 179 feet of crosscutting in the Copper Head zone, and 806 feet of drifting and 610 feet of crosscutting in the Python zone. In addition, a new adit at 2,519 feet elevation was driven 350 feet in a southwesterly direction from a portal situated 1,130 feet northerly from the portal of the 2825 level. Surface exploration included 901 feet of trenching, directed along the picrite-basalt and diorite contact from the Orphan Boy workings eastward to a point 2,600 feet beyond the Python shaft. Surface diamond drilling amounted to 3,822 feet, much of which was done on other groups of claims. The sites of these holes are shown on Figure 3. A total of 16,200 feet of road was constructed.

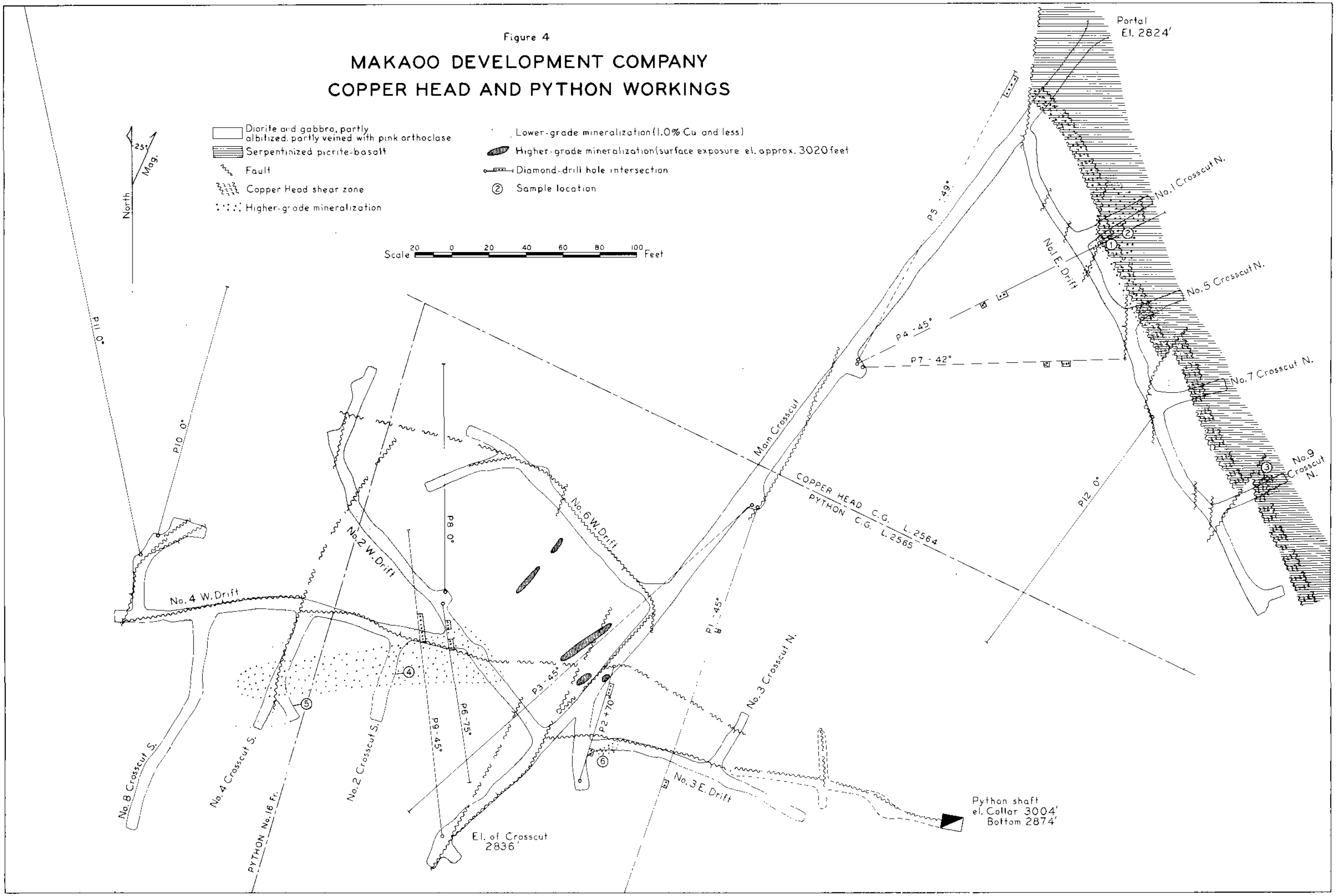
The *Copper Head* mineralized zone occurs within picrite-basalt at a highly sheared contact with altered diorite. The shearing is 6 feet wide and has an over-all trend of north 40 degrees west, but in the Copper Head workings it strikes north 25 degrees west. The dip is 70 degrees or more to the south. The picrite-basalt is pulverized within the shear zone, and in the footwall is less broken up but contains some strongly sheared sections. The hangingwall diorite contains pink veins of orthoclase feldspar and is traversed by numerous chloritic fractures.

Chalcopyrite is strongly disseminated in the shear zone and in the footwall. Gangue minerals are not abundant. Lenses of calcite and occasionally of tremolite asbestos occur, and contain small stringers of chalcopyrite. Small crystals of white fluorite line cavities within the mineralized rock. Little pyrite is present, and little oxidation of the chalcopyrite has occurred. On the hangingwall, diorite contains disseminated chalcopyrite for a foot or so from the shear zone and at greater distances where brecciated pink veins occur.

* Numbers in parentheses refer to location on Figure 3.

Figure 4

MAKAOO DEVELOPMENT COMPANY
COPPER HEAD AND PYTHON WORKINGS



Several steep faults pass from diorite into the shear zone, and apparently displace it. A shallow west-dipping fault cuts the shear zone in No. 1 crosscut.

Results of chip sampling in the Copper Head zone are given below. Sample locations are shown on Figure 4.

Samples from the Copper Head Zone

Sample No.	Location	Gold	Silver	Copper
		Oz. per Ton	Oz. per Ton	Per Cent
1	5 feet across shear zone	0.07	—	1.6
2	4½ feet across hangingwall side of shear zone	0.14	0.2	3.5
3	5 feet, of which 3½ feet is shear zone and 1½ feet in the footwall	0.02	0.2	0.8

The greatest width of mineralized rock is 23 feet, in No. 1 crosscut. The increased width there may be due to partial repetition of the shear zone by oblique faulting.

The shear zone is exposed on surface about 40 feet above Nos. 7 and 9 crosscuts. The mineralization extends across a width of about 20 feet in picrite-basalt. The adjacent diorite contains disseminated chalcopyrite.

The main mass of picrite-basalt is poorly mineralized, on the evidence of surface diamond-drill hole No. 17, 300 feet north of the portal. This hole was drilled south 30 degrees west at minus 45 degrees. Throughout its length of 409 feet, the hole cut picrite-basalt containing some sheared sections and sporadic small amounts of chalcopyrite and pyrite.

The *Python* zone occurs within a replacement breccia (*see* p. 51) of feldspathized diorite or gabbro. The replacement breccia has ill-defined margins and grades into less altered diorite. In the breccia the pink feldspar veins are non-systematic; elsewhere they are wider, more persistent, and tend to adopt one or more distinct attitudes. Where more massive veining occurs rather than replacement breccia, mineralization is purely local and is confined to the immediate vicinity of the pink veins. Epidote, calcite, magnetite, and chalcopyrite occur within or at the margins of many veins, either singly or as a varied assemblage of these minerals. In many instances they fill fractures within a vein. The same minerals also occur disseminated in the adjacent altered diorite.

The replacement breccia in which the Python mineralized zone occurs probably forms a steeply dipping tabular lens or pipe, which in the workings barely encloses the two mineralized areas that are shown on Figure 4. In plan it is elongate approximately east-west. Chip samples were taken at positions shown on Figure 4.

Samples from the Python Zone

Sample No.	Location	Gold	Silver	Copper
		Oz. per Ton	Oz. per Ton	Per Cent
4	5 feet, inclined 50 degrees to north	0.05	Trace	6.9
5	4 feet, vertical	0.01	.....	1.0
6	5 feet, vertical	0.02	.....	2.3

Chalcopyrite is essentially the only sulphide present. It occurs as stringers and lenses of varied orientation and as a dissemination in the feldspathized diorite. The larger lenses have a thickness of 1 foot. In places the ore is vuggy, with calcite, epidote, and some fluorite in the cavities. Quartz is virtually lacking. Magnetite lenses, nodules, and disseminations are common. Some oxidation of the sulphide to carbonates has occurred.

The ore is brecciated and dragged by steep faults striking north-northeast and west-northwest. The northerly faults offset those of the other set with small apparent displacements. A green muddy breccia as much as 1 foot wide is commonly present along parts of the faults. Specks of chalcopyrite in the green breccia probably represent mechanically incorporated material. The walls of the breccia are coated with a brown gouge, and are polished and slickensided in a manner indicating horizontal and oblique movement, probably subsequent to formation of the breccia. Only one of the northerly faults in the Copper Head (No. 1) drift possesses green breccia, but several show a thin seam of brown gouge. In No. 6 west drift an east fault probably moved later than faults of the two main sets. It follows a massive pink vein and contains a calcite breccia.

The faults shown on the 55-foot level of the Python shaft, which was not accessible, are based on information supplied by the company engineer. Other workings lie at the 110-foot level (Ann. Rept., 1913, p. 189).

On the surface, oxidized material carrying chalcopyrite and carbonates is exposed in the positions indicated on Figure 4. Weaker mineralization extends west of those exposures and is in diorite containing relatively few pink veins. Outcrops of replacement breccia are restricted to the localities of richer mineralization.

The sum of evidence available from surface and underground exposures and from diamond drilling is insufficient to show the shape and full extent of the Python mineralized zone.

A large number of trenches have been dug across the prevailing strike between the Orphan Boy workings and a point 2,600 feet easterly of the Python shaft. The longest one is some 1,200 feet in length and is directed southward toward the Noonday shaft. It lies immediately east of an assumed northerly fault shown on Figure 3. On the road at its northern end this cut exposes strongly albitized diorite which is in steep sheared contact with picrite-basalt to the south. Pyritic mineralization occurs in the diorite and at the sheared contact. The trench exposes 500 feet of sparsely mineralized picrite-basalt, which is in sheared contact with diorite to the south. This contact is penetrated at shallow depth by surface diamond-drill hole No. 3, and is not abundantly mineralized. It corresponds in structural location to the Copper Head shear zone. The succeeding diorite carries pink veins on a scale approaching that of the Python replacement breccia. Chalcopyrite is disseminated for about 200 feet north of the picrite-basalt, and also occurs as minor stringers in association with the pink veins.

The *Noonday* shaft is at the approximate southern limit of the pink veins, on an outcrop of sparsely mineralized diorite with pink veins. At the collar a steep shear trends north 5 degrees east. The shaft is inaccessible; in 1913 it was said to be 75 feet deep.

The *Lost Chord* workings are a short distance east of the Python group. No semblance of the structures seen on the Python group is apparent at these old showings, on which work was recorded in 1903 and 1913. Of two short adits, one is southwest of and about 70 feet higher than the other. The upper adit is 6 feet long and exposes a steep 4-inch-wide fault striking north 70 degrees east and carrying copper carbonates. The lower adit is driven southwestward 20 feet into partly altered diorite. Both north and northwesterly shears occur but are not mineralized. The diorite contains a trace of disseminated chalcopyrite. No pink veins occur in the general vicinity. Bornite was reported in the showings, on which there were once a number of open-cuts.

The *Orphan Boy* workings date from the early years of activity. A brief description is given in the Annual Report for 1903 (p. 179). A shaft, now flooded, was stated then to be 30 feet deep. Nothing can be seen at the collar of the shaft, but recent open-cutting has exposed, 20 feet from the shaft, an oxidized vein of sulphides following a shear that strikes east. Fifty feet north of the vein, which occurs in diorite with pink veins, a sheared contact of picrite-basalt and diorite is exposed. This contact is again visible 400 feet to the southeast, but at neither place is mineralization evident. Two surface holes, Nos. 23 and 24, were drilled with moderate dips northeastward to test this contact at greater depth. The core of No. 23, the only one examined by the writer, failed to show appreciable mineralization. The shear zone was intersected in this hole at a vertical depth of 200 feet.

The *O.K.* workings are three-quarters of a mile northeast of the Orphan Boy shaft. They are reported to consist of an adit and two shafts, of which one had east and west crosscuts at a 50-foot depth (Ann. Repts., 1899 and 1904). Makaoo Development Company has trenched in the vicinity of an old shaft about 10 feet deep, exposing several narrow oxidized veins of sulphide near a fault that strikes north 70 degrees east and dips northward. The host rock is diorite with pink veins. This shaft is not as deep as either of the reported ones, whose positions were not discovered by the writer.

Galaxy Minerals Ltd. (50° 120° N.E.) Head office, Room 1408, Royal Bank Building, 675 West Hastings Street, Vancouver; mine office, Kamloops. W. Fred Evans, president, Vancouver; W. I. Nelson, vice-president and general manager, Kamloops. This company holds seventy-eight mineral claims, the general boundary of which is shown on Figure 3. Six of the claims are Crown granted.

Underground work has been confined to the old shaft on the *Evening Star* (6) claim. This shaft was sunk to its final depth of 90 feet between 1903 and 1908. A shipment in 1916–17 is recorded of 53 tons of material containing about 0.5 ounce per ton of silver and 5 per cent copper. The present company cleaned out and retimbered the shaft and did 1,545 feet of trenching, mostly in the vicinity of the shaft. A total of 1,247 feet of diamond drilling was done at various sites shown on Figure 3. Four thousand feet of road was built.

Workings extending from the shaft consist of a drift 15 feet long and a northeasterly crosscut 60 feet long. The drift on the 55-foot level and the first part of the crosscut on the lower level expose talcose, serpentinized basaltic tuff. This rock is strongly sheared and foliated on planes striking north 50 to 60 degrees west. Mineralization is sparse and consists of narrow stringers and disseminations of chalcopyrite. These are associated with magnetite nodules and rather abundantly disseminated pyrite. Stronger mineralization occurs between two faults of north dip at 24 and 32 feet respectively from the shaft. A chip sample across 3 feet close to the northern fault assayed: Gold, 0.01 oz. per ton; silver, trace; copper, 1.7 per cent. The succeeding, more blocky fracturing tuff contains a very small amount of sulphide. At 53 feet a narrow fault strikes north 60 degrees east and dips 70 degrees to the north. Beyond it is diorite with pink feldspathic patches and disseminated chalcopyrite. A sample of this rock at the fault assayed: Gold, 0.01 oz. per ton; silver, 0.2 oz. per ton; copper, 0.65 per cent.

Two hundred feet northeast of the Star shaft, and probably on the Golden Star claim, is a short adit driven northeastward in tuff. A number of open-cuts explore an area immediately north of the shaft. The trenched area forms a rectangle 600 feet in a north-northwesterly direction and 300 feet east-northeasterly. Fractured grey tuffs and coarser-grained volcanic rocks are mostly exposed. Albitized diorite occurs at and southwest of an old shallow shaft 500 feet north-northeast of the Star shaft. Lenses of similar rock occur elsewhere, in sheared contact with the volcanics. Some of the lenses are highly albitized and have a small content of quartz. Faults and minor shears trend north 60 degrees west and carry limonite derived from sulphides. The end of one trench overlies the face of the crosscut; it indicates that the mineralized zone at the face is unlikely to be more than a few feet in width. In the vicinity of an old shallow pit 900 feet southeast of the Star shaft, two open-cuts have been bulldozed. They expose tuff with limonitic shears of uncertain strike. At the old pit, said to have been a gold prospect, a zone of intense carbonate alteration may represent a fault striking north 70 degrees east.

A strong topographical depression extends from the Star workings northwestward, passing south of the Lucky Strike (7) shaft. Immediately north of the depression and 400 feet south of the shaft, a pit 25 feet in diameter exposes a strongly oxidized zone that strikes north 60 degrees west. The only sulphide now preserved is pyrite. The host rock is feldspathized diorite similar to that at the Lucky Strike shaft. A shallow inclined diamond-drill hole, No. 9, was put down between this pit and the Lucky strike shaft. It failed to intersect mineralization.

Inland Copper Mines Ltd.

(50° 120° N.E.) Company office, 1519 Marine Building, 355 Burrard Street, Vancouver; mine office, Kamloops. W. I. Nelson, manager, Kamloops. This company holds by location seventy-one mineral claims in two areas shown on Figure 3. Work comprised trenching at scattered localities, totalling 297 feet in length, 1,081 feet of AX diamond drilling, and 136 feet of X-ray diamond drilling. Those holes whose cores were examined by the writer are located on Figure 3.

Two shallow AX holes were drilled to explore showings on the Windsor (8) group of claims 1⅓ miles east-southeast of Jacko Lake. Old workings spaced along a line 260 feet long, trending north 80 degrees west, consist of an inclined shaft more than 20 feet deep and several trenches and shallow pits. The rocks are Nicola volcanics, including banded tuff. The exposures in the workings indicate that a fault, striking north 80 degrees west and mineralized across a width of 3 feet, gives place westward to two or more fractures whose strike is north 60 degrees west. The fractures dip about 60 degrees to the north. Mineralization consists of chalcopyrite and abundant pyrite, rather coarsely crystallized in calcite and quartz gangue. Sulphides extend into the adjacent sheared greenstone. Samples of the best material on the dumps at the shaft and the large pit assayed 1.5 and 0.69 per cent copper respectively. Negligible amounts of gold and silver are present.

The diamond-drill holes, inclined to the southwest at minus 45 degrees, were not placed advantageously to intersect the mineralization should it persist to depth. Minor pyrite-magnetite mineralization was encountered at shallow depth in hole W2 300 feet northwest of the shaft. This hole ended at a depth of 220 feet, approximately on the strike of the fault in the shaft and 260 feet from it. At the end the hole passes from greenstones into strongly albitized and brecciated diorite and microdiorite. Hole W1 ends 50 feet to the northwest of the eastern large pit at a depth of 134 feet. An additional 20 feet of drilling would possibly have intersected the fault seen in that pit. The hole passes through altered picrite-basalt into greenstones and back into serpentinous rock. Minor pyrite occurs near the end.

Trenching is reported to have been done by the present company on the Jay group of claims, which lies north of the Python group. At several localities in this vicinity, hydrothermally altered volcanic rocks are stained by malachite. A specimen from close to the west bank of Guerin Creek, about 1,200 feet south of the abandoned coal mine, shows specks of native copper within epidosite. This rock, made up entirely of quartz and epidote, is traversed by occasional minute veinlets of chalcocite. Several old diggings occur in the general area.

Iron Mask (Kamloops Copper Company Ltd.)

(50° 120° N.E.) Company office, Royal Bank Building, Kamloops. J. W. Murray, manager. This company holds forty mineral claims, of which seven are Crown granted. Within the property shown on Figure 3 are several privately owned Crown-granted claims. The company was formed in 1951 to take over property that included the Iron Mask (9) mine. A shaft now known as the Larsen was deepened from 35 to 90 feet slope depth on the Night Hawk (10) claim, and the shaft on the Lucky Strike (7) claim was retimbered. In 1952 the property was optioned by Berens River Mines Limited. The Larsen shaft was again deepened, a first-level station cut at 90 feet slope depth, and a drift run west for 65 feet. Three holes totalling 400 feet were drilled underground, presumably all from a drilling-station which exists at the end of this drift. An electromagnetic survey of the property was followed by diamond drilling on surface. Nine holes were drilled, totalling 2,300 feet. Four of the holes were drilled in

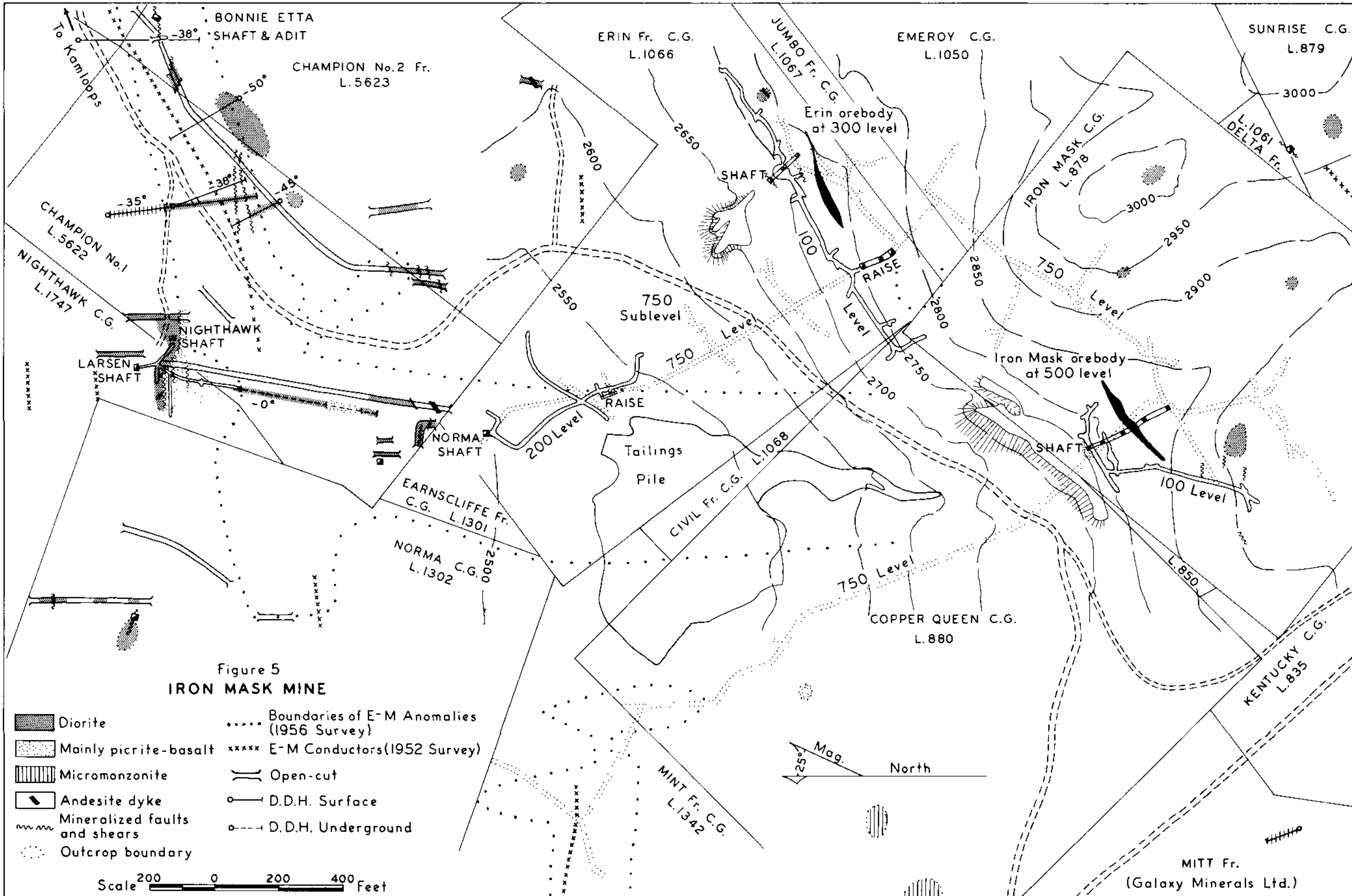


Figure 5
IRON MASK MINE

the general neighbourhood of the Lucky Strike shaft, four in the vicinity of the Larsen and Bonnie Etta workings, and one on the L.S. No. 1 Fractional claim, across the highway from the Larsen shaft. Where known, the sites of these surface holes are indicated on Figure 3 or on Figure 5.

In 1956 Kamloops Copper Company unwatered the Larsen shaft and extended the working on the 90-foot level. A total of 292 feet of crosscutting and 230 feet of drifting were done. Four holes totalling 1,400 feet were diamond drilled from the end of the crosscut.

A total of 12,000 lineal feet of bulldozer trenching was done, of which about 60 per cent exposed bedrock. Excepting some trenches made late in the year, all are shown on Figure 5. Surface diamond drilling amounted to three holes totalling 1,800 feet. An electromagnetic survey was made of an area measuring 6,000 by 6,000 feet that extends immediately north of the Iron Mask shaft.

The *Larsen* shaft, started in 1905, is sunk on the dip of a vein at 63 degrees due south and has a slope depth of 100 feet. At 90 feet a crosscut extends south 30 degrees west for 104 feet, then south 10 degrees west for 185 feet to the face. The elevation of the level is close to that of the 200 level of the Norma workings, toward which it has been directed. One drift extends 100 feet to the east and two others extend 65 and 133 feet to the west respectively.

In the Larsen workings the main or No. 1 zone of mineralization is in diorite north of a faulted contact with picrite-basalt, which is altered as previously described (p. 52). Where seen along the southern west drift, this contact dips very steeply. To the south the crosscut exposes picrite-basalt to the face. The inner part of the east drift is said to follow the contact. Except in the first west drift, the diorite is mostly altered to a replacement breccia similar to that of the Python zone. Pink veins ramify through the rock, which contains introduced orthoclase feldspar, magnetite, and chalcopyrite. Much calcite is present. In the second west drift are irregular dyke- or lens-shaped masses of white rock which contains pink veins and is generally mineralized. This rock consists principally of plagioclase feldspar, calcite, and epidote, and represents diorite which is almost wholly recrystallized. Albitization is not known to have occurred in the neighbourhood of the Larsen workings.

The southern west drift follows a well-mineralized fault zone 5 to 6 feet wide. Each wall follows fairly closely a persistent vein of chalcopyrite. The veins swell and pinch from place to place and range in width to 6 inches or more. They are linked obliquely by other fissure-controlled veins of similar width, whose strike is about north 60 degrees west. In the first 75 feet of the drift there are at least three oblique veins, of which two dip southwest moderately steeply. Other oblique veins may occur beyond the northernmost persistent vein. In addition, the diorite and white rock are traversed irregularly by minor stringers of chalcopyrite and carry disseminated chalcopyrite. The veins are brecciated and in places vuggy; much of the sulphide is granular. Oxidation is slight. Calcite, epidote, and gypsum occur in the gangue, together with occasional well-crystallized fluorite, prehnite, and zeolite. Talc and gypsum occur on slips in the diorite. Minor chalcocite is said to occur in material on the dump. The average assay of chip samples taken across drift-width, 13 feet from the crosscut, is: Gold, 0.03 oz. per ton; silver, 0.1 oz. per ton; copper, 2.25 per cent. At the place of sampling the northern vein was very narrow.

A narrow east vein occurs between the No. 1 zone and the shaft station. The vein on which the shaft is sunk is oxidized to a depth of about 30 feet, and here appears to be 3 feet wide. At the working level, the vein is not very wide, but the diorite at the shaft has disseminated chalcopyrite.

For a distance of 190 feet south of the contact, picrite-basalt encloses numerous lenticular masses of white rock containing pink veins and disseminated sulphide. The masses are shear bounded, and closely spaced faulting is general throughout the whole section. Talc occurs on the slips. Only two faults are significantly mineralized. The southerly one, 105 feet from the contact, is termed the No. 2 zone and is 3 feet wide, strikes east, and dips steeply south. It contains several narrow coalescing veins of chalcopyrite.

Two holes drilled south from the face of the crosscut did not penetrate an appreciable amount of mineralization. Hole A1 was horizontal and 436 feet long; A2, 451 feet long, was drilled in the same direction as A1 but at minus 25 degrees. These holes showed the picrite-basalt to have a steep south-dipping contact with altered diorite 50 feet south of the crosscut. A further 90 feet of picrite-basalt with white rock was intersected at 290 feet in hole A1. This same mass was intersected in A2 at 333 feet and continued to the end of the hole. In A1 small amounts of chalcopyrite occur at the picrite-basalt contact and in a shear zone midway in the mass. Further picrite-basalt succeeds diorite 220 feet north of the Norma workings in a long cut; 50 feet to the west, steep 6-inch-wide veins are in white diorite with pink veins.

There is no precise indication as to how far the No. 1 zone extends west of the Larsen workings. A long trench 2,600 feet west of the shaft failed to reach bedrock. A trench farther west exposes unmineralized diorite, but at an old shaft near by a vein 1 foot wide strikes north 70 degrees west and extends for 49 feet.

At the Night Hawk shaft, diorite contains disseminated chalcopyrite. Farther east the diorite contact with picrite-basalt coincides with an oxidized vein which strikes east and dips to the north at 70 degrees.

The *Bonnie Etta* adit is 55 feet long. A shaft of unknown depth is east of the adit and about 20 feet higher in elevation. In 1929, 33 tons of material was shipped from these workings containing: Gold, 0.25 oz. per ton; silver, 0.75 oz. per ton; copper, about 9 per cent. The content of gold and silver is unusually high for the area. The workings are in diorite intersected by pink veins. No mineralization was seen in the adit north of a fault zone that probably continues into the shaft. The zone strikes east in the adit and north 60 degrees east at the shaft. It is 6 feet wide in the adit, and dips steeply. A grab sample of partly oxidized material within the fault zone assayed: Gold, 0.52 oz. per ton; silver, 1.6 oz. per ton; copper, 5.3 per cent.

Surface hole No. 104 is reported to have encountered mineralization at a vertical depth of about 250 feet beneath the workings.

Three inclined surface holes were diamond drilled in 1952 in the area between the Bonnie Etta and Larsen workings. In 1956 a long inclined hole, No. 102, was drilled in the same area and roughly parallel to No. 104. The positions of these holes are shown on Figure 5. Hole 102 intersects micromonzonite to 226 feet, this rock being mineralized only with sparse pyrite; beyond is altered diorite, with occasional weak chalcopyrite impregnations and four widely spaced veins, each a few inches wide. Veins intersected at 472 feet and 522 feet may be correlated with ones recorded in the logs of earlier holes KC6 and KC7, and which are visible in an open-cut. They are vertical and strike nearly east, but are unlikely to continue on that trend for many feet east of the open-cut since massive unmineralized diorite is seen in that direction. Altered picrite-basalt is exposed in the cut immediately south of the veins but is not encountered at depth or in the northerly inclined hole KC7.

The interconnected *Iron Mask, Erin,* and *Norma* workings are now flooded to an elevation slightly below the collar of the Norma shaft, at 2,500 feet. Information about the property is contained in the Annual Reports of the Minister of Mines from 1896 to 1928, of which the most informative are those of 1913 (pp. 185–187), 1915 (pp. 210–215, 367), 1926 (pp. 182–185), and 1928 (pp. 208–209). The 1926 account includes a plan of the workings. The Iron Mask has seven levels, the lowest being at 750 feet slope depth below the collar. The Erin has levels at 100 and 300 feet vertical depths, the lower parts of the orebody being worked from the Iron Mask system. A raise connects the 750 level of the Iron Mask with the 300 level of the Erin. The Iron Mask shaft is inclined at 68 degrees and the Erin shaft at 70 degrees. The Norma shaft is sunk vertically to a single level 200 feet below the collar. A raise connects this level with the Iron Mask 750 level, which is estimated to be 160 feet lower in elevation.

Total recorded production from the property is: Gold, 3,794 oz.; silver, 14,843 oz.; copper, 5,390,723 lb., from 182,494 tons of ore mined between 1901 and 1928. The greater part was from the Iron Mask orebody, and, in addition to the Iron Mask and Erin orebodies, smaller ones were worked south and east of the Iron Mask shaft. Mining was by shrinkage stoping. Some of the ore was hand-sorted for direct shipment. Development was pushed in 1910 and a gravity mill installed; a flotation plant was added in 1917. Prior to completion of the Erin raise in 1916 or thereabouts, the partly oxidized Erin orebody was separately worked. The mine was closed between 1920 and 1925, except for a brief period of production in 1923. From 1925 until 1928, when the property finally closed down, extensive development was accompanied by some production, largely from smaller orebodies. The mill was removed in 1930. After World War II, quantities of high explosives were jettisoned into the Iron Mask and Erin shafts, whose collars are now wrecked and caved.

The Iron Mask and Erin orebodies were of similar shape, size, and attitude. Each was lens-shaped in plan and about 175 feet in horizontal length. Possibly they possessed a distinct easterly pitch (Ann. Rept., 1913, p. 186). Their widths were fairly similar; including low-grade ore, the Erin orebody generally did not exceed 30 feet, whilst the Iron Mask orebody attained a maximum width at lower depths of more than 20 feet. Both orebodies strike north 65 degrees east. The mine plans show that both orebodies dip about 75 degrees to the southeast, and that the Erin orebody dips less steeply above the 300 level. Stope outlines of both orebodies are lenticular above the 600 level. At this level the Erin orebody splits eastward. The Iron Mask orebody continued to 690 feet slope depth, where it is reported to have been cut off by a low-angle fault. The footwall of each orebody is recorded as well-defined and the hangingwall as indefinite. Mention is made in both cases of an unmineralized, crushed black rock immediately on the hangingwall. This tough rubbery material (Ann. Rept., 1915, p. 214) may refer to picrite-basalt breccia, which is exposed on surface near the footwall of the Iron Mask orebody.

Seventy-five feet west of the Iron Mask shaft, mineralized diorite in contact with picrite-basalt has been mined to within 8 feet of the surface. The exposed contact is irregular in detail, being essentially breccia of mineralized white rock and unmineralized picrite-basalt. It strikes about north 55 degrees east and dips at about 60 degrees to the southeast. Chalcopyrite occurs as disseminations and stringers. Iron oxide is abundant in a small vein in the northern wall of the breccia zone. At the shaft itself, a mineralized fault zone 5 feet wide strikes north 60 degrees east in diorite and dips at about 60 degrees to the southeast. The footwall of this zone is poorly defined and contains another mineralized zone that dips at 35 degrees to the southwest. Picrite-basalt is not seen.

The Erin shaft collar exposes a heavily oxidized breccia, about 20 feet in width, with no picrite-basalt in evidence. The Erin orebody is oxidized at least to the 100 level (Mem. 249, p. 107), but the quantity of oxidized material remaining is said to be not very large (Ann. Rept., 1923, p. 149).

There is little record of the mineralogy of the Iron Mask ore. On the dump, the only mineralized material seen is diorite carrying disseminated chalcopyrite. Ore mined in 1923 was stated to carry pyrite. The reported association of gypsum and talc in fracture planes in diorite near the bottom of the Iron Mask shaft is similar to the occurrence in the Larsen workings. Gypsum gangue occurred in one of the late developed orebodies in the eastern workings (Ann. Rept., 1926, p. 185). The oxidized material

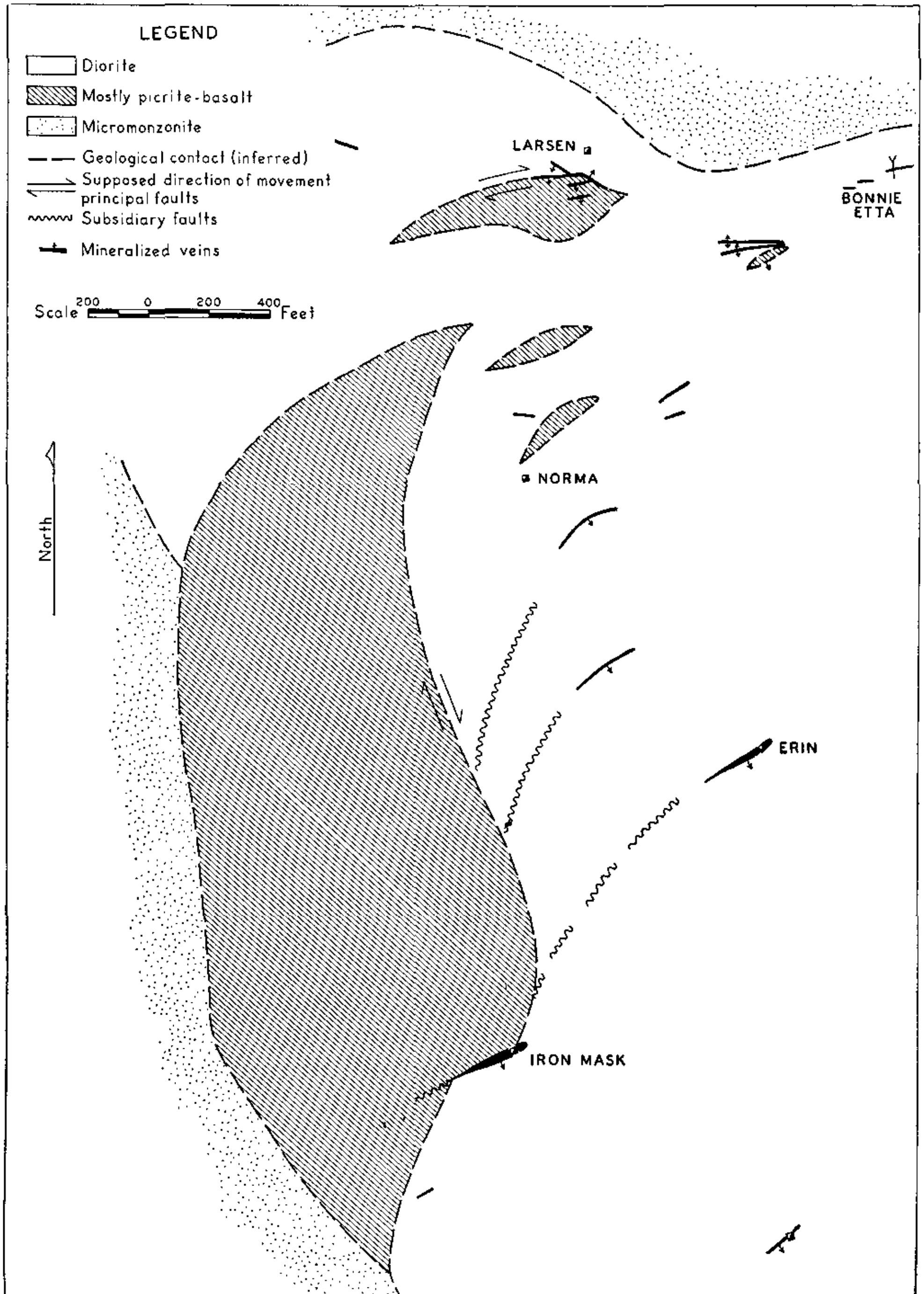


Figure 6. Hypothetical structural interpretation in the vicinity of the Iron Mask mine.

of the Erin orebody contained chalcopyrite, with some malachite, azurite, and cuprite. A little bornite was seen on the dump.

A number of smaller orebodies were developed. On the 600 level about 330 feet north of the Erin shaft station, a vein 14 inches wide was followed 450 feet in a drift. In 1928 production was principally from an orebody about 900 feet northwest of the Erin orebody. It was worked on the 750 level to a width of 12 feet, a length of 120 feet, and a height of 90 feet. Much of the material was low in grade. An oreshoot in the same vein on the 200 level was higher in grade but smaller. Two other veins developed on the 750 level apparently lay east of the Erin orebody in an area where possibly not all the existing workings are recorded. One was 14 feet wide and averaged over 4 per cent copper. The other lay 300 feet farther east and, on the level, was low in grade; it had not been mined when the property closed down. Material, some of high grade, was mined near the Iron Mask shaft station on the 750 level. The mine plans show numerous holes diamond drilled from the 600 and 750 levels outward from the Iron Mask workings. Considerable drilling was done in 1916–18 to locate a lower portion of the Iron Mask orebody, which was stated in 1918 to have been found. The western long crosscut to the north on the 750 level is not known to have intersected mineralization. It was probably driven in picrite-basalt, large quantities of which occur on the dump.

South of the Iron Mask shaft, several narrow east-trending veins of oxidized material are exposed. At a caved shaft 1,100 feet southeast of the Iron Mask shaft, an oxidized fault zone 2 feet wide with copper carbonate strikes north 50 degrees east and dips 70 degrees southeast. Late in 1956 the Kamloops Copper Company did some surface stripping in this locality.

The *Lucky Strike* shaft, now flooded, is 2,700 feet south of the Iron Mask shaft. At a depth of 60 feet a drift of unknown direction is reported to extend 120 feet on a vein said to be 3 to 4 feet wide. Recorded production is 30 tons in 1901, containing about 20 per cent copper, no gold, and negligible silver. The shaft was retimbered in 1951. A small dump shows disseminated chalcopyrite in diorite. The sulphide is not intimately related to pink veins, but occurs close to calcite-filled fractures. Magnetite veinlets occur. Three inclined holes were diamond drilled in the vicinity by Berens River Mines Limited, through short conducting zones trending east-northeast, and all intersected faults in diorite with only minor mineralization.

Ajax and Monte Carlo (The Consolidated Mining and Smelting Company of Canada, Limited)

(50° 120° N.E.) This company holds sixteen full and fractional claims by record and four Crown-granted claims under lease. The boundary of this block, known as the Ajax-Monte Carlo group, is shown on Figure 3. Work done in 1956 was 3,029 feet of diamond drilling in six surface holes. These holes were all drilled in the vicinity of the Ajax claim, as were fourteen holes totalling 7,250 feet that were drilled in 1955. The drilling followed upon an electromagnetic survey made in 1954; drilling was done by the company in the same area in 1929.

Trenching was done on the *Ajax* claim (11) between 1904 and 1910, and two caved adits lying immediately northwest of the claim may date from that period. The only accessible workings on the claim are two adits 81 and 29 feet long, driven north and south respectively from opposing sides of a low mineralized ridge. The longer adit was driven in 1924, and the results of sampling in it are given on page 147 in the Annual Report for that year. A winze sunk before or during 1928 was said to have exposed material of sufficiently high combined gold and copper content to have stimulated the subsequent drilling programme. In 1929 the Consolidated Mining and Smelting Company trenched and sampled the area and drilled ten surface holes whose positions are shown on Figure 7. The results of the drilling are discussed in the Annual Report for 1929, pages 226 to 228. Neither cores nor logs were available for examination in 1956. This earlier drilling was confined to an area extending about 720 feet west-northwest from the adits and about 400 feet wide. The results were summarized as pointing to sparse sulphide mineralization in a zone approximately 250 feet wide and trending north 65 degrees west, with a steep dip to the north. Lenses of barren ground were recognized within the zone. In general, no lateral continuity was indicated for seams of any considerable width having an economic metal content. The best indication of continuity in depth was obtained beneath the adits.

The adits are in grey-white albitized microdiorite. The southwest-driven one shows a confused series of faults but little mineralization. The northeast-driven adit follows a zone of faulting and shows mineralization for 61 feet, commencing 17 feet from the portal. A sample 58 feet from the portal assayed 0.85 per cent copper, mostly as carbonate. A sample of the best mineralization seen, in partly oxidized material at 22 feet, assayed: Gold, trace; silver, 0.90 oz. per ton; copper, 32.9 per cent. This sample may have contained chalcocite in addition to thickly disseminated chalcopyrite and copper carbonates. Half-way in the mineralized section, at 49 feet from the portal, a winze about 30 feet deep follows a strong fault striking north 45 degrees west and dipping 80 degrees northeast. Oxidation has produced much ochre at the fault and in its footwall. On the surface, immediately above the footwall portion of the adit, a large pit is dug in gossan. A line of cuts extends on either side of the adit for 450 feet in a west-northwesterly direction. Eighty feet northwest of the adit, chalcopyrite occupies slender veinlets in albitized rock, probably on the hangingwall of the fault.

Except near the workings, rock outcrops are few in the area drilled. From a total of 10,279 feet of drilling done in 1955 and 1956, all but 1,000 feet of core was available for examination. Figure 7 shows the inferred distribution of rock types at the bedrock surface.

Five diamond-drill holes lie east of the area of Figure 7. Four were drilled from two set-ups, one on either side of the Mars adit, which is 1,800 feet east of the Ajax adits. The fifth remaining hole, No. 23, was drilled south of the others and penetrated picrite-basalt. Scattered mineralization was encountered in the four Mars holes.

In the explored area, significant mineralization principally occurs in the finer-grained batholithic rocks, equivalent in original composition to diorite, monzonite, and granodiorite. It occurs less frequently in coarser-grained batholithic rocks—namely, diorite, pyroxenic diorite, and pyroxenite—and in greenstones which may in part represent dykes but which are mostly Nicola volcanics. Picrite-basalt is not significantly mineralized. In the western part of the Ajax claim the finer-grained batholithic rocks have an interfingering contact with diorite; elsewhere in this area they are in contact with pyroxenic diorite and pyroxenite.

Albitization is common in all but the darker-coloured rocks. As a result, epidote is prominent both as a dissemination and as replacement veinlets. Quartz, with or without calcite, appears subordinately as veinlets; mineralized calcite or calcite-quartz breccias occur and are commonly vuggy. Where chalcopyrite occurs in veins or in vuggy breccias, calcite is the most common gangue mineral. With albitization the rocks become less magnetic; one 6-inch intersection of solid magnetite observed in non-magnetic, partly albitized microdiorite may indicate some tendency toward hydrothermal concentration of this mineral. The magnetite content is relatively high in chloritic sheared sections.

A relationship between albitization and mineralization is generally suggested. The most uniform albitization is in rocks near the adit, where the best mineralization occurs. In drill cores throughout the property, intensity of albitization commonly changes foot by foot, and in detail seems unrelated to intensity of mineralization.

Intersections shown as mineralized on Figure 7 are those judged to be equal to or better than 0.35 per cent copper. Partial oxidation rarely penetrates to a depth of 140 feet below the surface and is generally confined to the upper 50 feet. Except for car-

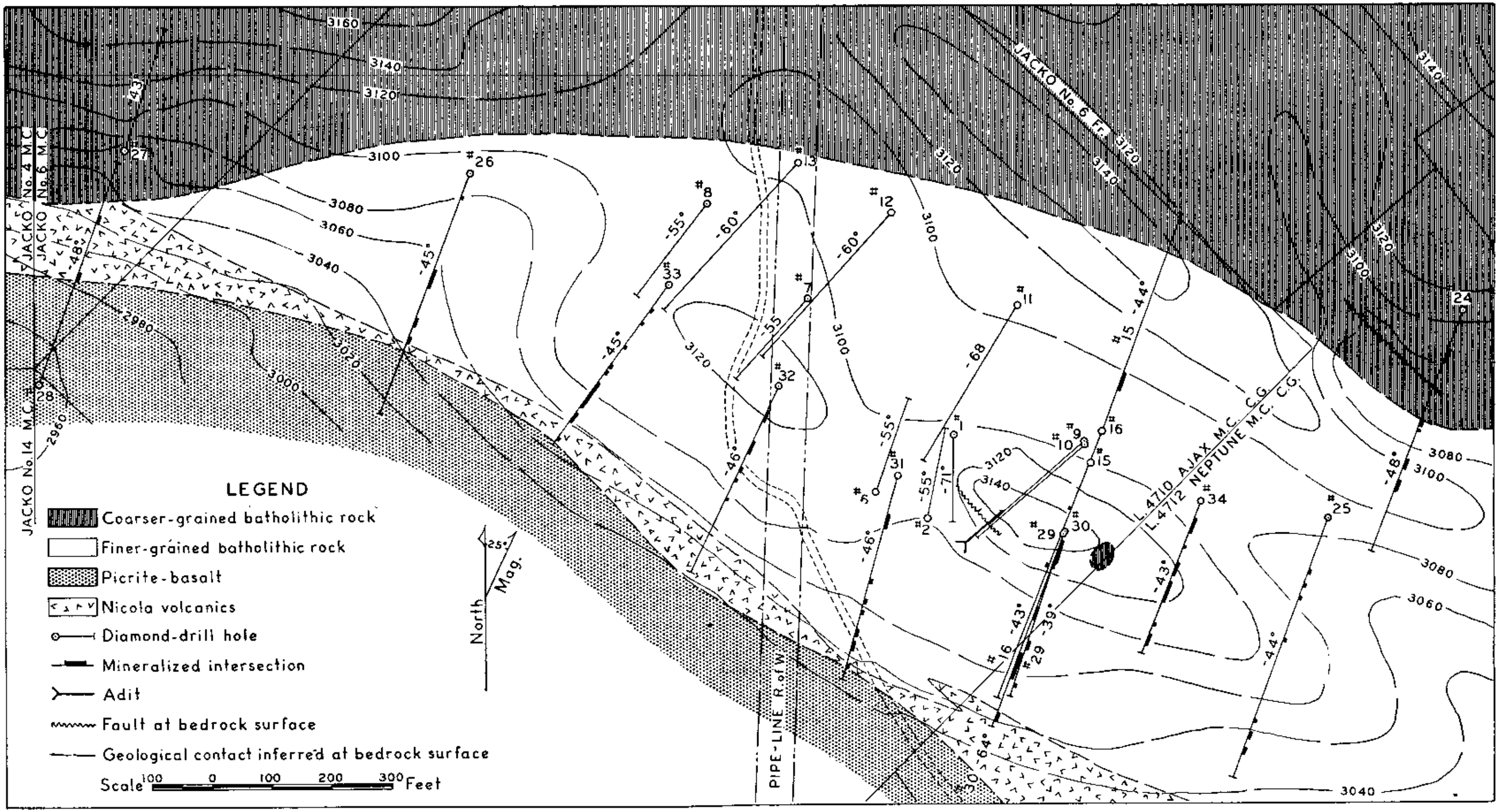


Figure 7. Ajax mineral claim. Diamond drilling, mineralization, and inferred geology.

bonates above these levels, chalcopyrite is the only copper-bearing mineral identified. It occurs as stringers as much as one-half inch wide, as blebs, and as a fine dissemination. Pyrite may accompany disseminated chalcopyrite or may occur separately. It is prevalent in sheared sections close to the southern margin of the finer-grained batholithic rocks, either in the latter or in greenstones and picrite-basalt.

The deepest penetration in the Ajax area, in hole No. 30, shows that mineralization occurs at least to a depth of 630 feet below surface. Correlation of the mineralized intersections is possible only in the vicinity of the adit. Information recorded in 1929 suggests that the steep mineralized zone seen in the adit persists on the footwall side to a vertical depth of 280 feet below the adit and maintains a width greater than 60 feet, inclusive of barren lenses. It is 25 feet wide where cut by hole No. 1. Holes Nos. 29 and 30 indicate that eastwards the zone maintains a width of 55 feet at the elevation of the adit, and that mineralization continues in the footwall to a depth of at least 40 feet below this elevation. The strike of the zone is north 65 degrees west. A vertical section through holes Nos. 16, 29, and 30 suggests that here the dip of the hangingwall is about 60 degrees. In this section the width of the zone narrows drastically at an elevation 140 feet below the adit, probably because at this depth the host rock is pyroxenite and pyroxenic diorite. Summarizing, it may be concluded that the adit zone persists laterally at shallow depth for at least 185 feet, and to a maximum known depth of 270 feet.

Evidence of faulting is widespread, and correlation of faulted intersections is difficult. Surface exposures suggest that faults of northwesterly strike and steep dip are important, and originated prior to mineralization. The picrite-basalt contacts are strongly sheared and are likely to be steep. So far as known, they are not well mineralized.

The *Wheal Tamar* workings (12) consist of six shafts, a caved adit, and several caved trenches. Work on this claim was mainly done prior to 1910, and is referred to in Annual Reports between 1899 and 1916. In the latter year the Granby Company is reported to have diamond drilled in the vicinity, but the results are not recorded. In 1909 the underground workings were stated to total over 700 feet, which included the shafts and the adit, then 470 feet in length. No production is recorded. The workings are at 3,200 feet elevation on the contact between diorite and porphyritic microdiorite. Material on the dumps is not albitized, but albitized rock outcrops near the southernmost shaft. None of the workings could be entered.

Three of the shafts lie on a line north 40 degrees west; the northern and southern ones are flooded. The central one is 30 feet deep and has a fair-sized dump, indicating workings at the bottom. A sample of the best material seen on the dump assayed: Gold, 0.04 oz. per ton; silver, 0.1 oz. per ton; copper, 2.0 per cent. The northern flooded shaft, 100 feet distant, has a smaller dump, from which two samples were taken. One, representing the best material seen, assayed 1.7 per cent copper; the other, selected as an average of the dump, assayed 0.49 per cent copper. Sixty feet due northeast of this shaft, and connected by a caved surface cut, a fourth shaft is 40 feet deep. Material on the dump is not well mineralized. A fifth shaft, showing oxidation to 25 feet depth, lies 150 feet slightly south of east of the fourth. Close to it is a sixth shaft, 10 feet deep. Four of the shafts are sunk on steep faults striking west of north. The fault in the 30-foot shaft is well defined, mineralized, and strikes north 5 degrees west and dips 70 degrees to the east. It is out of line with somewhat more northwesterly faults in the two shafts to the north and is displaced by a fault striking east-northeast. Faults of this latter direction occur on strike in the eastern workings. Mineralized material on the various dumps shows chalcopyrite and pyrite in fissures, commonly associated with disseminated epidote. Coarser gangue material includes quartz, calcite, and ankerite. A small amount of bornite is present.

The portal of the caved adit is 350 feet south-southwest of the southern flooded shaft and about 150 feet lower in elevation. It is driven northward in porphyritic microdiorite, somewhat mineralized with chalcopyrite. A sample of the best material seen on the dump assayed: Gold, 0.09 oz. per ton; silver, 0.2 oz. per ton; copper, 3.0 per cent. It consisted of chalcopyrite in fissures within partly albitized porphyritic microdiorite. The adit is stated to cut a mineralized zone south of the shafts.

The *Monte Carlo* workings (13) are 1,400 feet east of the Wheal Tamar adit. In an adit that is now caved the present company did 90 feet of drifting in 1929. About 180 feet southeast of this adit is an old shaft, said in 1924 to be 60 feet deep, on the dump of which is a small quantity of material mineralized with chalcopyrite and carbonates. Strongly oxidized material is exposed in a pit 60 feet southwest of the shaft.

Microdiorite on the dumps is albitized. Porphyritic olivine-basalt, much altered to serpentine, chlorite, and tremolite in the manner described elsewhere for picrite-basalt, is on the adit dump. In 1929 the present company drilled three inclined holes 800 feet in total length, between the shaft and the adit. Logs of the holes are not now available. Failure to intersect mineralization was ascribed to offsetting of the mineralized zone by cross-faults (*Minister of Mines, B.C.*, Ann. Rept., 1929, p. 227).

Four diamond-drill holes were put down in 1952 by Berens River Mines Limited in the general vicinity of the Monte Carlo claim. At least two of these holes were drilled midway between the Wheal Tamar and Monte Carlo adits. None of the holes intersected significant mineralization.

Commercial Minerals Limited

(50° 120° N.E.) Head office, Suite 2, National Trust Building, 10072 Jasper Avenue, Edmonton, Alta. R. E. Frederking, president. This company controls twenty-nine mineral claims, in a block whose outlines are shown on Figure 3. It includes the Joker (14), Jim, Ray, and Cupid groups. The Amakua group (15) adjoins the northeastern limit of the property and was formerly controlled by this company.

In 1956 work consisted of sampling the old Joker adits, 130 feet of bulldozer stripping, and 5,500 feet of surface diamond drilling.

On the *Joker* claim two short adits are 40 feet apart on a steep bluff on the west bank of Anderson Creek. Recent stripping has removed most of both adits, which expose an oxidized fault zone striking about north 20 degrees west and dipping 20 degrees westward. The fault zone is about 2 feet wide, with a poorly defined footwall and a hangingwall of grey microdiorite. The footwall is brecciated and heavily oxidized for a visible depth of 7 feet. A minor northeasterly fault cuts the zone and may displace it 2 or 3 feet downwards to the northwest. A chip sample taken across 18 inches where the northeasterly fault cuts the footwall breccia assayed: Gold, 0.01 oz. per ton; silver, 0.1 oz. per ton; copper, 1.5 per cent. Malachite was the only copper-bearing mineral seen in this oxidized material. The shallow-dipping fault has been exposed by stripping for 120 feet south-southeast. Forty feet farther in this direction, unmineralized micromonzonite is exposed.

Immediately west of the adits twenty-two vertical holes spaced at 50 and 100 feet have been diamond drilled in a drift-covered area measuring 400 feet westerly and 300 feet from north to south. From the southernmost adit, the mineralized zone dips uniformly west-southwest at 15 degrees for a horizontal distance of 350 feet. It achieves a maximum thickness of 20 feet, 110 feet from the adit, and is about 5 feet thick and of poor grade where intersected by the deepest hole. The zone splits into two shoots 100 feet due west of the northern adit. In the northernmost line of drill-holes showing mineralization, the upper flat shoot is as much as 24 feet thick. The lower one is here 9 feet thick, and is of limited east-west extent. The full northwestern extent of the shoot is not proved; where last intersected in this direction, it is 5 feet thick, although the grade is not reduced. Closer to the adits the northern limit of mineralization is well established.

Hole No. 40, 250 feet south of the adits, intersected a further series of thin mineralized zones, apparently of low dip. Three other holes in the same area and one to the east of the adits showed no mineralization. Various assessment holes drilled elsewhere on the property are indicated on Figure 3.

The mineralization is principally native copper disseminated in microdiorite and micromonzonite. A minor amount of chalcopyrite also occurs disseminated and occasionally in narrow stringers associated with chalcocite. Chalcocite occurs in this area to a depth of at least 62 feet. White alteration affects some of the rock and magnetite is partly altered to hematite, but these alterations do not appear closely related to the mineralization. A trace of chalcopyrite occurs in sparse, diffuse, pink feldspar veinlets, with which quartz veinlets are associated. Low-angle faulting is indicated throughout the area of mineralization.

Eight short vertical holes were diamond drilled by Commercial Minerals Limited in 1955 or 1956 in the immediate vicinity of the filled-in Grey Mask shaft, which is on the *Amakua* group, about 500 feet west of the Merritt highway. Three other vertical holes were drilled 700 feet south of the shaft and penetrated picrite-basalt with sheared contacts against narrow sections of poorly mineralized microdiorite. The total drilling done on the group was 1,306 feet.

The shaft is reported to be 28 feet deep, with a 40-foot drift to the south at the bottom. No mineralized material was seen on the shaft dump, but in a pit 140 feet to the southwest some coarsely intergrown calcite and specular hematite, with some chalcopyrite and quartz, was seen. Another pit exposes diorite traversed by a minor fault which dips northwest.

The drilling covered an area measuring 100 feet from east to west and 150 feet from north to south, with the shaft at the northeast corner. The holes were spaced at intervals of 50 to 100 feet and were drilled to a maximum depth of 240 feet in diorite penetrated irregularly by microdiorite. Both rock types show white alteration, not uncommonly with calcite replacement breccia. Much of the diorite is chloritic and traversed by shallow-dipping shear planes. It carries brecciated pink feldspar veins, with some epidote, minor chalcopyrite, and occasional magnetite veinlets. The best mineralization encountered was about 10 feet of sheared diorite, partly replaced by minerals of the same association as in the surface pit. The evidence suggests that this zone near the shaft trends north or northeastward and dips to the west. Minor amounts of native copper occur disseminated in sheared diorite outside this zone. One thousand feet southwest of the shaft a vertical hole on the Joker group intersected a 1-foot wide section rich in chalcopyrite.

Other Mineralized Localities

The *Iron Cap* mine (16), now flooded, is on the Iron Cap Crown-granted mineral claim. Production was 263 tons of material containing: Gold, 0.8 oz. per ton; silver, 1.7 oz. per ton; copper, 2 per cent. A sample of material collected from the dump assayed: Gold, 0.68 oz. per ton; silver, 0.7 oz. per ton; copper, 1.7 per cent. In this sample, pyrite exceeded chalcopyrite, whereas in most of the material on the dump the reverse is true. Pyrite in the wallrock of the orebody is recorded as having no appreciable gold values. The mineralization occurs in a monzonitic rock which is probably altered diorite. The mineralization seen on the dump is in a pink feldspar replacement breccia resembling that of the Python zone. Gangue minerals include magnetite, epidote, calcite, quartz, and siderite.

The Iron Cap vein is 6 feet wide at the shaft; it provided ore to the 60-foot level. The vein is said to be faulted 85 feet northwest of the shaft, and its continuation beyond the fault has not been discovered. The fault was traced for a considerable distance to the southwest by an electromagnetic survey by Berens River Mines Limited in 1952. This company put down five diamond-drill holes on the Iron Cap and adjacent claims to the west. In all cases the conductors proved to be unmineralized faults. The locations of three of these holes are unknown.

Work done on the *Kimberley* group (17) of seven Crown-granted claims between 1904 and 1913 included driving a 200-foot adit. It is uncertain whether the three trenches shown on Figure 3 are in the northern or southern of two zones referred to in the Annual Report for 1909 (pp. 139–140). The trenches are largely caved. The central trench shows intermittent exposures of disseminated chalcopyrite and pyrite over a length of 450 feet. A sample of the best material seen, at a point 180 feet from the southwest end, assayed: Gold, trace; silver, 0.2 oz. per ton; copper, 1.8 per cent. At the southwestern end of the northern trench, pyrite and chalcopyrite are disseminated for an exposed length of 110 feet. One hundred and twenty feet beyond the northeast end of this trench is an outcrop with lightly disseminated chalcopyrite. An outcrop at the southwest end of the southern trench shows no mineralization. The rock exposed throughout this area is a monzonite, in part with slender pink veins, and commonly altered to white rock and brecciated. Most of the exposed fractures trend north or northwest, this being the general direction recorded of the mineralized zones (Ann. Rept., 1909, pp. 139–140). The wide surface extent of mineralization would seem to justify bulk sampling in this area.

The *Kingpin* workings (18) consist of two old adits and a shaft, and some fairly recent trenches. One adit is caved, and the other, 400 feet north of the first, follows an oxidized fault zone south 45 degrees west for 40 feet. The zone is 3½ feet wide and is pyritous. A flooded shaft near the portal of the caved adit has a small dump of microdiorite carrying disseminated pyrite and chalcopyrite. The trenches crosscut an area extending 300 feet southwest of the accessible adit. One or more oxidized fault zones are poorly exposed, and small amounts of disseminated chalcopyrite, malachite, and azurite occur in the partly altered microdiorite. This area has been explored by diamond drilling, and the cores are stacked in the adit.

Other workings, including the *Utopia* (19), *Dewey* (20), and *Fargo,* were examined. These three are described in Memoir 249.

CLEARWATER*

Trophy Mountain (51° 119° N.W.)

Silver-Lead-Zinc

Ash, Cam, etc. (Goldcrest Mines Ltd., Ormsby Mines Ltd.)

A large number of claims, including the Ash, Cam, and other groups, located in November, 1955, on the north side of Trophy Mountain were held under option in 1956 by Goldcrest Mines Ltd. and Ormsby Mines Ltd., of Toronto. Trophy Mountain, elevation 9,000 feet, is about 12 miles northeast of Clearwater station, and lies between the Clearwater and Raft Rivers. A camp was established on the north side of Trophy Mountain at an elevation of 6,400 feet. It was reached from Kamloops by pontoon-equipped aircraft, landing on Summit Lake, elevation 5,500 feet, thence eastward by pack-horse trail 2 miles to Discovery Hill at the head of Moul Creek.

During the summer of 1956 exploration work was under the direction of S. W. Wright, resident engineer, and M. E. Woakes, geologist.

The claims are underlain by metamorphosed sedimentary rocks ranging from quartz mica schists to biotite and granite gneiss and containing a few 4- to 10-foot limestone beds now mostly transformed to wollastonite and brown garnet.

The rocks are cut by unfoliated grey to white granitic dykes and sills which tend to follow the foliation planes and then cut across them. The rocks also enclose coarse pegmatites composed essentially of quartz, feldspar, and white mica and occasional pink garnet but no tourmaline. The pegmatites commonly have diffuse borders against the schists and gneiss, and in some areas form an injection gneiss complex. Finally,

* By S. S. Holland.

all the rocks and the lode mineralization are cut by dark blackish-green andesite porphyry dykes a few inches to a few tens of feet wide that occupy fractures striking north 10 degrees east and dipping 70 degrees west. These fractures are commonly normal faults of small displacement.

The rocks strike west, and on Trophy Mountain dip dominantly to the south, whereas on Discovery Hill they dip 35 degrees north. On Trophy Mountain the rocks are involved in overturned folds of several hundred feet amplitude and with low plunges northwestward. On Discovery Hill, however, no folding was observed; all rocks seemingly lie on a uniformly northerly dipping limb.

Sulphide mineralization outcrops on Discovery Hill, which lies north of Trophy Mountain, on the divide between the head of Moul Creek and Raft River, between elevations of 6,800 and 7,075 feet. The old showings were prospected and held at one time by Angus Horne, of Blue River. The mineralization is a replacement by pyrrhotite, sphalerite, pyrite, galena, and chalcopyrite along bedding planes and is conformable with the bedding. The mineralization occurs in three segments — the "east vein," "Ady vein," and "west vein"—and has a strike length of about 3,500 feet between terminal exposures. It is not known, however, whether the "veins" represent the replacement in each instance of the same sedimentary bed.

The east vein outcrops between elevations of 6,800 and 6,890 feet and has been traced along its length by open-cuts and drilling for 750 feet and down dip by short drill-holes for a distance of 650 feet. The mineralization ranges up to a maximum of 16 feet in width and averages about 7 feet. In several places the lode is cut by post-mineral dykes occupying faults which have displaced the mineralization 50 feet south.

The Ady vein, more or less along strike to the west, outcrops at an elevation of 7,075 feet. It is exposed in surface cuts for a length of 60 feet and by three drill-holes along a length of 125 feet. Assays of outcrop samples taken by the company were good (for example: silver, 2.9 oz. per ton; copper, 0.9 per cent; lead, 5.0 per cent; and zinc, 10.0 per cent), but the results of drilling were disappointing.

The west vein, outcropping at an elevation of 6,940 feet, is exposed in surface cuts and explored by thirteen short diamond-drill holes.

During the course of the summer the company traced the several veins by magnetometer surveys, exposed them in surface cuts and strippings, and explored them by more than fifty diamond-drill holes totalling more than 10,000 feet. Most of the drilling was on the east vein, which is the largest and most promising of the three. The company states that exploration in it had indicated ore totalling 269,000 tons, having an average width of 7.2 feet and an average grade of: Silver, 0.8 oz. per ton; copper, 0.7 per cent; lead, 1.0 per cent; and zinc, 4.5 per cent.

Exploratory work on the property was discontinued in September.

BIRCH ISLAND*

Fluorite-Celestite-Uranium

Rexspar Uranium & Metals Mining Company Limited (51° 119° N.W.) Head office, 550 Sherbrooke Street West, Montreal; mine office, Birch Island. John W. Scott, manager, Birch Island. This company's property is in the Red Ridge area, 2 to 3 miles in a straight line southeasterly from Birch Island on the Canadian National Railway, 81 miles by rail or 90 miles by road north of Kamloops. The company holds 109 claims in an area which for many years has been known to contain celestite, fluorite, silver-lead, manganese, and, more recently, uranium. A road 7 miles long passes through the camp and connects the workings with the railway at Birch Island. The camp, consisting chiefly of three bunk-houses, office, and a cook-house, is 6 miles by road from Birch Island, 1 mile north of the Black

* By E. R. Hughes.

Diamond zone, and 1½ miles north of the "A" zone. During the first three months of 1956 a mill-site area of 10 acres was cleared near the railway at Birch Island. In preparation for open-pit mining, timber was cut over an area of 2½ acres on the "A" zone. Nine diamond-drill holes totalling 1,409 feet were drilled in the "B" ore zone. Surveys were conducted during the fall and early winter for the location of a crushing plant near the "A" zone, and for a 10,000-foot aerial tramway to connect the proposed crushing plant with the mill-site. No underground work was done.

The company reports that 1¼ million tons of ore has been proved up in two mineable lenses. A letter of intent for the purchase of uranium concentrate was received from Eldorado Mining and Refining Limited late in 1956, and arrangements were then made for the construction of a 750-ton mill and the development of a townsite. The number of men employed varied from seven to fourteen.

TULAMEEN RIVER*

Summit Camp (49° 121° S.E.)

Silver-Lead-Zinc

Silver Hill Mines Ltd. Company office, 800 Hall Building, Vancouver; mine office, Tulameen. Ralph J. Pronger, president; Edward L. Borup, vice-president and managing director. This property is in the Summit camp, 21 miles by road southwest of Tulameen. It includes the old Dornberg mine (also known as the Mary E or Silver King), as well as the old Jensen mine.

Work was resumed at the property on July 15th following suspension of operations in December, 1955. From the No. 2 level a three-compartment raise was started with the object of exploring the vein between the No. 2 and No. 1 levels, a distance of approximately 500 feet. At the end of the year the raise had been driven 250 feet. At a distance of 127 feet from No. 2 level a sublevel was driven from the raise 120 feet westward and 25 feet eastward on the vein. The No. 2 level main drift was extended 160 feet westward on the vein. From the No. 3 level East drift four box-holes were driven 40 feet, each in preparation for stoping, and one box-hole was driven in the West drift.

Surface construction included the erection of a large main building to provide bunkhouse accommodation for forty men, with kitchen and dining-room, recreation-room, office, and first-aid room. This building was completed except for the heating facilities. A separate dry-house was built near the main building.

The 50-ton mill was completed and went into production on December 6th. The first carload of zinc concentrate was shipped on December 29th. A crew of ten to thirty men was employed.

SIMILKAMEEN RIVER*

Gold-Silver-Copper-Zinc

Red Star (Woodbury Mines Limited) (49° 120° S.W.) Roy A. Tower, Sr., manager. This property is on the Hope–Princeton Highway, 32 miles south of Princeton. A D-7 tractor was used to strip overburden in the vicinity of the old Nos. 1, 2, and 3 level portals. At about 700 or 800 feet south of the old No. 3 level, now caved, a new adit was started and was driven approximately 200 feet westward and 270 feet northward in an effort to locate the downward extension of the vein. Five men were employed.

* By E. R. Hughes.

COPPER MOUNTAIN*

Copper

Copper Mountain (The Granby Consolidated Mining Smelting and Power Company Limited)

(49° 120° S.W.) Head office, 1111 West Georgia Street, Vancouver. J. A. C. Ross, general manager, Copper Mountain; D. W. Pringle, general superintendent; G. F. Camroux, mine superintendent. This company operates the Copper Mountain mine at Copper Mountain, 12 miles south of Princeton. The company's 17,500-kw. steam-electric power plant in Princeton supplies power to the mine and to the concentrator at Allenby, 3½ miles south of Princeton. A branch of the Kettle Valley Railway from Princeton serves the power plant, mine, and concentrator.

The main development of the mine has been described in previous Annual Reports. The exploration programme initiated in 1954 was continued in the early months of the year. The results of this programme were not sufficiently encouraging, and underground development was discontinued. During the last quarter of 1956, work had started in dismantling and removing equipment from the mine. Total underground development consisted of 5,327 feet of drifting and 4,171 feet of raising. Core drilling amounted to 31,204 feet, of which 8,227 feet was for underground exploration and 22,977 feet for surface exploration. A total of 20,139 feet of drilling was done with percussion machines to delimit orebodies underground. A total of 112,801 feet of 2⅛-inch-diameter blasthole drilling was done.

Open-pit operations were again expanded, and the output of ore from this source amounted to 60 per cent of the total production. Pits Nos. 4 and 6 were shut down, and No. 8 pit was started. Wagon drills and jackhammers for open-pit mining were discarded, and were replaced with four Gardner-Denver Airtracs mounting DH-123 machines. This change resulted in materially reduced mining costs. The loading of selected material from the No. 2 level waste dump was increased, and 384,509 tons containing 0.70 per cent copper was shipped from this dump. The ore from the open-pits and from the waste dump was loaded by power-shovels into trucks of 10- and 20-ton capacity and hauled to the surface ore-bin above No. 6 portal.

All ore mined at Copper Mountain, both from the surface and underground, is passed to No. 6 level and taken from the mine in Granby-type cars hauled by electric-trolley locomotives. After it is crushed in the coarse crushing plant on the surface near the portal of No. 6 level, the ore is hauled 8 miles by rail to the concentrator at Allenby. Ore produced during the year totalled 1,933,193 tons. The average tonnage milled was 5,288 tons per day, with an average copper content of 0.703 per cent. The total production from Copper Mountain to date is 34,214,482 tons of ore.

The vigorous safety programme continuously conducted at this operation has been most effective and has been instrumental in securing for the company and its employees the most favourable accident-free record among the mines of British Columbia during the past ten years. The John T. Ryan Regional Safety Award for the metal mine with the lowest accident-frequency record was again won by this operation. The frequency rating for lost-time accidents was 5.71 per 1,000,000 hours worked at the mine and 8.66 for the entire operation. During 1956, 155 men were hired and 207 men either quit or were laid off. The mine payroll at the year-end was 288 men, down from a high of 352 in April. The total number of men at the year-end employed in all operations at Copper Mountain, Allenby, and the power plant was 582. An emergency hospital is maintained at the camp, and a trained nurse and industrial first-aid attendants are available at all times. First-aid classes are held, and in conjunction therewith twenty-eight industrial first-aid certificates were awarded, as well as thirty-six senior and thirty junior St. John Ambulance Association awards. Aluminium-dust therapy is available for employees.

* By E. R. Hughes.

A doctor visits the Copper Mountain camp twice a week and is available in emergencies. An ambulance is maintained for transporting sick or injured persons to the Princeton General Hospital, 12 miles from the mine. A local first-aid competition was held at Copper Mountain in the spring for company employees and their families, and trained teams competed in the mine-rescue and first-aid field-day held in Princeton on June 2nd. Mine-rescue teams from Copper Mountain also competed at Cumberland on June 9th, and at the interprovincial meet at Nelson on September 8th. The team captained by Luke Kirby won the Cumberland competition and placed second in the interprovincial competition.

HEDLEY*

Gold

French (French Mines Ltd.)

(49° 120° S.E.) Company office, 314, 718 Granville Street, Vancouver; mine office, Hedley. W. B. Burnett, president; J. Biggs, mine superintendent. The controlling interest in this property was acquired by The Cariboo Gold Quartz Mining Company Limited from Kelowna Mines Hedley Limited and the new company was formed. The French mine is on the Oregon mineral claim, about 8 miles by road from Hedley and 1½ miles east of the Hedley–Nickel Plate road. The mine was formerly developed by Kelowna Mines Hedley Limited from two adits at an elevation of approximately 3,900 feet. The adits are about 300 feet apart and are connected. Two stopes were developed above the adits. Mining was continued below the elevation of the second adit, and it was from here that ore was mined when the operation was closed in 1955. When underground operations were resumed on July 12th, an old adit, 120 feet long, was rehabilitated and enlarged, and at the end of the year it had been extended eastward an additional 429 feet. This old adit, at an elevation of 3,835 feet, was originally driven over forty years ago by the Granby Company. The new development is to explore the downward extension of a skarn layer indicated in diamond-drill holes from the 3920 level.

A new adit was started at an elevation of 3,785 feet, and at the end of the year this had been driven 695 feet in a northeasterly direction. When completed, this adit will be used as the main haulage level. The exploratory work so far has given satisfactory results, and the downward extension of the skarn is now known to continue below the new 3785 level.

Owing to the difficulty of reaching the new development from the old road to the French mine, work was started in November on the construction of a new road 500 feet lower in elevation. The new road was 90 per cent completed at the end of 1956 and was in use.

Other work consisted of 600 feet of diamond drilling; 900 feet of 4-inch pipe was laid from the compressor building near the old 3920 adit to the new 3785 adit, and a 2-inch branch line was laid to the 3835 level. Eleven men were employed.

OLALLA*

Manganese

Olalla Mines Limited

(49° 119° S.W.) Company office, 1011 Rogers Building, 470 Granville Street, Vancouver. W. W. Geminder, manager. This property is 6 miles by road west of Olalla, at an elevation of approximately 5,000 feet. In 1956 a road was built to the showings on the Olalla No. 2 mineral claim, and a drift was driven 196 feet northward into the bedded manganiferous chert zone. Several shipments of the mined material were made for testing purposes. Five men were employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1955, pp. 42–43.]

* By E. R. Hughes.

FAIRVIEW CAMP*

Silica-Gold

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

(49° 119° S.W.) G. S. Ogilvie, property superintendent. This mine is about 5 miles west of Oliver. Quartz is mined and shipped to Trail for use as flux in the smelter. The quartz contains a small amount of gold and other metals. The ground is difficult to hold in shrinkage-stope mining and large pillars are left to support the ground. Drifting on No. 3 level, raising from No. 6 level to No. 3, and the commencement of mining above No. 3 level constituted the main development in 1956. No. 6 level is the lowest adit and the haulage level, near the portal of which are the dry-house, blacksmith-shop, ore-bin, and compressor-house. Electrical power is obtained from the West Kootenay Power and Light Company Limited. Total development consisted of 382 feet of drifting and crosscutting, 978 feet of raising, and 82 feet of diamond drilling. Operations were continuous throughout the year, and 34,500 tons of quartz was shipped. Twenty-four men were employed.

In addition to the rock shipped from the Fairview mine, 17,356 tons of tailings were shipped from the dump at the old Morning Star mill 2 miles west of Oliver.

BEAVERDELL*

Silver-Lead-Zinc-Cadmium

Highland-Bell (Highland-Bell Limited)

(49° 119° S.E.) Company office, 604, 789 West Pender Street, Vancouver; mine office, Beaverdell. K. J. Springer, president, Toronto; O. S. Perry, manager; J. DeYaeger, mine superintendent; A. D. Coggan, mill superintendent. The No. 4 adit is at 3,974 feet elevation on Wallace Mountain, east of the main camp at Beaverdell, and is the main haulage level for the upper mine. There were no new developments at the upper workings, where full production was maintained. The output was of already developed ore and the cleaning-up of old stopes.

The new or lower mine is serviced from the 2900 level, which is about 1½ miles by road northeast of the office at Beaverdell and 700 feet below the No. 10 level in the upper mine. The upper and lower workings are not yet connected.

The extensive development programme at the lower mine was successful in locating and opening up the faulted extension of the orebody. The 2900 adit level was extended to 6,000 feet, and an additional raise was put up to the 3000 level to facilitate ventilation. This development also included 710 feet of drifting and crosscutting on the 3000 level, of which 307 feet was in ore. Diamond drilling indicated the downward extension of the ore in the altered zone to the 2900 level. There was no production from the lower mine except from development work.

Additions to surface machinery and equipment included three Holman T60R 500-cubic-feet-per-minute electrically driven compressors, a compressor-house, and a machine-shop at the lower mine. Two Caterpillar diesel-electric generating sets, with a combined capacity of 575 kw. were installed at the mill to supply power to the mill and to operate the compressors at the 2900 level. A transmission-line 8,000 feet long was built to connect the mill with the 2900 level.

The ore from the upper mine is trucked to the mill, which is adjacent to a spur of the Canadian Pacific Railway at Beaverdell. Development in all parts of the property consisted of 1,298 feet of drifting and crosscutting, 1,014 feet of raising, and 6,209 feet of diamond drilling. The total ore milled was 14,322 tons. At the end of the year forty-four men were employed, of which twenty-three were underground.

* By E. R. Hughes.

GREENWOOD*

Copper

Greyhound (Salamet Mines Limited)

(49° 118° S.W.) B. W. Newkirk, president, Toronto. J. W. McLeod, manager, Greenwood. This property consists of thirty claims in the Deadwood camp area, 2½ miles by road west of Greenwood. It was formerly owned by Salmo Prince Mines Limited, which retains a minority interest in the present company. Surface diamond drilling was continued, and in 1956, 13,954 feet of drilling was done. In addition, the old Greyhound shaft was rehabilitated and a geophysical survey was conducted. Thirteen men were employed.

Mother Lode (Woodgreen Copper Mines Limited)

(49° 118° S.W.) Head office, 1024, 85 Richmond Street West, Toronto; company office, 301, 980 West Pender Street, Vancouver. S. B. Landell, president, Toronto; Hogan and McCuaig, consultants, Montreal; M. H. MacLeod, manager, Greenwood. In December the name of the company was changed from Surety Oils & Minerals Limited to Woodgreen Copper Mines Limited. The diamond-drilling programme started in October, 1955, was continued into March, 1956, and 7,000 feet was drilled. A contract was let to McClay Construction Company to construct a 1,000-ton concentrator near the old Mother Lode glory-hole. The concentrator was completed and put into operation on January 26th, 1957. Other surface work included the preparation for open-pit mining of ground between the concentrator and the rim of the Mother Lode glory-hole. Seventy-four men were employed.

Copper Queen (Aztec Exploration Ltd.)

(49° 118° S.W.) Company office, 800 Hall Building, 789 West Pender Street, Vancouver. S. H. Davis, manager. This property is in the Copper Camp area, 7 miles by road west of Greenwood. During the last three months in 1956 the company conducted an exploration programme which included geophysical surveying and diamond drilling. One diamond drill was used on a two-shift basis and seven holes were drilled, totalling 1,000 feet. Seven men were employed. Work was discontinued on December 11th.

PHOENIX*

Copper-Gold-Silver

Phoenix Copper Company Limited

(49° 118° S.W.) Company office, 1111 West Georgia Street, Vancouver; mine office, Davis Block, Grand Forks. L. T. Postle, president; J. H. Parliament, manager. This company was incorporated on July 1st. Prior to the new incorporation, exploration and development was done by the parent company, The Granby Consolidated Mining Smelting and Power Company Limited. The company holds twenty-seven Crown-granted mineral claims, nine located claims, and one leased claim in the Phoenix area, 5 miles east of Greenwood, and 9 miles northwest of Grand Forks. Exploration and development work done on the property consists of 2,566 feet of diamond drilling and the stripping of 25,360 cubic yards of overburden.

Foundations were excavated for a 500-ton concentrator near the old Phoenix war-memorial monument, and construction was completed of the following: Dry-house and first-aid room, warehouse and office, machine-shop, compressor-house, core-shed, tool-shed, and explosives magazine. No living accommodation is to be provided at the mine. In addition to the construction company's crew, nine men were employed.

EHOLT*

Copper

Noranda Exploration Company, Limited.—(49° 118° S.W.) Head office, 44 King Street West, Toronto. Under the direction of M. M. Menzies, exploratory work

* By E. R. Hughes.

continued on an extensive block of claims near Eholt. Magnetometer, self-potential, and geochemical surveys were made, and all showings and outcrop areas were geologically investigated.

ROSSLAND*

Gold-Copper

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

(49° 117° S.W.) Company office, 614 West Pender Street, Vancouver; mine office, Rossland. M. Maxwell, president; A. G. Pentland, director and consultant; C. H. Hewat, manager. Capital: 4,000,000 shares, 50 cents par value. This company owns the old Velvet mine on the Rossland–Cascade Highway, 13 miles west of Rossland. Former operators had developed the steeply dipping Velvet vein by a vertical shaft and a lower adit, No. 8, which was connected by raises to No. 6 level, the bottom shaft level. Most of the past production was from above the No. 4 level. The present owners started development work in 1955.

A new vein, or possibly the extension of the Velvet vein, was located on No. 7 level. Chalcopyrite mineralization was quite massive where encountered, but the walls were indefinite and the orebody is difficult to delineate. Service raises were driven from No. 8 level, but a positive extension of the orebody to this lower level was not found. On No. 3 level four veins were located in the footwall, parallel to the old worked-out Velvet vein. These are known as the Dick Rowe, Bunkhouse, H.W., and Staff House veins, and are 60, 130, 190, and 320 feet respectively from the Velvet vein. Not much work was done on them, other than to establish their position by diamond drilling and crosscutting. The Dick Rowe vein appeared to be the most promising of these veins, and in December a crosscut was started on No. 4 level to explore at this lower horizon.

No. 8 level was slashed to main-haulage width, and battery locomotives were installed. A main ore-pass raise was driven from No. 8 level to connect with the bottom of the vertical shaft at No. 6 level. One hoisting compartment of the shaft was retimbered as an ore-pass from No. 6 to No. 3 level. This permitted the handling of all ore from the upper levels, where it previously had to be hoisted.

Near the portal of No. 8 adit a crushing plant was built. The crushed ore was lowered by a gravity tram to a new 150-ton mill erected in the bottom of Sheep Creek valley. Machinery for crushing and concentrating was obtained from the Whitewater mill at Retallack. The tram came from the Lucky Jim mine at Zincton. Electric power was supplied by the West Kootenay Power and Light Company Limited. Milling started at the end of November. The concentrates were trucked to Northport, Wash., for rail shipment to the Tacoma smelter.

A new compressor-house was built near the No. 8 portal, and a new access road was built to this site. The old camp near the shaft headframe continued to be used for living-quarters. The crew was increased to forty-five by the end of 1956.

Snowdrop (Snowdrop Mining Company Ltd.)

(49° 117° S.W.) Company office, P.O. Box 659, Rossland. Warren Crowe, president and manager. Capital: 1,000 shares, $10 par value. This company controls the Snowdrop, Gold King, and Concordia Crown-granted claims about 1 mile west of Rossland. A narrow quartz vein in fine-grained massive volcanic rock has been developed by two short connecting adits and a small amount of stoping. In the last two years, work has been concentrated in following seams in the altered volcanic rock near the vein where high-grade pockets of gold have been encountered. In 1955 one such pocket was located about 100 feet from the portal of the upper adit. An additional 75 feet of drifting was done in this area in 1956. Another 35 feet of exploratory drifting was done in the east part of the upper level. However, no pockets of gold similar to that found in 1955 were found.

* By J. W. Peck.

On the surface a mill building 18 by 24 feet was erected, but no machinery was installed. Two men were employed. No shipments were made.

O.K., Midnight, I.X.L. (Midnight Consolidated Mines Ltd.) (49° 117° S.W.) Company office, 605 Howe Street, Vancouver. S. A. Liening, Seattle, Wash., president. Capital: 5,000,000 shares, $1 par value. This company was formed late in 1956 to develop a group of old Crown-granted claims west of Rossland. The main workings are on the Midnight, I.X.L., and O.K. claims and are accessible by a road 1½ miles long which leaves the Rossland–Cascade Highway one-quarter mile west of Rossland. A small crew was employed on development work in December. Previous to this the former owner of the Midnight, B. A. Lins, rehabilitated the lower levels; while at the O.K. a lessee, M. Doran, completed 48 feet of drifting.

CRESCENT VALLEY*

Uranium

Lucky Boy (49° 117° S.W.) The Lucky Boy group of five claims was located in 1955 and 1956 by F. F. Esovoloff, of Thrums. The claims are 1½ miles northwest of Crescent Valley and cover much of a rocky ridge between that community and Gander Creek. Two showings are close to the axis of the ridge at about 3,500 and 4,000 feet elevation respectively.

The country rock is a pegmatitic syenite consisting predominantly of coarse-grained feldspar with very minor quartz and muscovite and contains scattered inclusions of gneiss. It is buff-coloured on fresh surfaces but weathers reddish. A large part of the syenite has been more or less sheared. Quartz also occurs as scattered blocks of fist size and larger. Some quartz blocks are isolated in the syenite, while others are clustered in patches which are generally small but may reach several hundred square feet in area.

The two showings are two of these patches, which are much larger than the rest and contain black uranium and niobium-bearing minerals and football-sized masses of muscovite in addition to quartz and feldspar. The showings are about 1,000 feet apart horizontally. The higher one had had no work done on it when visited in May, but its dimensions were estimated to be no more than 50 by 100 feet and its grade comparable with the lower showing.

The lower showing is a triangular patch about 2,500 square feet in area in which a shallow cut has been blasted. The black minerals are sparingly and irregularly distributed, partly as nearly solid chunks as much as 2 inches across, but much more commonly as minute grains disseminated through feldspar. These grains are scarcely visible with a pocket lens, but their presence is indicated by reddening of the feldspar, by an increase in specific gravity, and by radioactivity. The buff feldspar grades to brick-red and reddish-brown with increase in black minerals, and with a little practice this reddening can be distinguished from that due to weathering. Only minor amounts of black minerals occur in quartz and muscovite. Estimation of grade would require bulk sampling, but this showing does not appear to contain more than 1 per cent of black minerals.

At least two black minerals are present; one is ilmenorutile, the other probably samarskite. They are indistinguishable in hand specimen, and their relative proportions are unknown. Essentially all the uranium should be in the samarskite. A chunk that was apparently largely samarskite assayed: Uranium oxide, 6.8 per cent; thorium oxide, 2.5 per cent; niobium, 25.7 per cent; tantalum, 9.8 per cent.

NELSON†

Gold-Copper

Bil Mecky, Archer (49° 117° S.E.) The Bil Mecky is one of four recorded claims staked on a new showing which was uncovered when a mudslide removed the overburden from the hillside above the Nelson–Trail

* By G. E. P. Eastwood.
† By J. W. Peck.

Highway, about 6 miles west of Nelson. The claims are owned by W. Koncewicz, of Castlegar, who also has applied for a lease from the Crown on the adjoining Archer Crown-granted claim. On the Bil Mecky a quartz vein in granodiorite was exposed at an elevation of 2,250 feet, or 350 feet vertically above the highway. It was 7 feet wide, with a north-south strike and a nearly vertical dip to the west. It was sparsely mineralized with pyrite. A sample taken across the vein assayed: Gold, *nil;* silver, *nil.*

On the Archer a narrow band of limy and siliceous sediments in granodiorite was explored many years ago by an adit 20 feet long which dipped 15 degrees into the hillside following the sediments. The band of sediments in the adit is 3 feet wide and is mineralized with small lenses of chalcopyrite. A sample taken across the band assayed: Gold, trace; silver, 0.2 oz.; copper, 0.47 per cent.

Copper

Queen Victoria (49° 117° S.E.) J. Norville, of Toronto, owns a large group of claims near Beasley, including the Queen Victoria. A road 1½ miles long leads to the property from a point on the Nelson–Trail Highway about 7 miles south of Nelson. A contact metamorphic deposit has been developed chiefly by a large open-pit (elevation, 2,750 feet), from which shipments were made over forty years ago to B.C. Copper Company smelter at Greenwood. The area back of the pit was diamond drilled in 1955. In the latter half of 1956 the Finley Company, of Reno, Nev., obtained an option. The road was repaired, a service building was erected, and a portable compressor installed. Ore remnants in the pit area were removed and trucked to the Kenville mill. The grade was about 1 per cent copper. More than 1,900 tons was milled, but 500 tons was left on site when weather forced a cessation of activity. Ten men were employed in this work.

Silver-Copper

Eureka (Copper Leaf Mines Limited) (49° 117° S.E.) Company office, K.W.C. Block, Baker Street, Nelson. F. C. Buckland, president and manager. Capital: 3,000,000 shares, $1 par value. This company owns the Eureka mine on Eagle Creek and the Kenville mill at the old Granite Poorman mine. The mill is 7 miles by road west of Nelson, and the Eureka mine is 2¾ miles farther by steep road. The mine is developed by two connected adit levels and a raise to surface from the upper adit. It was last worked in 1953.

Early in 1956 the upper or 250 level, which has been inaccessible for many years, was rehabilitated. Work was then concentrated in the south end of the workings, where former operators in 1917 had prepared a section 250 feet long for shrinkage stoping. The ore zone here is about 8 feet wide and is a remnant of calcareous sediments in granite. Quartz, chalcopyrite, galena, and native silver are the visible minerals. The zone is cut off by a fault at the south end. Three stopes totalling 110 feet long were carried up a short distance. A narrow, but richer, orebody was also mined from a sublevel above the bottom or 450 level, and a stope was carried up to the sill pillar on the 250 level. The total mined from the two levels amounted to about 3,000 tons. A battery locomotive was used for haulage on the 250 level, while a new Mancha 30-horsepower diesel locomotive was provided for the 450 level. Utility buildings were erected at the 250 portal. Mining ceased in August.

Work was also done in the vicinity of the old Star shaft, which had been sunk on an orebody similar to that developed in the south end of the Eureka 250 level, a point 1,500 feet north on strike. Four holes totalling 1,600 feet were drilled from surface in an effort to correlate results obtained from two holes drilled in 1938. The ore encountered was reported to be similar in grade to that in the Eureka but with greater widths.

Diamond drilling was also done on the Jack Pot, Dundee, and M.S. claims.

The Kenville mill operated intermittently on ore from the Eureka and Queen Victoria mines. Custom ore totalling 550 tons was milled from the Silver King mine. All concentrates were shipped to the Tacoma smelter.

In the latter half of 1956, funds were provided by the Finley Company, of Reno, Nev., and all operations of Copper Leaf Mines Limited were then carried on under that name. The maximum number employed was forty-five.

Silver King

(49° 117° S.E.) This old mine is under lease from The Consolidated Mining and Smelting Company of Canada, Limited, by A. Burgess, M. Burgess, and O. Gowing, of Ymir. The lower or Dandy adit, at 5,500 feet elevation, is reached by 9 miles of rough road southwest of Nelson. This adit extends about 2,400 feet to the old Silver King vertical shaft. The lessees rehabilitated the level for about 2,000 feet to where old shrinkage stopes had been left with broken ore when the mine last operated. This ore had become cemented and was removed with difficulty. It was trucked to the Kenville mill. The concentrates obtained were shipped to the Tacoma smelter. Production: Ore milled, 550 tons. Gross content: Gold, 5 oz.; silver, 4,429 oz.; copper, 14,682 lb.; lead, 600 lb.

About one-half mile west of the old workings The Consolidated Mining and Smelting Company of Canada, Limited, did diamond drilling to check geological and electromagnetic results obtained a few years previously. Two holes totalling 1,078 feet were drilled to check an anomaly, but without success. A short access road was built to the drill-sites.

Gold-Copper

Hungry Man

(49° 117° S.E.) This Crown-granted claim and five recorded claims constitute the Star Kay group on Connor Creek, a southerly flowing tributary of Rover Creek. The group is owned by S. M. Metcalf and J. McKay, of Trail. The area is accessible by a logging-road 2 miles long, which extends from the City of Nelson power plant road to Rover Creek. From Rover Creek a tractor-road 2 miles long was built in 1955 on the west side of Connor Creek to the showings at 3,300 feet elevation. This road was impassable in 1956. The Hungry Man was last active in 1901, when a shaft, now caved, was sunk to a reported depth of 65 feet to investigate a vein exposed in the schist bedrock of Connor Creek 100 feet to the west. A small pit has also been sunk on the showing, and there is an open-cut 800 feet north on strike. No mineral shows on the dump of the shaft, but a few tons of selected material have been stored near the small pit. The vein, where exposed in the creek bed and the open cut, strikes north 20 degrees west and dips 75 degrees to the east. Visible minerals are pyrrhotite, chalcopyrite, bornite, and quartz. Three samples were taken, as follows:—

Location of Sample	Width of Sample	Gold	Silver	Copper
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent
Selected material near small pit	Grab	0.61	Trace	0.25
From vein where exposed in creek bed near pit (not true width)	1	0.14	Trace	0.22
From open-cut	6	Trace	*Nil*	0.08

Silver-Lead-Zinc

Deer Horn (Bartlet)

(49° 117° S.E.) The Deer Horn group of five recorded claims is 4 miles south of Nelson on the Nelson–Salmo Highway. It is owned by L. Haycock, of Lumby, but was under option in 1956 to The Consolidated Mining and Smelting Company of Canada, Limited. The main showings are on the Deer Horn claim, which covers in part a former surveyed claim, the Bartlet. A wide shear zone containing zinc mineralization was tested by four diamond-drill holes totalling 1,500 feet. The option was dropped after this work.

SALMO*

Silver-Lead-Zinc

Lucky Boy

(49° 117° S.E.) L. R. Clubine, of Salmo, owns a group of claims adjoining the village of Salmo to the west. The Lucky Boy workings are west of the old Silver Dollar mine and are reached via a short access road from the old Salmo–Trail Highway. A gently dipping quartz vein in argillite was exposed by bulldozer stripping in 1953 and 1954. The owner also started an adit and drove it 20 feet. Early in 1956 Silver Standard Mines Limited obtained an option, and two men were employed to drive the adit a further 85 feet. Close timbering was required. The option was later dropped.

Erie Creek (49° 117° S.E.)

Gold-Silver-Lead

Go Lucky, Hard Luck

These two recorded claims, owned by W. M. Konkin, of Salmo, are on the north side of Grassy Creek, an eastward flowing tributary of Erie Creek. The property is reached via Ross Spur by 11½ miles of road up Beavervale Creek and 5 miles of trail over Grassy Mountain. The elevation of the showings is about 6,300 feet. Narrow quartz veins in granite have been explored by a small amount of stripping and open-pit work. Most of the mineralization seen was negligible. The largest open-pit exposed a northward striking vein dipping 25 degrees west. Values up to 5 ounces of gold per ton have been reported, but a sample taken across 2 feet, the widest section, assayed: Gold, 0.03 oz. per ton; silver, 2.1 oz. per ton; lead, 3.7 per cent.

Sheep Creek (49° 117° S.E.)

Gold

Nugget

This mine is part of the old Reno holdings in the Sheep Creek camp. It is owned by A. Endersby, of Fruitvale, who has worked the property intermittently for several years. Previous production was in 1954, when 124 tons was shipped. The 1956 output was sent to the Trail smelter. Production: Ore shipped, 51 tons. Gross content: Gold, 31 oz.; silver, 15 oz.

Gold

Queen

The Queen mill of Sheep Creek Mines Limited was leased by A. Kraft and A. MacDonald, of Ymir. A clean-up was made of the mill floor and sump. This was shipped to the Trail smelter. Production: Ore shipped, 4 tons. Gross content: Gold, 10 oz.; silver, 9 oz.

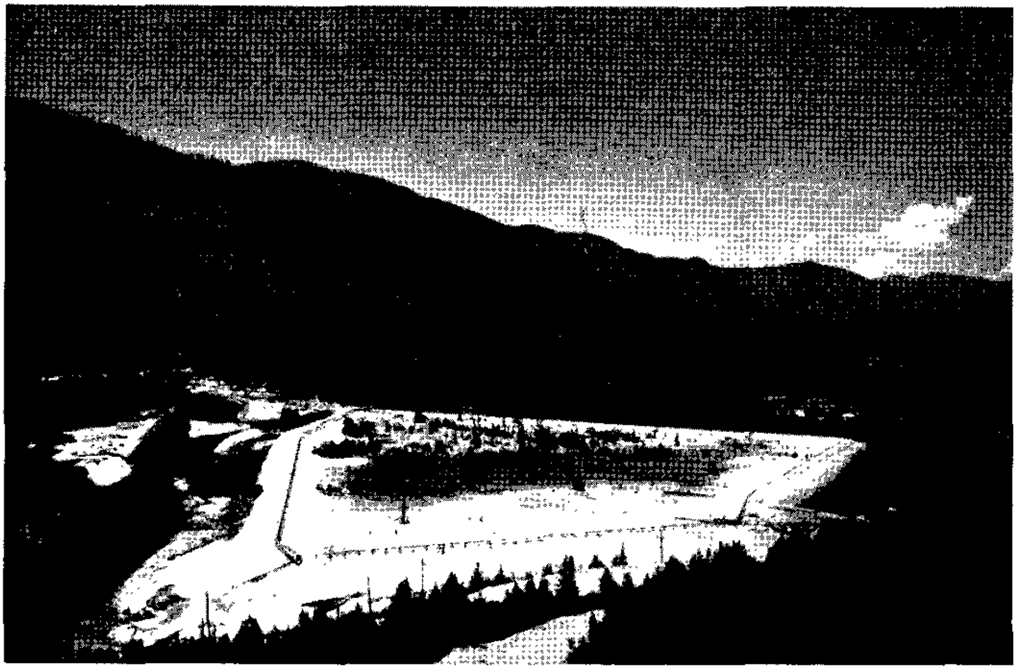
Iron Mountain (49° 117° S.E.)

Lead-Zinc-Tungsten

Emerald, Jersey, Dodger, Feeney (Canadian Exploration Limited)

Head office, Royal Bank Building, Vancouver; mine office, Salmo. G. A. Gordon, general manager; J. D. Little, assistant general manager; D. N. Hogarth, mine superintendent; H. A. Steane, general mill superintendent; R. MacLeod, superintendent, tungsten concentrator; E. A. Erickson, superintendent, lead-zinc concentrator. This company is a wholly owned subsidiary of Placer Development Limited. The Emerald, Feeney, Dodger, and Jersey mines, the tungsten concentrator, and the main camp are located on the summit between Sheep Creek and

* By J. W. Peck.



Tailings pond from Jersey mine, Salmo River.

H.B. mine and mill, valley of Sheep Creek.

Lost Creek. The property is reached by two roads which leave the Nelson–Nelway Highway 4 and 5½ miles respectively south of Salmo. The lead-zinc concentrator is on the Nelson–Nelway Highway and is served from the mine by a series of surface and underground conveyors. In the main camp an extensive townsite, comprising over 150 dwelling units, has been developed. The average number of employees was 360, slightly more than in 1955.

Emerald.—This tungsten mine, for the first time, produced the minority share of the ore for the tungsten concentrator. A considerable amount of this ore came from large open pits where the outcrop has been stripped for a length of about 1,000 feet. The remainder came from the winze area, where an interior 32-degree inclined three-compartment shaft has been sunk during the past three years to a slope distance of 2,100 feet below the 3800 or lowest adit. Nine levels have been established off this shaft, the bottom one being 1,130 feet vertically below the 3800 level. The shaft follows close to the ore, which plunges southward and has the shape of a trough, formed where the easterly dipping contact between black argillite and limestone is cut off on the east by granite. Scheelite skarn bands are found in the trough and also up limbs which extend as much as 100 feet above the trough. In the shaft area only the east limb has been productive. It is mined 5 to 15 feet wide by open-stope and slusher methods.

Feeney.—This tungsten mine is 800 feet north of the northern end of the Emerald workings. It is served by one adit, and the ore has been mined through to surface. The mine was idle in 1956. Production since the start of operations in 1951 totals about 60,000 tons.

Dodger.—The Dodger 4400 tungsten mine, with a portal elevation of 4,405 feet, is a 14- by 15- foot adit driven south 1,050 feet. A new extension of the ore zone was located in the east wall of the adit. This was stoped above and below the adit level. The ore was transported by diesel trucks to the top of an ore-pass near the Dodger 4200 portal, leading to an underground crusher on the 3800 level of the Emerald mine.

The Dodger 4200 tungsten mine is about 5,000 feet southwest of the Dodger 4400 mine. A 14- by 15-foot crosscut adit, with a portal elevation of 4,125 feet, has been driven east for 2,500 feet. From near the end of this crosscut a drift of similar size extends north for 1,950 feet. The end of this drift is connected by raises and via the 4300 level to the Dodger 4400 mine. Irregularly shaped orebodies are located above the main drift. These were connected over a length of 1,500 feet and were considered nearly mined out by the end of 1956. The ore was removed by diesel trucks to the main ore-pass just outside the Dodger 4200 portal.

Tungsten Concentrator.—This mill is near the 3800 portal of the Emerald mine. It can receive ore by track haulage from the Emerald mine, by conveyor from the underground crusher on the Emerald 3800 level, or by truck from outside sources. The milling rate averaged 17,300 tons per month, an increase over 1955. The Dodger mines provided 53 per cent of the ore, the Emerald mine 47 per cent. All tungsten concentrates continued to be sold to the United States Government under contract.

Jersey.—This lead-zinc mine extends like the spread fingers of a hand through Iron Mountain in a northerly direction from the Lost Creek slope. The ore zones occur in dolomitized limestone along folds which plunge gently to the south. They are irregular and lenticular in cross-section but relatively continuous parallel to the plunge of the folds. The six ore zones now recognized are referred to as the A, B, C, D, E, and F zones. In plan they are close together at the southern end of the mine, but to the north they are farther apart. The A or most westerly ore zone, with long axis striking almost due north, has been fully developed from near the south end of the Jersey mine to the old Emerald lead-zinc mine, a distance of 4,000 feet. The B, C, and D ore zones, with long axes striking somewhat east of north, have not been developed more than about 1,500 feet north of their outcrop at the south end of the mine on the Lost Creek slope. The

E zone is east of the others and has been developed northward for almost 2,000 feet from a point about 1,500 feet north of the south end of the mine. The F zone, east of and at a lower elevation than the E zone, was developed during 1956 near the eastern end of the Dodger 4200 crosscut.

The ore zones vary greatly in thickness. At places the A zone is as much as 60 feet thick, whereas the E and F zones are 8 to 10 feet thick. Most of the production was by trackless mining through the Jersey 4200 adit, but some ore was taken out through an ore-pass from workings in the E zone to the Dodger 4200 crosscut. Mining was by room-and-pillar method, the ore being removed by diesel trucks and shovels. Ore is trucked to the top of the ore-pass beside the tungsten ore-pass near the Dodger 4200 portal. Both ore-passes lead to the underground crusher on the 3800 level of the Emerald mine.

The following diesel equipment was in use underground: 7 Koehring Dumptors, 1 Caterpillar DW-10 and Landis Wagon, 1 Euclid 10-ton dump truck, 3 Dart 10-ton dump trucks, 3 track-mounted drilling jumbos, 1 Caterpillar 212 grader, 1 Caterpillar D-7 bulldozer, 5 Eimco overhead loaders, 1 Trump Industrial Giraffe, and 1 LeRoi 500D compressor.

In November the track area at the southern end of the ore zone was rehabilitated after being shut down for three years. Ore was mined by open-stope methods and moved to draw points by slushers. The main haulage was on the 4000 level, which is connected to the ore-pass system above the underground crusher in the Emerald 3800 level. Battery locomotives were used.

Lead-Zinc Concentrator.—This mill operated at 31,500 tons per month, or at about half capacity. The lead and zinc concentrates were shipped respectively to smelters at Kellogg, Idaho, and Black Eagle, Mont.

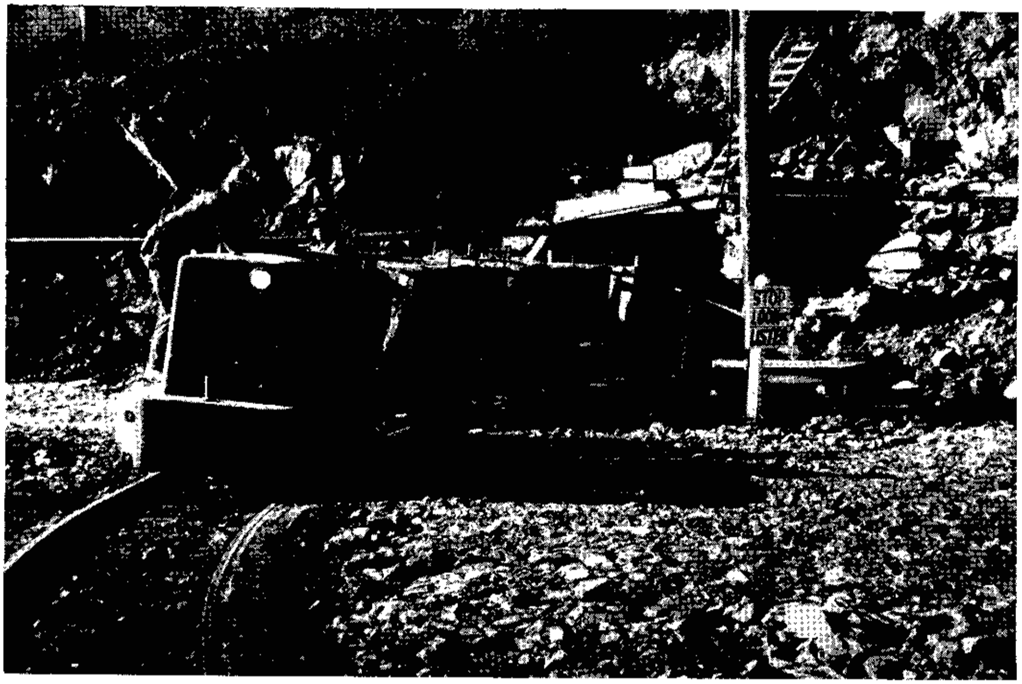
Surface Exploration.—A tungsten deposit on the Invincible claim, north of the Feeney and west of the Dodger 4400 mines, has been under investigation for two years. Extensive diamond drilling, with holes several hundred feet deep, has been done. Encouraging results are reported.

Aspen Creek (49° 117° S.E.)

Silver-Lead-Zinc

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

J. C. MacLean, property superintendent; H. G. Barker, mine superintendent; H. Chalmers, mill superintendent. The H.B. mine is on the west side of Aspen Creek, with the main camp located on the north side of Sheep Creek, 7 miles by road from Salmo. Zinc-lead dolomite replacement orebodies have been developed by two adits connected by an interior two-compartment vertical shaft. The hoistroom is on the top or 3500 level, and the main haulage is the bottom or 2800 level. Long ore-pass systems extend from the 2800 level to the ore zones. All production since mining commenced in 1955 has been from above the 3300 level. Two ore bodies are being mined by diamond-drill blasting to slusher drifts. In plan the orebodies are roughly parallel to each other, about 150 feet apart, and have a rake to the south of about 20 degrees. In cross-section they are lenticular, with nearly vertical sides. The average width is 50 feet, and the maximum height mined is 350 feet. The No. 1 or East orebody was developed for stoping an additional 450 feet to the south in 1956, to a total stoping length of about 1,000 feet. The No. 2 or West orebody was developed to a length of 400 feet. A new orebody was outlined by diamond drilling below the No. 1 and No. 2 ore zones. It is a tabular body dipping about 20 degrees to the south, with a maximum thickness of 35 feet and a maximum width of about 200 feet. A new ore-pass system was started from the 2800 level to develop this new orebody and the southern end of No. 1 zone. The 3000 and 3200 levels were driven to connect with the ore-pass system. Diesel locomotives were used on the 2800 level.



Diesel locomotive, 2800 portal of H.B. mine.

Underground repair-shop, Jersey mine.

The milling rate averaged 36,000 tons per month, the highest in the Nelson district. The number employed averaged 140.

NELWAY*

Silver-Lead-Zinc

Reeves MacDonald Mines Limited (49° 117° S.E.) Company office, 413 Granville Street, Vancouver; mine office, Remac. W. L. Zeigler, Metaline Falls, Wash., general manager; L. M. Kinney, Metaline Falls, Wash., general superintendent; J. B. Shannon, property superintendent; J. Kozar, mine superintendent; J. S. Steele, mill superintendent. Capital: 3,000,000 shares, $1 par value. This company owns the Reeves MacDonald mine on the Pend d'Oreille River, on the Nelway–Waneta road 4 miles west of Nelway. Zinc-lead limestone replacement orebodies were mined at a steady rate of over 33,000 tons per month. The main haulage is the 1900 level. At 3,500 feet from the portal the Reeves orebody, which has been responsible for most of the production, has been developed by an interior 55-degree inclined shaft which extends to the 2650 adit level. Some sections of this orebody are now fully mined between the two adit levels. Development of the O'Donnell orebody was accelerated in 1956. This orebody is about 7,000 feet from the portal on the 1900 level. A 50-degree service-raise connection was made between the 1900 level and the old O'Donnell adit, 450 feet vertically above. The O'Donnell adit (now the 2350 level) was last worked in 1929 and contained about 900 feet of drifting and crosscutting. Sublevels were established off the service raise at 1970, 2050, 2100, 2200, 2250, and 2300 levels. The 1970 level was established as a main scram drift, and the ore was removed by blasting to pillar slots above this drift, similar to the mining method in the Reeves orebody. By the end of 1956 the O'Donnell was producing a steadily increasing proportion of the total ore mined.

Exploration was started on the Reeves orebody below the 1900 level. The 52-degree inclined shaft which was sunk in 1953 to the 1500 level was unwatered. The orebody was followed by a drift for 300 feet on the 1500 level and slashed to its limits as much as 60 feet wide. Other exploration was in the B.L. section. The B.L. orebody is thought to be a faulted upper section of the Reeves orebody and should bottom at the 2350 level horizon. Work ceased in 1953 after drifting 600 feet on the 2350 Reeves level to explore this area. In 1956 this drift was driven another 600 feet, which should put the face close to the objective.

The mill was enlarged to include a regrind ball mill. Mill-heads averaged about 4.4 per cent zinc and 1.2 per cent lead. Concentrates continued to be shipped to smelters in the United States. The crew remained fairly steady at 130.

BOUNDARY LAKE*

Copper

Copper Queen (49° 116° S.W.) This property, owned by L. R. Clubine, of Salmo, is on the north side of Monk Creek, an easterly flowing tributary of Priest River which flows south into the United States. The property is accessible from Porthill, Idaho, by 26 miles of road to a point 3 miles west of Boundary Lake, whence a trail about 4 miles long extends to the showings at an elevation of 5,500 feet. The main showing is a spectacular iron-stained quartz outcrop which has been exposed by stripping and open-cut work on the east bank of an unnamed southerly flowing tributary of Monk Creek. The quartz has been exposed over a width of 50 feet. It occurs roughly at right angles to the strike of greenstone schist and dips 80 degrees south. Visible minerals are quartz, chalcopyrite, hematite, sericite mica, malachite, azurite, and minor bornite. The best part of the showing is a 20-foot-wide

* By J. W. Peck.

section at the south end of the stripping, and from it a small dump of massive chalcopyrite has been sorted. An open-cut has been made 700 feet south on another iron-stained outcrop. This showing contained quartz stringers, but other minerals were negligible. Most of this work was done several years ago; in recent years the owner has paid cash in lieu of assessment work.

Five samples were taken, as follows:—

Sample No.	Location of Sample	Width of Sample	Gold	Silver	Copper
		Ft.	Oz. per Ton	Oz. per Ton	Per Cent
1	South end of main stripping	10	0.01	*Nil*	0.15
2	Next to and north of sample 1	10	0.01	Trace	0.17
3	Next to and north of sample 2	10	*Nil*	*Nil*	0.048
4	Small cut 7 feet east on strike of sample 1	5	Trace	*Nil*	0.006
5	Small dump at cut 700 feet south of main stripping	Grab	*Nil*	*Nil*	0.01

SOUTH KOOTENAY LAKE*

NEXT CREEK (49° 116° S.W.)

Gold-Silver-Lead-Zinc

Spokane† This mine is on Wall Mountain, 18 miles by road from Tye. The Spokane, Spokane No. 1, Snowslide, Tramline, Fraction No. 1 Fraction, and Fraction No. 2 Fraction claims are owned by K. K. Laib, of Bayonne, who has worked the property intermittently for many years. The last production was in 1954. In 1956 a lease and option was given to Dennis G. White, of Nelson. A steeply dipping quartz vein in granodiorite has been developed by several adits, the main one being No. 4, which is at the upper terminal of a small tram-line. A new adit, No. 5, was driven 120 feet as a crosscut in 1949. This was extended 52 feet to reach the vein. In a drift 12 feet south of the crosscut the vein was reported to be 18 inches wide. Three carloads of ore were mined from above the No. 4 level. This ore was trucked to Tye and thence shipped to the Trail smelter.

A considerable amount of repair work had to be done on the road. Five men were employed until October, when weather forced a shut-down. Production: Ore shipped, 97 tons. Gross content: Gold, 24 oz.; silver, 313 oz.; lead, 9,124 lb.; zinc, 1,408 lb.

SANCA (49° 116° S.W.)

Silver-Lead-Zinc

Lakeview (Blumont Mines Ltd.) Head office, Rogers Building, Vancouver, and 307 Sixth Avenue West, Calgary, Alta.; mine office, Boswell. In January, 1956, this company optioned the Lakeview mine property of five claims from E. G. Timmons, of Boswell. The claims are on the east shore of Kootenay Lake, immediately south of Sanca Creek.

The occurrence consists of lenses of quartz and calcite, mineralized with galena and sphalerite with minor chalcopyrite, in a northerly trending shear zone in a roof pendant of Creston quartzite and siliceous limestone within quartz diorite of the Bayonne batholith.

The mine has been developed by a shaft and three drifts. The shaft collar is at an elevation of 1,940 feet, 40 feet east of the Creston–Kootenay Bay Highway, one-half mile south of Sanca Creek bridge. No. 1 level, 30 feet below the shaft collar, extends as a drift for a distance of 380 feet, and No. 1 sublevel, 60 feet below the collar, extends as a drift for a distance of 175 feet. No. 2 level, at the shaft bottom 90 feet below the

* By J. E. Merrett, except as noted.

† By J. W. Peck.

collar, is connected to the surface by a crosscut 240 feet in length; drifting extends 170 feet to the north and 628 feet to the south. In past years, stoping has been done and shipments of ore were made to the Trail smelter. In 1956 a crew of three men drove 400 feet of drift on the south heading of No. 2 level. No ore was shipped.

Boswell (49° 116° S.W.)

Silver-Lead-Zinc

Hope

This property, comprising six located claims, is on a steep mountainside one-quarter mile east of Dark Canyon Creek, the first south-flowing tributary of Akokli Creek east of its mouth. The claims were located by N. E. Bainbridge, of Boswell, and optioned to W. Schwartzenhuer, of Castlegar.

Access to the property from the Creston–Kootenay Bay Highway is by 1½ miles of road up Akokli Creek and 2¼ miles of trail by way of and beyond the pack-trail leading to the Copper Canyon mine, formerly operated by the United Lode Mining Co., Ltd. A new access road, suitable to four-wheel-drive vehicles, is under construction, and 1.3 miles of it has been completed.

The main mineral occurrence is at an elevation of 5,000 feet on the steep south slope of the mountain and is a galena-bearing quartz vein ranging in width from 1 inch to 2.3 feet over an exposed length of 200 feet. The vein strikes north 12 degrees west and dips 77 degrees east, and is in folded, thinly bedded white limestone of the Dutch Creek formation. At the upper or north end the vein pinches to a fracture, and at this point the white limestone merges with a less thinly bedded zone of blue-grey limestone. Galena occurs in bands and pockets within the quartz and in minor concentrations in the bedding planes of the limestone adjacent to the vein. Minor scattered disseminations of galena are in the blue-grey limestone beyond the end of the vein.

Development work included the stripping of the vein, excavation of an open-cut, and construction of the road and trail.

Four samples assayed as follows:—

Sample No.	Location	Width	Gold	Silver	Lead	Zinc
		Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	Oxidized material in open-cut	Grab	Trace	5.2	9.8	26.4
2	Middle of open-cut face	2.3	Trace	11.3	19.0	18.7
3	40 feet north of open-cut face	2.0	Trace	5.8	11.4	17.9
4	65 feet north of open-cut face	1.5	*Nil*	6.0	9.7	7.2

NORTH KOOTENAY LAKE*

Crawford Creek (49° 116° N.W.)

Copper

United Copper†

This property, comprising sixteen located mineral claims, is held by F. W. Cartwright and S. F. Williams, both of Nelson. It is at an elevation of 6,900 feet on the west side of Cogle Pass, on the divide between Sawyer Creek, a tributary of Crawford Creek, and Blueberry Creek, a tributary of St. Mary River.

Access to the property from Crawford Bay on the Creston–Kootenay Bay Highway is by road 10 miles up Crawford Creek to the mouth of Sawyer Creek. From this point a steep pack-trail follows the north side of Sawyer Creek a distance of 4 miles to Cogle Pass.

* By J. W. Peck, except as noted.
† By J. E. Merrett.

The mineral occurrences are quartz veins containing minor amounts of chalcopyrite and galena in laminated argillite of the Dutch Creek formation. The veins follow the bedding planes of the argillite.

The principal showing is a semi-continuous quartz vein, outcropping in a small stream and on a bluff face 150 yards west of the pass. This vein strikes north 30 degrees east and dips 57 degrees eastward. Surface stripping has indicated a length of approximately 1,000 feet. At one exposure it was noted that the vein was not continuous, and, as surface stripping is not complete, it is possible that other breaks may occur. At its widest point the vein is 8.2 feet wide. It pinches to a width of 1 foot at the north end and to a few inches at the south end. The average width is 3.5 feet. Six samples assayed as follows:—

Sample No.	Location	Width	Gold	Silver	Copper	Lead	Zinc
		Ft.	*Oz. per Ton*	*Oz. per Ton*	*Per Cent*	*Per Cent*	*Per Cent*
1	Creek cut 180 feet north of crosscut	0.65	0.03	0.7	0.047	----	----
2	60 feet north of crosscut	8.2	Trace	0.1	0.75	0.05	----
3	South face of crosscut	6.4	0.01	Trace	0.43	Trace	----
4	25 feet south of No. 3	3.0	Trace	0.2	1.2	Trace	----
5	50 feet south of No. 3	4.5	Trace	Trace	0.51	0.18	0.04
6	75 feet south of No. 3	3.6	*Nil*	0.9	0.45	0.29	0.04

Approximately 1,000 feet west of the upper vein and 500 feet lower in elevation, surface stripping has been done at intervals on a quartz vein system parallel to the main vein. No samples were taken as the owners reported that the assay values were low.

Parallel to and approximately 500 feet west of the second vein system a series of open-cuts and five small drifts have been made on a similar occurrence of semi-continuous quartz veins which extend nearly half a mile across a basin. Where exposed the veins are short and irregular. Widths vary from 2 inches to 2 feet along strike lengths of 5 feet. Mineralization is also irregular, but with larger local concentrations of chalcopyrite than occur in the main vein. Because of these irregularities and the large intervals between exposures, representative sampling did not appear feasible.

Silver-Lead

Santa Fe* This property of two located mineral claims is on the northwest slope of the ridge between Hooker and Canyon Creeks, tributaries to Crawford Creek. It is owned by J. W. Mulholland, of Nelson. Access to the property from Mile 10 on the Crawford Creek road is by way of 2½ miles of abandoned logging-roads and 1½ miles of pack-horse trail.

An open-cut, 80 feet long, at an elevation of 5,500 feet, separated from a 15-foot deep winze by an interval of 170 feet, discloses a galena-bearing quartz vein or veins. This occurrence is in black laminated argillite of the Mount Nelson formation, one-quarter mile east of its contact with the Toby Creek conglomerate.

In the middle of the open-cut a section of a quartz vein was exposed for a distance of 25 feet, but at no point was the footwall of the vein clearly exposed. The vein strikes north 20 degrees west and dips 42 degrees eastward. In some places on the footwall of the vein a narrow band of fine-grained galena and pyrite is exposed. Elsewhere the vein contains a considerable amount of oxidized material. Five samples were taken in the open-cut, but the winze was full of water and was not sampled. The samples assayed as follows:—

* By J. E. Merrett.

Sample No.	Location	Width	Gold	Silver	Lead	Zinc
		Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	Northwest end of vein exposure	3.2	*Nil*	1.1	0.14	0.08
2	5 feet southeast of No. 1	1.8	0.01	10.2	0.57	0.23
3	10 feet southeast of No. 1	2.0	*Nil*	3.1	0.85	0.11
4	15 feet southeast of No. 1	2.5	*Nil*	1.0	0.17	0.09
5	20 feet southeast of No. 1	2.8	*Nil*	2.3	0.16	0.08

Lead-Zinc

Dixie*

J. E. McGregor, of Port Crawford, holds by record five mineral claims on the east slope of the ridge west of Crawford Creek, approximately 2½ miles up Crawford Creek road from the Creston–Kootenay Bay Highway. The deposit is a lead-zinc replacement in limestone. Sheep Creek Mines Limited optioned the property and drilled three diamond-drill holes totalling 324 feet. In addition, 25 cubic yards of material was removed in open-cut excavations.

RIONDEL (49° 116° N.W.)

Silver-Lead-Zinc

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

Company office, Trail; mine office, Riondel. D. S. Campbell, property superintendent; J. B. Donald, mine superintendent; T. F. Walton, mill superintendent. This mine is at Riondel on a small peninsula on the east shore of Kootenay Lake, 6 miles by road north of the ferry-landing at Kootenay Bay. The ore deposits are sulphide replacement bodies in a limestone band that crosses the peninsula and dips westward under the lake. The Bluebell ore zone is in the central part, the Comfort near the north, and the Kootenay Chief ore zone is at the south end of the peninsula. The early history of the property was given in the Annual Report for 1949, in which year extensive development was begun.

Mining and development operations were confined to the Comfort and Kootenay Chief ore zones, most of the work being done in the latter area. Development work completed in 1956 was as follows: 2,526 feet of drifting, 2,187 feet of crosscutting, 5,208 feet of raising, 75 feet of shaft-sinking, and 18,734 feet of diamond drilling.

The major part of the drifting and crosscutting was done on the 375, 525, and 675 levels.

The raising was done for mine development and ventilation purposes.

The No. 1 or Kootenay Chief shaft was extended 76 feet to a total slope length of 1,876 feet. The work on this extension was hampered by the unexpected encountering of a watercourse discharging water at the rate of 500 gallons per minute. This water was heavily charged with carbon dioxide.

Most of the diamond drilling was for exploration purposes, but a large amount was done in advance of the level heading faces. Drilling in advance of headings has now become standard practice in order that water-bearing fissures may be detected and adequately sealed before being reached by the development face. This practice has been necessitated because of the increasing inflow of water in the mine. In December, 1956, the quantity of water pumped from the mine was in excess of 2,000 gallons per minute. To meet the increased pumping requirements, a fourth 150-horsepower 500-gallons-per-minute pump was added to the equipment at the 525 level pumping-station, and a new 60-horsepower pump was installed at the shaft bottom.

In order to meet ventilating requirements, not only for normal demand, but also to dilute and remove the large amount of carbon dioxide entering the mine at several points, the over-all mine ventilation was revised. At the south end of the Kootenay Chief ore

* By J. E. Merrett.

zone, connecting raises were driven from the 375 level to the surface, where an intended fan installation will increase the present discharge capacity from 75,000 cubic feet per minute to 150,000 cubic feet per minute.

Stope mining was done by conventional open-stoping methods and the ore scraped to draw points. A total of 41,000 cubic yards of backfill material was placed in empty stopes. This material was principally gravel, together with a minor amount of waste rock.

Surface construction consisted of an addition to the steel-shop, a reagent storage shed adjoining the mill, and a new repair garage.

The safety programme was successful in maintaining a good record, with an accident-frequency rate of 0.08 and a severity rate of 5.8 shifts lost per thousand shifts worked. Mine-rescue and first-aid classes were held, and teams were entered in the Department of Mines mine-rescue and first-aid competitions held in June at Riondel.

During the year Inland Dredging Ltd., of Calgary, undertook on contract to recover jig-tailings from Bluebell Bay. These tailings, having a high zinc content, were laundered into the lake during milling operations from 1900 to 1928, during which period it was not economically profitable to recover the zinc. The tailings settled at the bottom of the lake in two locations—one at a depth of 60 feet and the other at a depth of 400 feet. The dredging company recovered 3,397 tons of tailings from the shallow deposit by air-lifting the material vertically to a barge, screening out the oversize pieces, and pumping the tailings to settling-ponds on the shore. The tailings were then trucked to the conveyor to the mill fine-ore bin. At the year's end, preparations were being made to air-lift the material from the deep deposit directly to the settling-ponds.

The average number of persons employed was 290, of which 155 were employed underground.

The concentrator milled 252,523 tons of ore, of which 3,397 tons was reclaimed tailings. The concentrates produced were shipped to the Trail smelter.

Tam O'Shanter, etc.*

Harrison Minerals Ltd., under the auspices of Brewis and White Ltd., of Toronto, and the direction of Mid-North Engineering Services Ltd., made an extensive exploration survey of several mineral claims adjacent to the Bluebell property at Riondel. These claims included the Tam O'Shanter Crown-granted claim, the F.M. group owned by D. F. Sutcliffe, the Arcon Base Metals Limited property controlled by A. MacIsaac, and other claims.

The purpose of the exploration was to search for an occurrence of geological conditions similar to those at the Bluebell mine, in the hope that other orebodies might be found. It was believed that the cross-fractures occurring at the Bluebell mine were solution channels for the replacement ore at that property. It was believed that should these cross-fractures or fissure veins persist up Bluebell Mountain east of the mine and cross sufficiently large deposits of limestone, there was a possibility of finding replacement orebodies.

The work included line cutting, mapping, magnetometer surveying, and diamond drilling. A total of 4,224 feet of diamond drilling was completed in fifteen holes. The drilling encountered some veins, but no limestone or replacement orebodies of appreciable size were disclosed; in general, the veins, where intersected, did carry low values in silver, lead, and zinc.

* By J. E. Merrett.

AINSWORTH (49° 116° N.W.)

Silver-Lead-Zinc

Highlander, etc. (Yale Lead & Zinc Mines Limited)

Company office, 525 Seymour Street, Vancouver; mine office, Ainsworth. H. W. Knight, president; H. D. Forman, managing director; P. E. Olson, mine manager; E. Pickard, mine superintendent; C. Anderson, mill superintendent. Capital: 5,000,000 shares, $1 par value. This company controls most of the claims lying between Coffee and Cedar Creeks in the Ainsworth camp. The crushing plant, mill, and main haulage adit are below, and the mine plant and old Highlander adit are above the Nelson–Kaslo Highway, about three-quarters of a mile south of Ainsworth. Production of over 5,000 tons per month was maintained, except from March 21st to June 1st when the property was closed by a strike. All ore came from the Highlander mine.

The Highlander mine is serviced by the old Highlander or 2150 level adit, and by the main haulage or 1900 level adit. The 2150 level explores for several thousand feet the 7-foot-wide Highlander ore-bearing shear which strikes north-south and dips 45 degrees west. Two orebodies, the Albion and Banker, have been developed by raises to the 2600 Albion adit and the 2500 Banker adit respectively. By the end of 1955 the Albion orebody had been mined out above the 2150 level, and by the end of 1956 all main ore pillars, including the main-raise pillar, had been removed. Below the 2150 level the Albion orebody has been developed from a sublevel at the bottom of the orebody, 60 feet above the 1900 level. This area produced up to 75 per cent of the mill-feed in 1956. The remainder of the ore came from the Banker section above the 2150 level, where the orebody has been fully developed by sublevels off the main raise. Exploration and development were also carried out in the old Banker shaft workings, which are connected to the 2500 adit level. Below the 2150 level the Banker orebody has not been developed, but the 1900 level was steadily driven toward it during 1956. A new section of ore 150 feet long has been exposed in this drive.

The outside properties, such as the Eden and Crescent, Krao, etc., which had in the past produced up to 25 per cent of the mill-feed, did not operate in 1956. Exploration at the Danira, Hector, and Firebrand was not continued. The number of employees averaged eighty.

Kootenay Florence (Western Mines Limited)

Company office, 850 West Hastings Street, Vancouver; mine office, Ainsworth. H. M. Wright, president; H. M. Turner, superintendent. Capital: 2,500,000 shares, $1 par value. This company owns a large group of claims lying south of Lendrum Creek and astride Princess Creek. The mine plant and mill are on the Nelson–Kaslo Highway, 2 miles north of Ainsworth. Since 1954 The Consolidated Mining and Smelting Company of Canada, Limited, has been carrying out an exploration programme with a view to gaining eventual control of the property. A gentle arc in the beds of the limestone in the vicinity of the old Lakeshore shaft has been investigated by surface diamond drilling. This drilling was completed in 1956 to a total depth of 23,000 feet.

Western Mines Limited also conducted an exploratory programme. The area adjacent to the Nicolet workings was stripped with a bulldozer and sampling was done. Stripping was also done on the Florence vein system, midway between the Florence No. 1 adit and the north Twin drift.

The concentrator has remained intact since the shut-down in 1953. A clean-up of the lower floor was made by Fred Sonnenberg under a lease arrangement. This amounted to 2 tons of lead concentrate, which was sent to the Trail smelter. Gross content: Silver, 37 oz.; lead, 2,574 lb.; zinc, 150 lb.

Highland

This old mine, owned by The Consolidated Mining and Smelting Company of Canada, Limited, has been idle for many years, except for leasing operations. It adjoins the holdings of Western

Mines Limited to the southwest. Four holes totalling 1,968 feet were diamond drilled to check electromagnetic results.

Hercules, Silver Glance (Triumph Mines Limited) Company office, 355 Burrard Street, Vancouver. S. A. Liening, Seattle, Wash., president; C. Lind, manager. Capital: 3,000,000 shares, $1 par value. This company owns a group of recorded and Crown-granted claims south of Lendrum Creek and west of the property of Western Mines Limited. The Hercules, Sullivan, and Noranda recorded claims cover respectively the Pataha, Ellen, and Bugaboo cancelled Crown-granted claims. In 1954 and 1955 two fissure veins were developed by adits which are shown by a recent survey to be on the Noranda and Sullivan claims and not on the Hercules claim as stated in previous Reports. These adits are 2.7 miles by road from the Kootenay Florence camp. In 1956 work was concentrated in the Silver Glance adit, 1,800 feet northwest and 380 feet lower than the closest adit on the Noranda claim. About fifty years ago the Silver Glance adit was driven 270 feet on a mineralized fissure containing silver and gold mineralization. At 70 feet from the portal there is a raise 60 feet to surface and a winze reported to be 38 feet deep. At 230 feet from the portal there is a drift to the north 60 feet long. The adit was extended to the southeast with the object of intersecting, in a drive of about 1,000 feet, the known fissure veins on the Noranda and Sullivan claims. A band of limestone containing encouraging concentrations of silver-lead-zinc mineralization was encountered between 662 and 712 feet from the portal. When the work ceased because of winter conditions, the adit had reached a point 821 feet from the portal. Three men were transported daily from Kaslo for this work.

Tariff This Crown-granted claim, owned by Yale Lead & Zinc Mines Limited, was under lease to T. Lane, of Ainsworth. One shipment was made to the Trail smelter. Production: Ore shipped, 7 tons. Gross content: Silver, 148 oz.; lead, 6,445 lb.; zinc, 1,535 lb.

Laura M This Crown-granted claim is part of the Western Mines Limited holdings in the Ainsworth camp. A lease was given to Fred Sonnenberg, who made a shipment of ore collected from surface strippings. Production: Ore shipped, 4 tons. Gross content: Silver, 41 oz.; lead, 2,556 lb.; zinc, 818 lb.

Woodbury Creek

Amazon (Kaslo Base Metals, Ltd.) (49° 116° N.W.) Company office, 800 Hall Building, 789 West Pender Street, Vancouver. H. M. Turner, manager. Capital: 3,000,000 shares, 50 cents par value. This company owns the Amazon, Budwiser No. 2, Superior, and Superior Fraction claims at the mouth of Woodbury Creek. The last work was done in 1953, when Woodbury Mines Limited drove the Amazon adit 860 feet on the south bank of Woodbury Creek, just above the Nelson–Kaslo Highway. This adit was driven an additional 185 feet in 1956. At 990 feet from the portal the downward projection of a fissure vein exposed in Woodbury Creek canyon was intersected. This vein had been followed by old drift workings which extended east and west from the canyon 140 and 120 feet respectively. A raise was driven from the Amazon adit to the west drift, 15 feet vertically above. At 906 feet from the portal a new fissure vein was intersected. It contained 3 to 4 inches of galena, and replacement extended into the walls to a width of 2 feet.

The mining plant was an Ingersoll-Rand 315-cubic-feet-per-minute portable compressor. Some difficulty was encountered in obtaining permission to use the surface near the portal. Work ceased in November. Four men were employed.

Can-Amer Mining & Milling Company Ltd. (49° 116° N.W.) Company office, 459 Baker Street, Nelson. L. N. Martini, Kennewick, Wash., president; L. D. Besecker, Ainsworth, manager. Capital: 400 shares, $500 par value. Since 1953 this company has been operating intermittently a custom mill at the mouth of Woodbury Creek. Capacity is rated at 85 tons per day. The following tonnage was treated in 1956: Caledonia, 326 tons; Star, 139 tons. The Star ore had been left over from 1955.

PADDY PEAK*

Silver-Lead-Zinc

Utica (49° 117° N.E.) The Utica mine is at the head of Twelve Mile Creek, about 15 miles by road from Kaslo. It is owned by Utica Mines (1937) Limited and has been under lease since 1953 to J. A. Cooper, of Kaslo. The main level is the No. 7 adit, which is connected by raise to the No. 4 adit. A sublevel, the No. 5, has been driven from the raise to develop two parallel veins known as the East and West veins. As in previous years, production in 1956 was from the East vein. The nearly vertical vein was mined by cut-and-fill methods from No. 7 level nearly to No. 5, and from No. 5 level nearly to No. 4. The vein contained from 1 to 6 inches of galena with a high silver content. Ore was removed by horse haulage via the No. 7 level. It was trucked to Kaslo and thence by barge and rail to the Trail smelter and East Helena, Mont. About three men were employed. Production: Ore shipped, 193 tons. Gross content: Silver, 18,459 oz.; lead, 39,550 lb.; zinc, 48,122 lb.

RETALLACK-THREE FORKS*

Silver-Lead-Zinc

Caledonia (50° 117° S.E.) The Caledonia mine is on the east side of Rossiter Creek, a southerly flowing tributary of Kaslo River. A short access road leads to the workings from Blaylock. It is owned by G. E. McCready, of Retallack, who has been responsible for a small but steady production for several years. An east-west fissure zone with a steep southerly dip has been developed by surface workings and two adits. Recent production has been from the lower adit, which is a crosscut for 155 feet, and contains more than 350 feet of drifting on the fissure. Stoping was done in the east end as previously. Ore was trucked to the Can-Amer mill near Ainsworth and also to the Trail smelter. Production: Ore milled, 326 tons. Gross content: Silver, 3,160 oz.; lead, 30,152 lb.; zinc, 37,374 lb. Ore shipped, 22 tons. Gross content: Silver, 1,555 oz.; lead, 25,717 lb.; zinc, 2,791 lb.

Whitewater (50° 117° S.E.) This old property at Retallack was operated by Kootenay Belle Gold Mines Limited from 1943 until 1953, when the assets were taken over by Canada Trust Company. The property has since been inactive. In 1956 the mill equipment was sold and removed for use at the Velvet mine near Rossland. A clean-up lease was given to P. McCrory, who made a shipment of lead concentrate to the Trail Smelter. Production: Concentrate shipped, 4 tons. Gross content: Silver, 194 oz.; lead, 3,090 lb.; zinc, 855 lb. The mineral rights were acquired by The Consolidated Mining and Smelting Company of Canada, Limited.

Min, Cork (50° 117° S.E.) The property of Slocan Monitor Mines Limited near Three Forks was optioned to Frank McMahon, of Calgary. Sixteen Crown-granted claims make up the property, as follows: Keewatis, Friday Fraction, Monitor, Hustler Fraction, Nellie Fraction, Ouray, Portland No. 5, Taw Fraction, Horn Fraction, Guf, Tip, Min, Lope, West Fraction, Cork, and Ouray Fraction. The property adjoins Violamac ground on the north and west. Bull-

* By J. W. Peck.

dozer stripping and geological mapping were done in the vicinity of the Min and Cork workings. This work indicated that a favourable situation might exist in the limy argillites on the Lope claim. A Cork adit at an elevation of 3,600 feet was rehabilitated and a drive started southwesterly into the Lope claim. At the start of this work the dip of the limy argillites was to the west, but when about 600 feet had been driven the dip had changed to the east. Mining was contracted to F. P. Vanin and V. C. Hanson, who installed a small plant near the portal. This site is reached by one-half mile of road from a point on the Violamac mine road, 1.2 miles from the Three Forks–Sandon road. R. E. Legg, of Vancouver, is consultant.

SANDON*

Silver-Lead-Zinc

Silversmith, etc. (Carnegie Mines of British Columbia, Ltd.)

(49° 117° N.E.) Head office, 1160 Peel Street, Montreal; mine office, Sandon. J. A. Murphy, Montreal, president; T. R. Buckham, mine manager. Capital: 10,000 shares, $1 par value. This company owns the Silversmith, Slocan Star, Richmond-Eureka, Ruth Hope, and Slocan King mines on Sandon Creek, south of Sandon. A truck-road extends to all mines from the mill on the western outskirts of Sandon. In the first half of 1956 work was restricted to the driving of an exploratory crosscut on the No. 10 level of the Silversmith. This crosscut was started in 1955 and was driven into the hangingwall to investigate parallel vein systems projected downward as the result of previous geological mapping. This crosscut, a possible 1,800 feet long and driven on a one-shift basis, was nearing its objective in December.

In the latter half of 1956 the Slocan Star, idle since 1953, was put into production. Stoping and development work were carried out on the No. 3 adit level. In the Ruth Hope mine stoping was done from a sublevel above the west end of the No. 5 adit level. This latter area had been made accessible by development work in 1954, but was idle in 1955.

The mill operated in the latter half of 1956 on a one-shift basis at about 30 tons per day. In addition to the Slocan Star and Ruth Hope ores, 500 tons of jig tailings were obtained from the site of the old Slocan Star mill at the No. 10 portal. The crew had increased to over twenty by December.

Noble Five, etc. (Cody-Reco Mines Limited)

(49° 117° N.E.) Head office, 721 Eastern Avenue, Toronto. James A. Taylor, president; D. M. Kline, consultant. Capital: 3,000,000 shares, $1 par value. This company owns a group of claims north of Cody, including old mines such as the Noble Five, Slocan Sovereign, Last Chance, American Boy, and Deadman. A road extends from the mill at Cody to all principal workings. The mill can also be served by tram-line from the lower portals of the Noble Five and Slocan Sovereign mines.

As in 1955, all work was in the Noble Five mine. This mine is serviced by a long adit crosscut (No. 18 level) and a 1,000-foot, vertical, interior, four-compartment shaft extending from this adit to No. 8 adit. The shaft has not been used for many years, but several raises have been driven in recent years to No. 16 level, the most extensive level off the shaft. In 1956 development work was concentrated on No. 18 level to the west of the main adit crosscut, where the projected American Boy vein shear was located in 1955. This shear was explored by drifting 365 feet west and 113 feet east. In the west drift a raise was put up 70 feet and a sublevel 60 feet long established. Exploratory raises totalling 100 feet were driven from this sublevel. The mineralization encountered was negligible. About 100 feet of raising was done on small stringers from the 18/21 raise. The results of this work also were disappointing. Development work was under the

* By J. W. Peck.

direction of W. Hall, and ceased in May. Commencing in August a geological and diamond-drilling programme was carried out by Mid-West Engineering Services Limited, of Toronto. This work was confined to Nos. 8 and 18 levels, with Grant Harper in charge. The mill did not operate. The number of men employed averaged ten.

Victor (Violamac Mines Limited) (49° 117° N.E.) Head office, 416, 25 Adelaide Street West, Toronto; mine office, New Denver. George A. MacMillan, president; J. C. Black, manager, western operations; W. M. Sharp, manager. Capital: 5,000,000 shares, $1 par value. This company owns the Victor mine, 2½ miles by road northwest of Sandon, or 2½ miles by road southeast of Three Forks. The nearly vertical Victor vein has been developed by several connected adits, the lowest being No. 9. Between No. 7 and No. 9 levels a long sublevel, the 3950, was extended in 1956. This work indicates that the Victor vein has a mineralized length of about 1,400 feet and a width ranging from a crack to as much as 6 feet. Most of the production in 1956 came from above the 3950 level. Very little ore has been found on No. 9, which is the longest level—it is 4,200 feet long. One block of ore known as the West Victor is 195 feet long on No. 9 level. Ore search was also conducted on the No. 5 and No. 7 levels.

The No. 10 adit, which is below No. 9 adit and on a different vein, was extended to a length of 750 feet. One stope was started in the best mineralized section.

The old Cinderella mine downhill from the Victor was reopened, mapped, and surveyed. A short access road was built. This mine consists of two connected adits and approximately 2,000 feet of workings.

Sorted ore, which assayed over 70 per cent lead and 90 ounces of silver to the ton, continued to be shipped to the Trail smelter. Ore of milling grade continued to be trucked to the Western Exploration mill at Silverton, at an average of about 1,800 tons per month. The grade was slightly below that milled in 1955. The number of men employed averaged sixty-five.

Lone Bachelor (Lone Bachelor Mines Limited) (49° 117° N.E.) This company is controlled by Violamac Mines Limited, which owns the adjoining Victor mine. The main haulage is the No. 4 level, which is connected by raises via a sublevel to the old No. 3 adit. Exploration continued on a small scale, chiefly on the sublevel where a narrow vein containing small lenses of galena has been followed by a drift for a few hundred feet. A small amount of drifting and raising was done on the sublevel, and a small exploratory stope was started in the best section. All services were supplied from the Violamac camp. Two men were employed.

Hinckley (49° 117° N.E.) This is an old Crown-granted claim east of the Victor claim, about half-way along the Sandon–Victor mine road. It is owned by W. D. Pengelly and associates, of New Denver and Silverton. Since 1954 a narrow lode containing small lenses of galena has been developed intermittently by the extension of an old adit. Sorted ore was trucked to the Trail smelter. Other ores, stockpiled since the start of operations, were milled at the Van Roi concentrator.

Wonderful (Silver Ridge Mining Company Limited) (49° 117° N.E.) Company office, 373 Baker Street, Nelson. J. R. Kenney, Chicago, Ill., vice-president and manager. Capital: 5,000,000 shares, 50 cents par value. This company owns a large group of claims southwest of Sandon, including the Wonderful.

The property has been idle since 1953, except for exploratory work on a small scale. A narrow vein was exposed by bulldozer stripping a few hundred feet from the Pearson adit. An adit was started on this vein, and a few tons of galena were sorted out. Two men were employed. Production: Ore shipped, 10 tons. Gross content: Silver, 596 oz.; lead, 10,521 lb.; zinc, 2,050 lb.

Discovery Fraction (49° 117° N.E.) This claim is near the summit of Mount Payne, north of Sandon. It is owned by E. H. Petersen, of Sandon, who made a small shipment to the Trail smelter. Previous production was in 1953. Production: Ore shipped, 9 tons. Gross content: Silver, 1,035 oz.; lead, 11,739 lb.; zinc, 450 lb.

SLOCAN LAKE*

Silver-Lead-Zinc

Mammoth, Standard, Enterprise, Monarch (Western Exploration Company Limited) (49° 117° N.E.) Company office, 38 South Dearborn Street, Chicago, Ill.; mine office, Silverton. M. P. McCullough, Chicago, president; A. M. Ham, Silverton, managing director; R. A. Avison, mine superintendent; C. E. Towgood, mill superintendent. Capital: 2,000,000 shares, 50 cents par value. This company owns the Mammoth, Monarch, and Standard mines near Silverton, and the Enterprise mine on Enterprise Creek, 12½ miles by road south of Silverton. The Monarch lode, which lies between the Mammoth and Standard mines, has been under development since 1952. As a result of several thousand feet of drifting and crosscutting in the Monarch adit (elevation 5,350 feet), followed by diamond drilling, an orebody was indicated below the adit. The Hecla drift, on the No. 7 adit level of the Mammoth mine (elevation 5,040 feet), was extended to a total length of 4,000 feet in 1955 to reach under this orebody. A raise was started in the hangingwall of the lode toward the orebody and was completed in 1956 to the Monarch adit. A sublevel was established half-way in the raise in the vicinity of the orebody. In the Hecla drift a mineralized section 500 feet long was explored by several box holes, and the broken material from the drift and the box holes was milled as a large bulk sample totalling about 1,000 tons. The results were sufficiently encouraging to warrant the start of a diamond-drilling programme to explore this orebody at depth.

Production started from the Mammoth mine, which had been idle since 1952. The main haulage level is No. 7 adit, which is connected by a 45-degree raise to No. 9 adit level, 340 feet below. The last production was from No. 8 level, where a square-set stope was carried up nearly to the mined-out block above No. 7 level. In 1956 a stope was started on No. 9 level near the main raise, and the adit was driven to a point about 400 feet east of the main raise. Mineralization encountered was sufficient to warrant prospecting by box holes. This development ore and the stope production, and the Hecla drift ore, was delivered to the mill via the 16,000-foot tram-line. Electricity and compressed air were supplied from the company's hydro plant on Silverton Creek. The living-quarters on site were used.

The Standard was idle except for leasing operations. J. Kelly and W. Postlethwaite obtained about 300 tons from Nos. 2, 6, and 7 levels. This ore was milled at the company's mill.

The Enterprise mine remained closed, but the camp is intact and a watchman is employed.

The mill operated throughout 1956 treating Violamac ore on a custom basis. Company ore amounted to about one week's run per month. The number of men employed averaged thirty-five.

Bosun (New Santiago Mines Limited) (49° 117° N.E.) Company office, 511, 850 West Hastings Street, Vancouver. R. Crowe-Swords, president. Capital: 3,000,000 shares, 50 cents par value. The Bosun mine is on the east shore of Slocan Lake, 1½ miles south of New Denver on the Nelson–Nakusp Highway. The main haulage, No. 6 adit, is driven beneath the highway from a site 40 feet above the lake. The mine has been idle since 1953, except for a small crew engaged to unwater the winze section in 1955. In 1956 a lease

* By J. W. Peck.

was given to W. H. McLeod, of Silverton, who, with the aid of two partners, started an exploratory crosscut in the south centre section of the mine to investigate a vein reported to have been intersected by a diamond-drill hole many years ago. The crosscut was driven beneath the hole, which had been drilled slightly upward. The crosscut was driven 132 feet and an additional 35 feet was diamond drilled from the face, but no vein was encountered. A raise was then started to locate the exact position of the old diamond-drill hole.

Van Roi, Hewitt (Slocan Van Roi Mines Limited) (49° 117° N.E.) Company office, 532 Burrard Street, Vancouver; mine office, Silverton. W. Tattrie, mine manager; T. Leask, mill superintendent. Capital: 5,000,000 shares, no par value. This company owns the Van Roi and Hewitt mines near Silverton. Transcontinental Resources Limited has directional control. As in 1955, work was concentrated in the Hewitt mine, 6¼ miles by road southeast of Silverton. On the lowest or No. 10 level, an orebody about 2,000 feet from the portal has been stoped in the past above the level. In 1956 a 10- by 7-foot winze, inclined at 65 degrees, was sunk in the hangingwall and a level established 100 feet vertically below No. 10 level. A crosscut was driven 100 feet south to reach the vein, and drifting was done east and west. This work exposed a section 95 feet long, well mineralized over drift width with galena, sphalerite, and ruby silver. Development of this ore block was in progress at the end of 1956.

Above No. 10 level a lease was given to M. Tarnowski, of Silverton, to mine remnants in the 1026 stope. Tarnowski and two partners removed 563 tons for milling at the company's concentrator.

The Van Roi mine and camp are one-quarter mile by road east of the Hewitt No. 10 portal. Since 1953 the mine has been under lease to M. Slobodzian, J. W. Miller, and L. Fried, who are known collectively as the S.F. and M. Mining Company. Most of the ore in 1956 came from stopes above No. 1 level and some from the winze area in the southwest end of No. 3 level. Development was started of a block of ore below the mined-out "Brookes'" stope in the extreme southeast end of No. 3 level. With company assistance a crosscut was driven under this ore from No. 4 sublevel. Leasing operations employed as many as eight men.

Another lease was given in the latter half of 1956 to V. Hansen and C. Higgins (Higgins & Co.) to mine ore on No. 5 level in the 546 south stope. Considerable track and pipe had to be installed to service this area.

The Van Roi mill is 1 mile south of Silverton on the Nelson–Nakusp Highway. It had been shut down since 1952. It was rehabilitated and milling started in March, 1956. It operated on company and custom ore at a rate of 40 to 50 tons per day. The following tonnage was treated:—

	Net Tons
A.U. (N.G.N. Partnership)	97
Van Roi lessees (S.F. & M. Mining Co.)	3,684
Hinckley Mining Co.	96
Galena Farm (F. Mills)	238
Westmont (Myers & Thickett)	170
Hewitt lessee (M. Tarnowski)	563
Van Roi lessees (Higgins & Co.)	405
Fisher Maiden (F. Mills)	75
Austin (L. Gormley)	34
Total custom milling	5,362
Company production, Hewitt	2,049
Total	7,411

The Van Roi camp, consisting of modern bunk-houses, change-house, and cook-house, was again put into use. It had been partly stripped in 1953. The number of men employed on company operations averaged twenty.

Galena Farm

(49° 117° N.E.) This mine is about 2 miles by road south of Silverton. For several years it has been leased intermittently by Frank S. Mills, of Silverton. A mineralized fissure, discovered in 1955 east of the old shaft, was developed by a short adit. A well-mineralized section, 50 feet long, was stoped to near surface. Sorted ore was shipped to the Trail smelter, and the lower grade was milled at the Van Roi concentrator. Production: Ore shipped, 30 tons. Gross content: Silver, 3,315 oz.; lead, 39,619 lb.; zinc, 3,166 lb. Ore milled, 238 tons. Gross content: Silver, 3,085 oz.; lead, 32,259 lb.; zinc, 43,034 lb.; cadmium, 278 lb.

Noonday

(49° 117° N.E.) The Noonday mine is just east of the Galena Farm mine. It was under lease to K. Millar and H. Lyon, of Silverton, who made a shipment to the Trail smelter. Production: Ore shipped, 5 tons. Gross content: Silver, 25 oz.; lead, 661 lb.; zinc, 428 lb.

A.U. (Lucky Thought)

(49° 117° N.E.) The A.U. No. 1 and A.U. No. 2 are recorded claims adjoining the Van Roi holdings to the south and cover ground at one time known as the Lucky Thought. The workings are reached by a road, 1 mile long, from a point on the Silverton Creek road 3 miles from Silverton. The property has been idle since 1950, but in 1956 operations resumed under the N.G.N. Partnership of J. Nesbitt, K. Gordon, and W. Nixon. A mineralized shear in argillite has been developed by four adits. A sublevel is established off a raise between the No. 4 and No. 3 adits. All previous ore has been obtained from the sublevel and above No. 3 level. In 1956 work was concentrated in No. 4 adit, which consists of a southerly crosscut for 650 feet long and 600 feet of drifting on the shear. No worth-while mineralization has been encountered on this level. Further exploration by a raise west of the main raise was without success. In the main raise a slash was started at a point half-way up the raise on the east side at what appeared to be the bottom of an oreshoot. The ore obtained was trucked to the Van Roi mill. Production: Ore milled, 90 tons. Gross content: Silver, 181 oz.; lead, 1,005 lb.; zinc, 11,149 lb.

Fisher Maiden

(49° 117° N.E.) The Fisher Maiden property consists of the Troy and St. Helena Crown-granted claims on the north side of Silverton Creek, 8 miles by road from Silverton. It is owned by Frank S. Mills and S. Dewis, both of Silverton. It was last active in 1953, when the lowest adit was rehabilitated for its full length of 1,330 feet. The main oreshoot in this adit is near the portal, where a fissure vein in granite has been partly stoped to the adit above. The ore thus obtained and stored many years ago in a cribbed structure at the portal was removed in 1956 and trucked to the Van Roi mill. Production: Ore milled, 75 tons. Gross content: Silver, 1,196 oz.; lead, 1,929 lb.; zinc, 11,097 lb.

Westmont

(49° 117° N.E.) This is a group of eight Crown-granted claims on the north side of Enterprise Creek, opposite the Enterprise mine. It is owned by J. A. Cullinane, of Nelson. A short access road leads to the lowest of four adits from a point on the Enterprise Creek road about 4½ miles from the Nelson–Nakusp Highway. The property has been idle since 1929, and most of the workings are inaccessible. In 1956 a lease was given to C. Thickett and H. Myers. The No. 4 dump, which is on the Eastmont claim, was mined and trucked to the Van Roi mill at Silverton. Production: Ore milled, 170 tons. Gross content: Silver, 2,453 oz.; lead, 3,986 lb.; zinc, 5,599 lb.

Austin

(49° 117° N.E.) The Austin group of three recorded claims is west of the Enterprise mine of Western Exploration Company Limited and covers the abandoned Mount Royal group of Dumac

Mines Limited. It is owned by L. Gormley, of New Denver. A strong shear zone has been developed by open-cuts and short adits. The property has been idle since 1952 but was worked on a small scale in 1956, and the ore obtained was trucked to the Van Roi mill at Silverton. Production: Ore milled, 34 tons. Gross content: Silver, 184 oz.; lead, 1,891 lb.; zinc, 2,944 lb.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1952, p. 180.]

Boomerang

(49° 117° N.E.) The Boomerang and Richmond claims are owned by the estate of S. N. Ross, which is administered by the executrix, Mrs. E. Ward, of Nelson. The claims are on the south side of Enterprise Creek, about 1½ miles above the confluence with Paupo Creek. The property is accessible by fair road to Paupo Creek, 9 miles from the Nelson–Nakusp Highway, and thence by a steep road and 1,000 feet of trail. Recent activity has been restricted to road-building. A quartz vein in granite has been explored by two adits, but recent flood erosion has covered the area with debris, making the mine inaccessible. Previous to this, Mr. Ross had done a small amount of development work with hand-steel, and several tons of ore was sorted from this work and stored in sacks on site. Quartz, galena, sphalerite, and grey copper were the noticeable minerals in the ore. Mrs. E. Ward, P. Ward, and N. Subasic made one shipment to the Trail smelter. Production: Ore shipped, 3 tons. Gross content: Silver, 144 oz.; lead, 266 lb.; zinc, 271 lb.

SPRINGER CREEK*

Silver

Ottawa (Ottawa Silver Mining & Milling Company)

(49° 117° N.E.) Company office, c/o W. E. Graham, Slocan City. Capital: 3,000,000 shares, 1 cent par value. This company owns the Ottawa mine on Springer Creek, 5 miles by road from Slocan City. Intermittent work has been carried on for several years in the lowest or No. 6 adit, which is not connected to No. 5 adit. Four stopes numbered A to D have been carried up the 25-degree dip of a quartz vein. C. Thickett, W. Boisvert, and A. Archibald were employed to make a raise connection to a sublevel which is accessible from No. 5 adit level, and about 190 feet was driven before work ceased. These men underhand mined in the vicinity of " B " stope and shipped ore to the Trail smelter under a working agreement. Production: Ore shipped, 10 tons. Gross content: Silver, 2,732 oz.; lead, 116 lb.; zinc, 36 lb.

LOWER ARROW LAKE*

Gold-Silver

Promistora

(50° 117° S.W.) This property is near Burton, at the north end of Lower Arrow Lake. D. Pearce, of Arrow Park, made a shipment to the Trail smelter. Production: Ore shipped, 9 tons. Gross content: Gold, 23 oz.; silver, 27 oz.; lead, 185 lb.; zinc, 258 lb.

NORTH LARDEAU†

Gold-Silver-Lead-Zinc

Spider, Eclipse, etc. (Sunshine Lardeau Mines Limited)‡

(50° 117° N.W.) Company office, 307, 413 Granville Street, Vancouver; mine office, Beaton. J. Drybrough, president; G. G. Sullivan, manager; O. Meurling, mine superintendent; E. Hall, mill superintendent. Capital: 4,000,000 shares, no par value. The mine camp and mill are at the old townsite of Camborne, 6

* By J. W. Peck.
† By J. W. Peck, except as noted.
‡ By G. E. P. Eastwood and J. W. Peck.

miles by road northeast of Beaton, on the northeast arm of Upper Arrow Lake. The mine is on the south side of Pool Creek, 2 to 3 miles by very steep road from Camborne.

The veins strike a few degrees west of north and dip steeply east. They consist of sphalerite, silver-bearing galena, pyrite, and minor chalcopyrite in quartz-carbonate gangue. Grey copper and arsenopyrite occur locally. A small amount of gold is recovered from the ore, but its mineralogical association is unknown. Vein walls have been extensively replaced by siderite, in places accompanied by green chromium mica.

Mining in recent years has been mainly from the Spider No. 4 vein, the largest of five *en échelon* veins in the Spider zone. In 1956 the company began mining a vein in the Eclipse zone, 1,000 feet east of the Spider. This vein was at first thought to be the extension of an unproductive vein followed by an old adit on the Eclipse claim, but it is now believed to be distinct, and is called Eclipse No. 2 in this Report. Some exploratory work has been done on the Barclay and Sandy veins, 1,000 and 2,000 feet west of the Spider zone, with inconclusive results.

Four adit levels have been driven on the Spider No. 4 vein, the lowest being No. 10. By the end of the year the vein was mined out nearly down to this level. The Eclipse No. 2 vein is developed by a long crosscut off No. 10 adit, by a 10-level drift, by a raise, and by a sublevel 110 feet above No. 10. In 1956 the raise was completed to the surface of bedrock and an adit driven in overburden to intersect it. At the end of the year, preparations were made to sink an internal shaft below No. 10 level. A 90-foot crosscut investigated mineralization found by drilling east from the Eclipse vein on No. 10 level. Four long holes were drilled to test the extensions of the Spider No. 4 and Eclipse No. 2 veins below No. 10 level, and a few short holes were drilled from Nos. 5 and 6 levels to test the downward extensions respectively of the Spider Nos. 1 and 2 veins and Spider No. 5 vein.

In May a fire completely destroyed the mining plant at No. 10 portal. It was rebuilt with some improvements. Another fire in May destroyed a new modern bunk-house with the loss of one life. The structure was replaced during the summer. These accidents affected the mill tonnage in May, but the average for the year was about 2,400 tons per month. Mill-heads averaged: Gold, 0.1 oz. per ton; silver, 11½ oz. per ton; lead, 9½ per cent; zinc, 12 per cent. The concentrates were transported by truck and Arrow Lakes barge to rail-head at Nakusp and then to smelters in the United States. Stockpiling was done at the mine for several weeks in the winter, when the upper end of Upper Arrow Lake froze over. The number of men employed averaged sixty-four.

History.—Underground work on the Spider claim began in 1910, and small-scale development was carried on until 1930. I. G. Nelson acquired the claim in 1937 and in 1948 optioned it to W. J. Scorgie, who subsequently assigned the option to Sunshine Lardeau Mines Limited, a company organized by him and incorporated in 1947. In 1950 a diamond-drilling programme supervised by D. Burns resulted in the discovery of Nos. 4 and 5 veins. In 1951 a crosscut was driven to the veins on No. 5 level, No. 6 adit was driven, and the option was exercised. A mill was installed in the old Meridian mill building and started up in May, 1952. A short adit formerly known as No. 6 was extended as No. 8 to intersect No. 4 vein. Berens River Mines Limited provided additional funds and assumed operating control in 1952. No. 10 adit was driven in 1953. In 1956 Berens River Mines Limited was liquidated, and control of Sunshine Lardeau operations passed to the parent organization, Newmont Mining Corporation. Production through to 1956 is tabled on the following page:—

	Ore Shipped	Ore Milled	Gold	Silver	Lead	Zinc	Copper	Cadmium	Vein
	Tons	Tons	Oz.	Oz.	Lb.	Lb.	Lb.	Lb.	
1911	6	....	....	1,051	4,153	....	....	....	1
1912	12	....	16	9,909	4,137	....	....	....	1
1917	6	....	....	307	1,633	....	....	....	1 and 2
1926	137	....	8	9,314	35,786	32,260	....	....	1 and 2
1927	28	....	1	1,863	8,652	7,687	....	....	1 and 2
1929	6	....	....	470	2,434	....	....	....	3
1937	90	....	8	6,784	34,019	29,838	....	....	2 and 3
1941	12	....	1	1,294	8,132	3,122	....	....	Probably 1 and 2
1949	26	....	3	942	9,839	7,028	....	....	1 and 2
1952	800?	6,319	706	147,710	1,298,777	836,525	....	....	1 and 4
1953	755?	16,503	1,103	154,658	2,221,558	2,478,730	38,969	19,058	4
1954	685	17,219	2,117	299,252	3,911,339	3,280,068	....	17,575	4
1955	710?	28,345	2,475	326,828	5,143,334	5,608,261	....	31,027	4 and Eclipse 2
1956	....	28,142	2,129	333,714	5,193,437	6,064,726	97,781	36,024	4 and Eclipse 2

The Eclipse claim was located in 1899, and the adit on No. 1 vein started in 1900. The Consolidated Mining and Smelting Company of Canada, Limited, drilled the showing in 1927–28 and drove the adit to its present length. Sunshine Lardeau Mines Limited obtained an option-purchase agreement from Lardeau Mines Exploration Limited in 1954 and found the No. 2 vein by diamond drilling from surface. A long crosscut on the Spider No. 10 level was driven to the vein in 1955.

Sunshine Lardeau Mines Limited drilled the Sandy vein from surface in 1954, and late in 1955 enlarged and extended the upper adit. Diamond drilling from this adit found no additional ore, and the temporary mining plant was removed in the spring of 1956.

Topography.—The veins are on the south side of Pool Creek, which flows in a deep rock canyon. Away from the creek the hillside is heavily timbered and thickly covered with overburden. Natural exposures are scarce, and exceedingly thick gravels on the Eclipse claim have presented difficulties in diamond drilling and mining.

Geology.—The country rock is greenstone and locally black phyllite, squeezed into close asymmetric to isoclinal folds, with overturning to the southwest. Plunges are to the southeast, averaging about 25 degrees. The folds can rarely be traced between exposures.

The rocks are broken by six types of steeply dipping fractures:—

(1) Slip along the schistosity, which in turn is parallel to bedding except in the axial regions of folds. Bedded gouge seams are locally conspicuous, and polished foliation surfaces are closely spaced through most of the rock. Rare slickensides indicate right-hand movement.

(2) North-striking right-hand faults. These are the principal sites of mineralization and are discussed in some detail below.

(3) Fault offshoots, which commonly break directly across the foliation. Some are mineralized.

(4) Radiating shears in Spider Nos. 1 and 3 vein areas; some are mineralized. Types (1) to (4) are believed to be genetically related and to have been produced at roughly the same time by the same stresses.

(5) Rare, widely scattered, east-west joints and faults with variable dips and in part quartz bearing. One is known to be mineralized.

(6) Small gouge-bearing faults in the Pool Creek bluffs displacing phyllite, diorite, and quartz veins in various directions and senses. Mineralization has not been observed in them.

The right-hand faults strike mostly between north 5 degress west and north 15 degrees west and dip 70 to 80 degrees east. The strike length ranges up to at least 450 feet, and the vertical range is probably at least as great. The strike-slip was proved to be right hand except on the Spider Nos. 3 and 5 and Barclay faults, where data are obscure. Eclipse No. 2 is a normal fault with a net slip of about 140 feet raking about 45 degrees south. On most other faults the net slip is probably between 30 and 200 feet. Oblique slip is probable on most faults even though drag structures within them indicate nearly horizontal movement.

The faults terminate laterally by fraying and curving left into the foliation, the displacement presumably being taken up along foliation slips. Most faults have one or more mineralized cross-fractures that curve to the right perpendicular to the foliation. The amount and direction of movement on these fractures are unknown.

The faults appear to be restricted vertically. Mineralization in Eclipse No. 2 ends a short distance above the sublevel, suggesting the fault may be dying out upward. Spider No. 1 fault disintegrates upward into a shatter zone, and Spider No. 4 shortens toward surface. Spider No. 1 fault shortens downward.

Silver-lead-zinc mineralization, so far as is known and with one exception, is restricted to the north-striking faults and to a few fractures associated with them. Conversely, north-striking faults devoid of mineralization have not been observed. Additional faults beneath overburden might be predicted if offset could be shown, but this appears possible only along the greenstone-phyllite contact. Elsewhere, horizon markers are difficult to establish and the structure is complex.

Along most veins the wallrock is largely replaced by siderite, but not all siderite rock is associated with veins. Considerable areas of phyllite show partial replacement, accompanied by some silicification, and a few patches of nearly complete replacement occur in both phyllite and greenstone distant from any known veins or faults. Normally, carbonate replacement of the wallrock dies out just before the fault curves into the foliation, but from the Spider No. 2 vein it follows the foliation to No. 1 and on to Nos. 4 and 5. The replacement was therefore once believed to be a bedded zone with ore occurring in it along north-striking joints, and Nos. 4 and 5 veins were found by drilling the zone at intervals. The north-striking fissures are now known to be faults, and the siderite replacement is believed directly related to them. Intense alteration dies out in scattered surface exposures a short distance southeast of No. 2 vein and in slashes into the west wall of No. 5 vein on No. 5 level. The southerly extension of No. 4 vein on No. 7 and lower levels is beneath the altered area on No. 5 level and surface. It is suggested that disturbance by four faults locally opened the foliation to siderite replacement.

Spider Zone (*see* Figs. 8 and 9). — The five known Spider veins are all in greenstone and have considerable thicknesses of altered wallrock. Quartz is the principal gangue, accompanied by some calcite and siderite. Quartz is sparing on the upper levels but forms a thick continuous vein along No. 4 fault on Nos. 8 and 10 levels, obliterating the fault for considerable distances. Sulphides line fault remnants or form large ragged lenses and pockets in the gangue. Veinlets of quartz or sulphides extend into the walls. The principal sulphides are pyrite, sphalerite, and silver-bearing galena. Chalcopyrite is minor but is widely distributed. Grey copper is rarely seen in No. 4 vein but was an important constituent of ore from Nos. 1 and 2 veins. Arsenopyrite is rare.

The Spider No. 4 vein has a known vertical range of more than 600 feet and a length which increases from 85 feet on No. 5 level to 400 feet on No. 10 level, in addition to about 100 feet of low-grade ore in an offshoot on No. 10. The ore is from 3 to 10 feet wide. Ore is continuous along the vein in the upper levels, but the longer sections of vein on Nos. 8 and 10 levels contain short lengths carrying only sparsely disseminated sulphides. On these levels the vein splits toward the north end, the intersection plunging 70 degrees north. On No. 10 level an offshoot curves to the right across the foliation and back to a north strike; sphalerite and galena are essentially con-

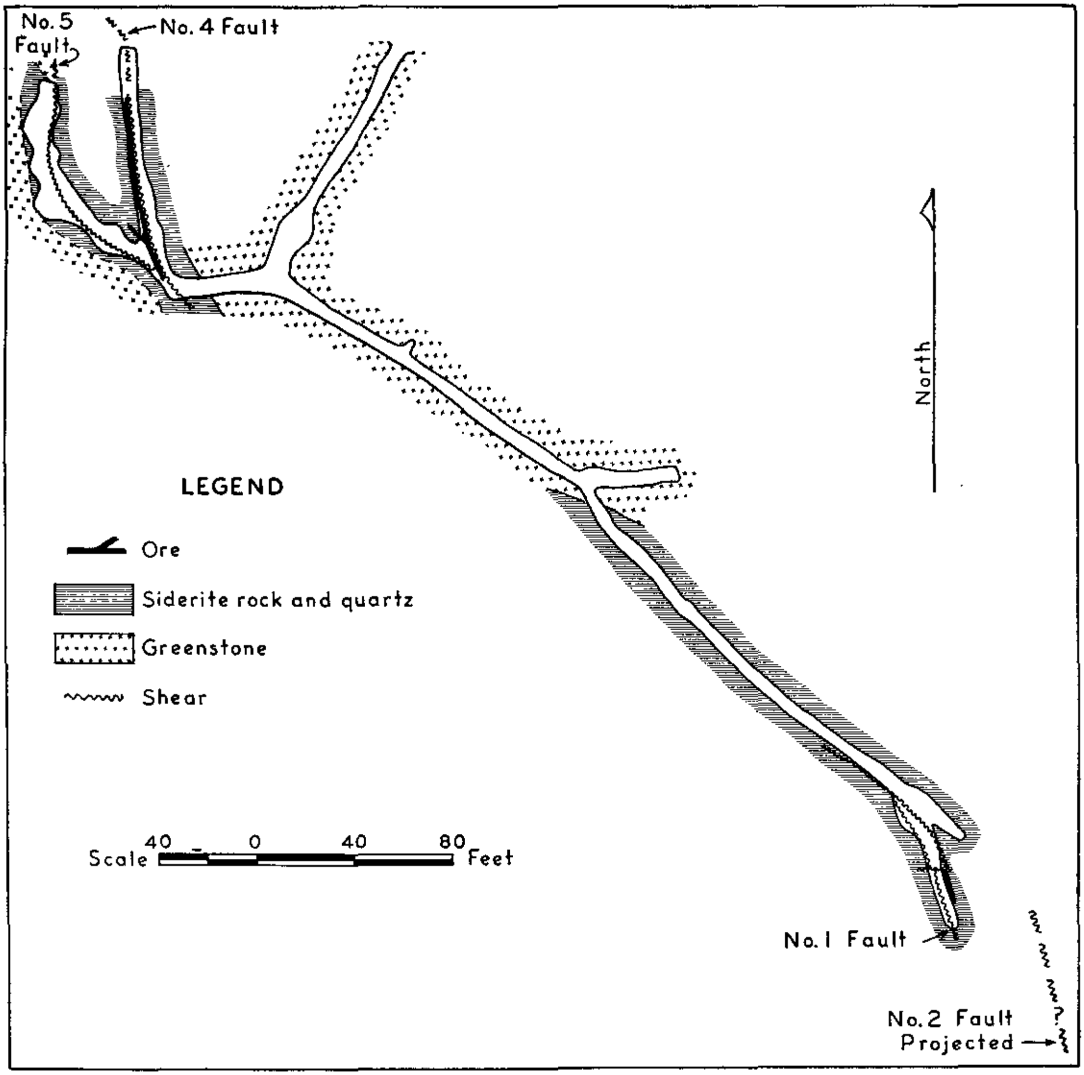


Figure 8. Spider zone. No. 5 level.

fined to the north-striking portion of the offshoot, although quartz and pyrite are continuous around the double curve. The offshoot has not been explored above No. 10 level.

No. 1 vein is 70 feet long on No. 4 level, where a cross-fracture vein extends a short distance southwest. It has been stoped through 3 level to surface, and an old winze followed ore down 46 feet from No. 4 level, but only a few small pockets of ore minerals were found on No. 5 level in a drift which is probably on No. 1 vein. This vein probably does not extend more than 20 feet beyond the present face of No. 5 level.

No. 2 vein is 50 feet long on No. 2 level but shortens upward and downward. It has been stoped for about half its length through No. 1 level. On No. 4 level either of two mineralized shears 5 feet apart could be the downward continuation of No. 2 fault. Drilling does not appear to have disproved the possibility of ore in this vein on No. 5 level.

No. 3 vein is actually a shattered zone in and near No. 8 portal. Some of the many fissures are mineralized with as much as 3 feet of sphalerite and galena. No. 9 adit (originally called No. 7) was driven in 1929 and 1937 to intersect one of these veins but encountered only a little sparse mineralization, and drilling from Nos. 8 and 10 adits encountered none. However, ore possibilities are not disproved. No. 1 vein passes upward into a rather similar shattered zone. Small veins are scattered through altered greenstone for 120 feet westerly from No. 8 portal; therefore, any coherent vein underlying the shattered zone may lie to the west of No. 9 adit and have been missed by the drilling. Such a vein might rake down to the offshoot of No. 4 vein on No. 10 level, but this seems unlikely.

No 5 vein has been stoped from No. 5 level to surface, and little of it can now be seen. The ore is reported to have been soft and heavily oxidized. The wallrock is intensely replaced by siderite, weathered and considerably broken. Scattered observations along the drift suggest that mineralization followed a shear branching off the south end of No. 4 fault and curving to a north strike. Drilling from Nos. 6 and 8 levels does not appear to have disproved the possibility of ore at greater depth.

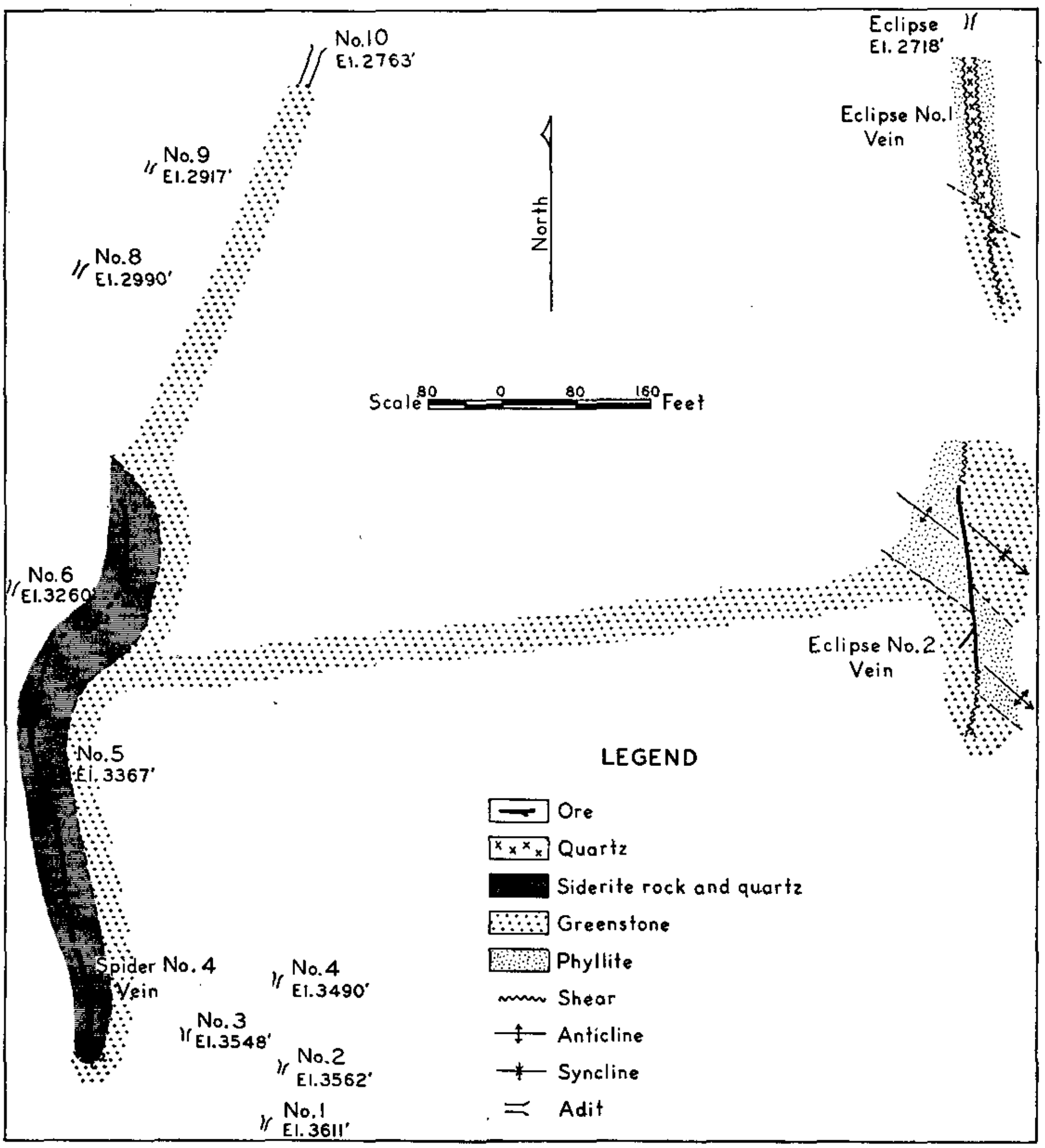


Figure 9. Spider and Eclipse zones. No. 10 level.

Eclipse Zone.—The two Eclipse veins are believed to be on separate faults because shears in the Eclipse adit curve into the foliation some distance short of the face, because mineralization in No. 2 vein dies out short of the face, and because the veins do not line up when projected to the same level. The adit vein may be analogous to the offshoot of Spider No. 4 vein, but this is unlikely. It would require the quartz to cross the footwall shear where the shear curves toward the hangingwall, and a crosscut to the start of this curve exposes no appreciable quartz beyond the shear.

The No. 2 vein has a known vertical range of about 250 feet and an average length of about 200 feet. It closely resembles the Spider veins, even though it is partly in black phyllite, but the envelope of altered wallrock is much thinner, rarely extending more than 8 feet from the fault. Toward the south end a cross-fracture to the southwest contains abundant sphalerite and galena for some 30 feet. On the sublevel the fracture appears to end at a bedded shear. The intersection rakes steeply north.

Drilling and drifting eastward from the Eclipse No. 2 found a narrow arcuate vein containing sphalerite and galena, having an average east-west strike and dipping steeply north. The enclosing greenstone is but little altered. This vein is too small to be mineable, but is of interest as an exception to the prevailing north-striking veins.

The No. 1 or adit vein is a thick quartz vein largely in black phyllite. The country rock is extensively altered around the portal but is relatively fresh in the adit. The vein is bounded by shears and appears to end abruptly where they join and pass into foliation. It contains massive pyrite veins as much as 3 feet thick and lenses of arsenopyrite. A promising pocket of ore was opened in a surface cut above, but ore mineralization in the adit is negligible.

Other Veins.—The Sandy is a large quartz vein which is sliced by at least four faults striking 18 to 22 degrees west of north, or about 3 degrees left of the vein trend. The quartz grows irregular and narrows to 3 feet at the face of the adit. Ore minerals occur as minor pockets along the three easterly faults and as random veinlets in the irregular quartz. A lens of ore minerals follows the fourth fault for a short distance and sends an offshoot into altered greenstone for 40 feet slightly west of south. This offshoot is 2 to 5 feet wide for the first 25 feet and has a nearly vertical dip. Veinlets of ore minerals extend westerly as much as 15 feet.

The Barclay vein consists of galena sparingly disseminated in quartz at the east end of a road cut in altered greenstone. Strike and dip cannot be measured accurately in this small exposure, and consequently the failure of drilling in 1954 and 1956 to find mineralization is not necessarily conclusive.

Conclusions.—1. Ore is essentially restricted to north-striking faults in greenstone and in phyllite upfolded into greenstone.

2. Veins and faults are short and some are blind.

3. Siderite replacing wallrock is a rather limited drilling target. It is possible to miss the end of ore by 20 feet and core only fresh country rock.

4. The veins tend to occur in north-striking zones of unknown extent. The southerly extensions of the Spider, Eclipse, and Sandy zones in greenstone are therefore of interest. It is worth noting that two pyrite-quartz veins are reported above the Spider workings at about 4,250 feet elevation, one followed by an old adit.

[References: *Geol. Surv., Canada,* Mem. 161, pp. 85–89. *British Columbia Bureau of Mines,* Bull. 2, 1914, pp. 17–19. *Minister of Mines, B.C.,* Ann. Rept., 1926, p. 270; 1929, p. 340; 1938, pp. E 22–25; 1952, p. 182.]

Beatrice (Beatrice Mining Co. Ltd.) (50° 117° N.W.) Company office, 404 Pemberton Building, 744 West Hastings Street, Vancouver. W. J. Scorgie, president and managing director. Capital: 50,000 shares, $1 par value. This company owns a group of claims at the head of the east fork of Mohawk Creek. The main workings are on the Beatrice claim and are accessible by 4 miles of road and trail from the Spider mine road. Work in 1956 was restricted to building a road to the mine but was stopped by winter conditions before the road was completed.

SOUTH LARDEAU*

Silver-Lead-Zinc

J.G. (50° 116° S.W.) This group of claims lies northwest of Glacier Creek and extends across a mountain ridge to the east arm of Duncan Lake. The ground was at one time known as the Amato-Ruby and Glacier groups. The Bunker Hill Company, of Kellogg, Idaho, held an option from J. Gallo and associates, of Howser. A band of limestone has been explored by trenching and diamond drilling over several thousand feet of strike length, and there is an adit on the Glacier Creek side. Bulldozer stripping and diamond drilling were done in 1956, but the option was dropped in the latter part of the year.

Moonshine, Right Bower (Willett Mines Ltd.) (50° 116° S.W.) Company office, 313, 717 West Pender Street, Vancouver. C. G. Willett, president; O. Moen, superintendent. Capital: 1,000,000 shares, 50 cents par value. This company optioned the Moonshine (or Moonstone) and Right Bower Crown-granted claims and sixteen recorded claims from J. Robinson, of Kamloops. A short access road leads to the workings from a point on the Kaslo–Lardeau Highway about 1 mile south of Lardeau. Work was last done in 1952. A narrow fissure vein in limestone has been developed by two short connected adits and an old shallow inclined shaft. The upper adit has been stoped to surface. In November work started in driving the upper adit, and the two levels were connected by another raise. On surface an open-cut was made about 500 feet on strike east of the workings, on the same or a similar vein. About 35 tons of sorted ore was stockpiled from surface and underground work. Five men were employed.

CRESTON†

Copper

Bob (49° 116° S.W.) This property, comprising ten claims, is owned by C. O. Ogilvie, of Wynndel. In 1956 work was directed to reopening and extending an old adit at an elevation of 2,400 feet, one-quarter mile east by road from the Duck Creek road, one-half mile north of its junction with the Creston–Kootenay Bay highway at Wynndel.

The occurrence is a quartz-calcite vein with chalcopyrite and lesser amounts of galena and copper carbonates in Creston argillaceous quartzites. Where exposed underground the vein strikes approximately northeast, dips 45 degrees southeast, and has a width ranging from 1 to 4 feet. A. Bysouth, of Sirdar, and F. J. Brady, of Creston, retimbered the portal and removed the caved material in the first 50 feet of the 225-foot crosscut to the vein. The north drift was driven to a total length of 50 feet, and a 35-foot raise was driven on the vein at the crosscut. Approximately 10 tons of ore was stockpiled.

It was reported that this property was formerly known as the Elsie Holmes and that the old workings included another longer crosscut, the portal of which was approximately 800 feet southwest of the reopened adit.

Lead-Silver-Copper

King This group of four claims on Glaser Creek, 2 miles north of Creston, is owned by J. B. Vaughn and L. J. Lansing, of Creston. A new highway link, when constructed, will cover a 30-foot winze at the south end of the vein outcrop.

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* By J. W. Peck.
† By J. E. Merrett.

Silver-Lead

Aurea (49° 116° S.E.) H. Demchuk, of Camp Lister, holding six located mineral claims, completed 40 feet of drift on a galena-bearing quartz vein on the west side of a small rock ridge, 1 mile north of the International Boundary and 2 miles southwest of Camp Lister. The vein ranges in width from 6 inches to 2 feet.

Copper

Creston Hill (Bon Ton Syndicate) (49° 116° S.E.) This property is 1 mile south of the Creston–Cranbrook Highway, 2 miles west of Kitchener. The crosscut commenced in 1955 by Reward Uranium Ltd., of Edmonton, Alta., was extended to a total length of 203 feet. Sixteen feet of drifting was done on a quartz-calcite vein at a point 125 feet from the portal, and slashing was done for diamond-drill stations. A crew of three men was employed.

May-Bee (49° 116° S.E.) O. Arrowsmith, of Erickson, completed 50 feet of drift on a chalcopyrite-bearing quartz vein on the May-Bee group of three claims, 2 miles west of Kitchener. The mineral occurrence is on the south end of Iron Range Mountain immediately adjacent to the large fault that follows the crest of that mountain.

Lead

M.B. (49° 116° S.E.) This property of two located claims is at the north end of Iron Range Mountain, 8 miles northwest of Kitchener. The owners are E. J. Mattson, of Creston, and E. Brennan, of Erickson. The claims are at the head of a small creek basin on the south side of Hall Creek, a tributary of Goat River. Access to the property is either by the Kitchener trail, which follows the summit of Iron Range Mountain, or by way of 9 miles of logging-roads from Kitchener up the Goat River and 3 miles across a burned area through which there is no trail.

The mineral occurrence is a strong quartz-calcite vein containing minor amounts of galena, chalcopyrite, and pyrite. The vein has an average width of 4.5 feet and has been exposed at intervals over a distance of approximately 1,000 feet across the nose of the ridge, at an elevation of 5,000 feet, west to the creek basin, at an elevation of 4,500 feet. The strike is north 45 degrees west and the dip 85 degrees southwest. The southeast exposure is approximately 500 feet west of the Iron Range Mountain fault. The vein is in grey quartzite of the Aldridge formation, and in one instance cuts across a Purcell diorite sill.

The vein is reported to have been discovered prior to 1900, and since then has had considerable work done on it. This work included the sinking of a 16-foot-deep shaft near the southeast end, one small drift, the opening of a cave to drift size for a short distance, and a total of 100 feet of stripping. Recent work was confined to cleaning out the old workings. At no point was sufficient mineralization seen to appear to warrant further development.

Two samples were taken—the first across a width of 4.5 feet on the southeast side of the shaft, 11 feet below the collar, and the second, 19 feet northwest of the shaft, across a mineralized width of 2.8 feet at a point where the vein is 6 feet wide. The samples assayed as follows:—

Sample	Width	Gold	Silver	Copper	Lead
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
No. 1	4.5	Trace	*Nil*	Trace	Trace
No. 2	2.8	Trace	0.2	0.25	0.65

CRANBROOK*

Lead-Tungsten

Campsall (49° 115° N.W.) Alfred R. Campsall, of Cranbrook, and partners, one-quarter mile east of Joseph Creek, 3½ miles north of Cranbrook, employed a bulldozer to excavate a trench 150 feet long and 12 feet wide, to a maximum depth of 27 feet. A total of 1,200 cubic yards of clay was removed in investigating a narrow quartz vein containing minor amounts of galena and tungsten. The results obtained were inconclusive, and the cut was refilled to avoid leaving a dangerous opening.

Copper

King (49° 115° N.W.) D. Sherling, S. Thompson, and Alfred Campsall, all of Cranbrook, own nineteen located claims, 1½ miles north of Eager station on the Canadian Pacific Railway and 5½ miles north of Cranbrook. Surface stripping along a length of 600 feet and across a width of 200 feet has exposed part of a northerly trending Purcell diorite sill within argillite of the Kitchener formation. Chalcopyrite occurs as low-grade disseminations within the diorite and in local concentrations adjacent to and within northwesterly striking diagonal cross-fractures in the sill. In addition to the surface stripping, 110 feet of diamond drilling was completed in two holes.

ST. MARY RIVER*

Copper

Mystery (Green Bay Mining & Exploration Ltd.) (49° 116° N.E.) Company office, B 100 Royal Trust Building, Edmonton, Alta. This property is at an elevation of 5,000 feet on Alki (John) Creek, a tributary of St. Mary River. Access is by way of 3 miles of trail leaving the main road at the west end of St. Mary Lake. The mineral occurrence is in Purcell diorite and is a quartz-calcite vein carrying chalcopyrite, pyrite, and small amounts of galena and sphalerite.

The holdings include one Crown-granted and seven recorded mineral claims. In the early summer geophysical surveying was done on some of the property. Following this, 3,000 feet of exploratory diamond drilling was done. Six men were employed.

[Reference: *Geol. Surv., Canada,* Mem. 228, 1941, p. 58.]

Silver-Lead-Zinc

Boy Scout (Thomas Consolidated Mines Incorporated) (49° 116° N.E.) Company office, 640 Peyton Building, Spokane, Wash.; mine office, Marysville. David E. Watson, president and manager. Mining operations by this company at the Warhorse mine on Hellroaring Creek were terminated at the end of July. The 4500 level adit was extended 290 feet to a total length of 4,084 feet, and 604 feet of diamond drilling was completed in eight holes. When operations were suspended, all equipment was removed from the surface and underground. Five men were employed.

KIMBERLEY*

Silver-Lead-Zinc

Sullivan (The Consolidated Mining and Smelting Company of Canada Limited) (49° 115° N.W.) Company office, 215 St. James Street West, Montreal; mine and smelter office, Trail. R. E. Stavert, Montreal, president; R. D. Perry, Trail, vice-president and general manager; W. G. Jewitt, Trail, vice-president in charge of mines. Sullivan mine office, Kimberley. B. E. Hurdle, general superintendent; A. G. Robertson, superintendent of concentration; J. E. Giegerich, mine superintendent; H. W. Poole, Chapman Camp, superinten-

* By J. E. Merrett.

dent of concentrator. Capital: 21,000,000 shares, no par value. This company owns and operates the Sullivan mine on Mark Creek, near Kimberley, and the Sullivan concentrator at Chapman Camp. The holdings include 678 Crown-granted mineral claims and fractions in a block in the Kimberley area, covering and surrounding the mine workings, from which over 71,500,000 tons of ore has been removed since December, 1909, at which time the company commenced operations on this property. The following report, prepared by the management, is a synopsis of the 1956 operations:—

"The Sullivan mine produced and the concentrator treated 2,769,177 tons of ore during 1956. Approximately 20 per cent of this came from the open pit. The section of the mine above the 3900 level furnished 56 per cent of the production, mainly from the recovery of pillars. The remainder of the ore was produced by primary stoping in the area below the 3900 level.

"Long-hole drilling methods, using diamond and percussion drills with sectional steel, accounted for 92 per cent of the underground production. The remainder of the underground tonnage came from open stopes using bench mining methods. Six winzes, used in float filling stopes below the 3900 level, were sunk by diamond-drill methods. The longest winze was 81 feet in length.

"Development footage in 1956 was above that for 1955, mainly because of additional ventilation development. This development was part of a plan for the removal of contaminated air, by a separate circuit, from float-filled stopes.

"Primary ventilation of the mine required seven Jeffrey fans totalling 950 horsepower, two Joy fans totalling 250 horsepower, and one Sheldon fan at 100 horsepower. In 1956 a 75-horsepower Sirocco fan was installed on No. 9 shaft for exhaust duty. The total volume of air exhausted from the mine was 908,000 cubic feet per minute.

"No gravel fill was placed in stopes above the 3900 level during 1956.

"One hundred and ninety-six thousand cubic yards of waste from the sink-float plant were placed in stopes below the 3900 level, of which 64 per cent was scraped. Induced caving of waste rock from the hangingwall accounted for 267,000 cubic yards of backfilling above the 3900 level.

"The mine and concentrator maintained an active safety programme during the year. Although the mine had two fatal accidents, the frequency and severity rates were comparable to the previous year. The mine had thirty-six lost-time accidents, with a frequency rate of 0.16 and a severity rate of 10.9 per 1,000 shifts worked. The concentrator established the best safety record in its history, with a total of only four lost-time accidents, giving a frequency rate of 0.04 and a severity rate of 1.1 per 1,000 shifts worked.

"Sixty-nine mine employees attended the underground school of mining instruction during the year, making a total of 1,932 employees who have been instructed to date. Twelve mine employees received mine-rescue certificates during the year. Four mine-rescue teams competed in the mine competition, and the two winning teams entered the East Kootenay Mine Safety Association Competition. A Sullivan mine team won that competition and was successful in winning the Provincial Mine Rescue Competition which was held in Nelson. A total of 246 St. John first-aid certificates were awarded to 98 adults and 148 juniors, who were instructed by Safety Department personnel.

"The number of men employed at the mine and concentrator at the year-end was 1,406, of which 679 were employed underground."

FORT STEELE*

Lead

Kootenay-Selkirk (49° 115° N.W.) T. Tuma and two partners, all of Vancouver, hold four claims by record covering the mineral exposures formerly held by Kootenay Selkirk Mines Limited. The mineral occurrence

* By J. E. Merrett.

is at an elevation of 7,000 feet on the north side of the basin at the headwaters of Herbert Creek, the extension of Lakit Creek, a tributary to Kootenay River. Access to the property from the Fort Steele–Wasa road is by way of 4½ miles of logging-roads to the lower end of Herbert Creek and by 3 miles of pack-trail up this creek.

The owners cleaned the upper tunnel, 120 feet in length, and exposed a barren quartz-calcite vein striking north 38 degrees west and dipping 61 degrees southwest. Considerable surface stripping above the portal exposed several small quartz veins in parallel and *en échelon* over a length of 700 feet and across a width of 50 feet. Narrow quartz cross-stringers appeared to link the main veins. At the junctures of these two sets of veins, concentrations of galena and pyrite occur. The extent and frequency of the concentrations do not appear to be sufficient to warrant mining at present.

[Reference: *Geol. Surv., Canada,* Mem. 207, 1937, p. 53.]

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. H. E. Doelle, managing director; J. B. Magee, resident manager. In January the company's official name was changed from Sheep Creek Gold Mines Limited to Sheep Creek Mines Limited. The property is on the Toby Creek slope of the ridge between Jumbo and Toby Creeks, 27 miles west of Athalmer. The deposit is a lead-zinc replacement, with barite, in limestone of the Mount Nelson formation.

Development work included 1,521 feet of drifts and crosscuts, 1,762 feet of raises, and a total of 4,572 feet of diamond drilling completed in forty-eight holes. No. 7 or 4,750-foot level adit was extended from 2,008 to 2,781 feet. Parallel manway and ore-pass raises, with slopes of 57 degrees toward the north, were begun near the inner end of No. 7 level. These two raises were directed to intersect the No. 3 or 5,450-foot level horizon 300 feet north of the present working area. The manway raise was extended to a slope length of 465 feet and the ore-pass raise to a slope length of 435 feet. Interconnecting raises were driven at intermediate level horizons. Both raises entered the Mount Nelson limestone 240 feet above No. 7 level. It was reported that at 340 feet above No. 7 level a 12-foot ore intersection assayed 14 per cent lead, 9.1 per cent zinc, and 11.8 ounces of silver per ton.

Open-stope mining methods were used, and 146,566 tons of ore was mined and milled.

New surface construction included the foundation for a new ore-bin, additions to the crusher building, office, and bunk-house, a powder magazine, a storage shed, two dwellings, and a post-office building. New equipment installations included a 3-foot gyratory crusher in the crusher-house and a 375-horsepower diesel-electric generator in the power-house. The generating capacity of the power plant was thereby increased to 1,500 horsepower.

The average number of men employed was ninety-five, of which fifty were employed underground.

Lead-Zinc

Red Ledge

(50° 116° S.E.) Noel Routson and partner continued exploratory drifting on this property on Stark Creek, a tributary of Toby Creek. The property is at an elevation of 5,500 feet and is 3 miles by trail south of the Mineral King mine. It was reported that approximately 100 feet of drift

* By J. E. Merrett.

has been driven by hand-mining in an oxidized zone in limestone of the Dutch Creek formation. Minor scattered occurrences of galena and sphalerite were encountered.

HORSETHIEF CREEK (50° 116° N.E.)

Silver-Copper

Ptarmigan 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. H. K. F. Seel, of Edgewater, employing a crew of two men, reconstructed to truck standards the upper 6 miles of road between the lower crossing of McDonald Creek and the lower terminal of the old aerial tram to the mine. Additional work was done on the 1½ miles of jeep-road between the lower terminal and the mine. No work was done underground, although the portal of the No. 3 or lowest drift was retimbered and a snowshed was constructed between it and the dump. A 30- by 32-foot machine-shop and compressor-house was constructed near by, and an Ingersoll-Rand 310 diesel-driven air compressor was installed. The old bunk-house was completely rebuilt and furnished.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1955, p. 71.]

SWANSEA MOUNTAIN (50° 115° N.W.)

Copper

Cu (Mid-West Copper & Uranium Mines Ltd.) Company office, 614 West Pender Street, Vancouver. A. G. Pentland, consulting geologist. This company holds one Crown-granted and twenty-eight recorded claims on Swansea Mountain, 3½ miles east of Athalmer. The mineral showing is at an elevation of 5,100 feet on the eastern shoulder of the mountain. To provide access to the property, the 2-mile trail to the forestry lookout on the mountain was reconstructed to four-wheel-drive vehicle standards.

Mineralization occurs within the Upper Jubilee dolomite in a brecciated zone that lies just east of a northerly striking fault. Copper minerals, chiefly malachite and azurite with some bornite and chalcopyrite, occur along narrow discontinuous stringers within the calcite and hematite cement of the breccia. Some diamond drilling was done in 1947 on this property by Sheep Creek Gold Mines Limited.

Between May and September a crew of four men completed 40 feet of raising and 600 feet of drifting and crosscutting.

[Reference: *B.C. Dept. of Mines,* Bull. 35, 1954, p. 65.]

SPILLIMACHEEN*

Silver-Lead-Zinc

Silver Giant (Giant Mascot Mines Limited) (50° 116° N.E.) Company office, 908 Royal Bank Building, Vancouver; mine office, Spillimacheen. R. B. Buckerfield, president. A management contract is held by H. L. Hill and associates, consulting mining engineers, Vancouver. J. M. McDearmid, general superintendent; J. C. Ehlers, mine superintendent; J. A. Vallance, mill superintendent; D. C. Beddie, surface superintendent. The property is on the west slope of Jubilee Mountain, on the northeast side of Spillimacheen River, 8 miles by road from Spillimacheen station on the Kootenay Central Railway.

Development work included 200 feet of shaft-sinking, 3,061 feet of drifting and crosscutting, 2,238 feet of stope-raising, and 15,700 feet of diamond drilling.

The three-compartment No. 1 shaft was extended a slope distance of 200 feet to open up No. 10 level and to provide a sump below it. In addition to excavating No. 10

* By J. E. Merrett.

level station and loading-pockets, two crosscuts were driven radially to the ore zones and slusher drifts were driven along the zones.

Most of the drifting and crosscutting was done on the No. 6 adit level. This work was done in the investigation of scattered ore occurrences east of the shaft.

Surface diamond drilling on the Rothschild Crown-granted claim, which was acquired during the year, indicated an ore zone 200 feet long and 22 feet wide, with an average grade of 2.61 per cent lead. An exploration programme was commenced to investigate this occurrence at depth. Surface stripping along the limestone-slate contact above the adits on the Hidden Treasure claim indicated an ore occurrence. Two cuts, 60 feet apart, exposed a 15-foot width of an average grade of 3.5 per cent lead. This claim lies east of and above the Giant and Rothschild claims.

Approximately 80 per cent of the mine production was obtained from the footwall ore zone below No. 8 level. The remainder was obtained throughout the rest of the mine, including the open pit. The pillars were mined by long-hole stoping methods, and the stopes were mined by shrinkage and open stoping methods.

The concentrator treated 185,441 tons of ore, an average of 508 tons per calendar day. Concentration was by selective flotation, and the recoveries were reported to average 93.4 per cent of the lead and 84 per cent of the zinc.

During the summer the tailings pond adjacent to the Spillimacheen River was enlarged and encompassed with distributing launders.

The average number of persons employed was 122, of which seventy-four were employed underground.

Lead-Zinc

Lead Mountain (Giant Mascot Mines Limited)

(50° 116° N.E.) This property, comprising twelve claims, is 6 miles by road northeast of the Silver Giant mine in the Spillimacheen Valley. An agreement was made with The Consolidated Mining and Smelting Company of Canada, Limited, to jointly explore the property.

The northwest and southeast drifts in the 3930 adit were extended a distance of 200 feet each to total lengths of 250 feet. A total of 2,000 feet of diamond drilling was done from these drift extensions. A crew of three men was employed.

VOWELL CREEK*

Silver-Lead-Zinc

Ruth-Vermont (Rio Canadian Exploration Ltd.)

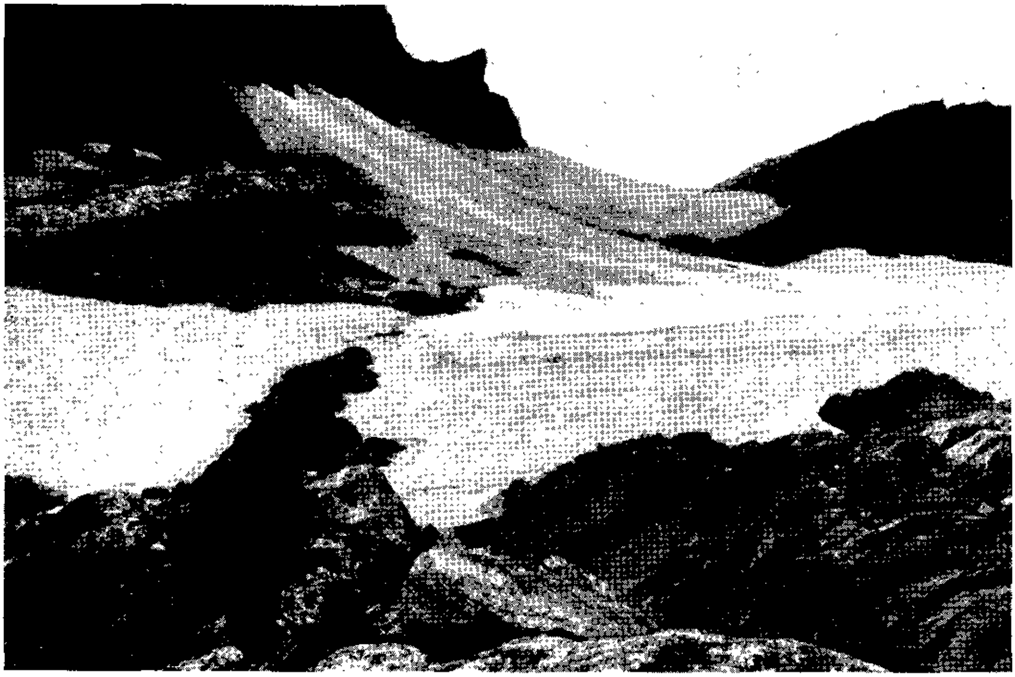
(50° 116° N.W.) Company office, Suite 1001, 335 Bay Street, Toronto. President, D. R. Derry; property manager, S. M. Manning. This property consists of thirteen claims and fractions held under option and fifteen located claims. The claims are on Vermont Creek about 3 miles west of the confluence of that stream with Vowell Creek, which is tributary to the Spillimacheen River by way of Bobby Burns Creek. The mineral occurrences are at an elevation of about 6,000 feet. Access to the property is by way of 30 miles of winding road west from Parson on the Kootenay Central Railway.

Mineralization is of silver, lead, and zinc in narrow quartz veins and stringers with some replacement of limestone beds near the veins.

A small crew was employed between July 15th and November 1st. During this period approximately 10 miles of old logging-road was repaired and in places relocated to four-wheel-drive vehicle standards to give truck access to the workings. At the property, mapping and prospecting were done on the surface and 1,240 feet of old underground workings were surveyed and mapped; 515 feet of drifts were sampled. From the underground workings 1,780 feet of diamond drilling was done.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1936, E 37.]

* By J. E. Merrett.



Outcrop of King Fissure ore zone, Jordan River.

Looking down Columbia River towards Revelstoke. Jordan River heads in the high mountains left of the photo centre.

REVELSTOKE*

Silver-Lead-Zinc

King Fissure (American Standard Mines Limited)

(51° 118° S.E.) Company office, 711, 525 Seymour Street, Vancouver. C. Riley, consultant; D. Sloan, manager. This company, together with New York Alaska Gold Dredging Limited, owns a large group of claims north of Mount Copeland at the head of an unnamed northeasterly flowing tributary of Copeland Creek, an easterly flowing tributary of Jordan River. The property is 15 miles by road and trail from a point on the Trans-Canada Highway 2 miles west of Revelstoke. There is some evidence that the extremities of the showing were discovered about fifty years ago, but it was not until 1950 that an attempt was made to develop the property. At that time, interests from the United States started road construction but abandoned the project after two years. In 1955 the ground was staked by S. and A. Brewer, who granted an option late in that year to the present owners.

No. 1 zone is a vein-like lead-zinc replacement deposit 1½ to 8 feet wide, and is exposed at intervals over a horizontal length of at least 6,000 feet. The outcrops range in elevation between 6,100 and 7,800 feet. The strike is north 60 degrees west. The dip is steep to the southwest, except at the northwest end of the showings where the lode reverses in dip and flattens. There is a plunge to the east of 15 degrees. This end of the zone may mark the bottom of a trough, of which the vein-like No. 2 zone, exposed several hundred feet to the north, would be the upturned northeast limb. Such a relationship is perhaps substantiated by the fact that there is a band of marble in the hangingwall of No. 1 zone and a similar band in the footwall of No. 2 zone. No. 1 zone, on which most of the work has been done, appears to represent the complete replacement of a limestone band within quartz-mica schist. Barite, pyrite, sphalerite, and fine-grained galena are the noticeable minerals. No. 1 zone is covered with talus or ice for more than half its strike length. Five samples were taken, as follows:—

Location of Sample	Width of Samples	Silver	Lead	Zinc
		Oz. per Ton	Per Cent	Per Cent
No. 1 zone, east end	16 in.	4.0	12.9	0.5
No. 1 zone, east end	36 in.	3.6	15.1	3.2
No. 1 zone, west end	6 ft.	2.3	12.2	4.4
No. 1 zone, west end	5½ ft.	2.4	13.6	4.5
No. 2 zone, east end	2½ ft.	1.9	6.9	2.0

Work in 1956 was restricted to sampling and open-cut work. A tent camp was established at 5,300 feet elevation. A start was made on a road which will be very difficult to build. The season's work indicated that although this showing is one of the best surface exposures in southern British Columbia, a very large expenditure will be required to develop it.

SKAGIT RIVER†

Copper

A.M. (Canam Copper Company Ltd.)

(49° 121° S.E.) Company office, Hope. S. A. Perry, Toronto, president; H. D. Forman, general manager; F. R. Thompson, mine manager. The A.M. group consists of eight Crown-granted claims, in addition to which, in order to locate a low-level tunnel, the Parks Branch of the Department of Lands and Forests allowed use of a small area in Manning Park under Park Use Permit No. 10. The property is on the western boundary of Manning Park and is about 4 miles by road southerly from approximately Mile 26 on the Hope–Princeton Highway. The claims are about 24 miles southeast of Hope.

* By J. W. Peck.
† By R. B. King.

Underground development work and diamond drilling, road construction, and building of mine buildings was carried on during the year. The 4300 level crosscut was driven 3,126 feet with considerable difficulty as it encountered a water-bearing sheared zone in granitic rock. In this crosscut, 650 feet of diamond drilling and 1,692 feet of long-hole drilling were done to investigate rock structure and to assist in draining water from the rock ahead of the crosscut. Exploratory diamond drilling totalling 1,181 feet was done on the 4900 level, 5500 level, and on surface of the A.M. claims. On No. 5 level of the Invermay group 252 feet of drilling was completed.

A mill-site just below the 4300 level was selected, and clearing and grading were completed. Mine waste was washed and crushed for fill and foundation.

Fifty men were employed.

CHEAM RANGE*

Copper

Lucky Four (Rico Copper Mines Limited) (49° 121° S.W.) Company office, 413 Granville Street, Vancouver. T. H. Wilkinson, managing director. This property is on Foley Peak in the Cheam Range at the head of Wahleach Creek, about 15 miles from Laidlaw. During the year a road 3½ miles long was constructed from the Chilliwack River to a lake on Ford Creek, and from there a pack-trail 3½ miles long was built to the property. Prospecting and geological work were carried out on the property. Five men were employed.

HOWE SOUND*

Copper

Britannia Mining and Smelting Co. Limited (49° 123° N.E.) Head office, 730 Fifth Avenue, New York, N.Y.; mine office, Britannia Beach. H. H. Sharpe, president; G. C. Lipsey, vice-president and general manager; T. M. Waterland, assistant manager; L. Allan, mine superintendent. G. C. Lipsey succeeded E. C. Roper as vice-president and general manager on January 1st, 1956. The company owns and operates the Britannia mine and mill at Britannia Beach. The following report, supplied by the management, provides details of the operation in 1956.

The development footage totalled 15,007 feet for all sections of the mine.

Classification by Type

Class	Jane	No. 8	Bluff	Fairview	Empress	Victoria	Total
	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
Drifts	1,101	828	2,137	......	......	2,007	6,073
Crosscuts	236	153	292	......	......	505	1,186
Raises	72	1,385	2,095	367	......	609	4,528
Winzes	......	528	......	......	......	......	528
Powder workings	744	......	978	970	......	......	2,692
Totals	2,153	2,894	5,502	1,337	......	3,121	15,007

Classification by Mines

Mine	Current	Stope	Total	Per Cent of Total
	Ft.	Ft.	Ft.	
Jane	1,051	1,102	2,153	14.35
No. 8	1,650	1,244	2,894	19.28
Bluff	2,393	3,109	5,502	36.66
Fairview	......	1,337	1,337	8.91
Empress	......	......	......	
Victoria	2,358	763	3,121	20.80
Totals	7,452	7,555	15,007	100.00

* By R. B. King.

The ore is mined by caving, shrinkage, open cut-and-fill and filled square set mining methods. The tonnage broken in the various sections of the mine was as follows: Bluff mine, 328,672 tons; Fairview mine, 120,104 tons; Victoria mine, 95,775 tons; No. 8 mine, 160,253 tons; Jane mine, 89,421 tons; Empress mine, 10,572 tons; development, 10,128 tons; a total of 814,925 tons (dry). The No. 5 mine was inactive.

The consumption of explosives and blasting accessories was: Powder, 17,581 cases; electric blasting-caps, 10,495; No. 6 blasting-caps, 290,585; safety fuse, 2,377,540 feet.

The accident-frequency rate for the mining department showed a considerable improvement over former years as a result of an intensive safety programme. The frequency rate was 0.164 per 1,000 shifts worked. The severity rate was 18.5 shifts per 1,000 shifts worked. The total number of men on the mine payroll at the end of the year was 634, including sixty staff. Total number of shifts worked in the mining department was 146,362.

The total number of full-time employees in all departments at Britannia at the year-end was 859. The accident-frequency rate for the whole operation was 0.126 per 1,000 shifts worked.

Production: Ore milled, 834,458 dry tons.

TEXADA ISLAND*

Iron

Texada Mines Ltd. (49° 124° N.W.) Registered office, 626 West Pender Street, Vancouver. A. D. Christensen, San Francisco, Calif., president; B. L. Alexander, general manager; J. Kenneth Halley, chief engineer; J. Yuill, mine superintendent. This property is on the southwest coast of Texada Island and about 3 miles westerly from Gillies Bay, which is nearly 70 air miles northwest of Vancouver Airport. The Prescott, Paxton, Yellow Kid, and Yellow Jacket orebodies were operated during the year.

Magnetite is mined in pits from levels which are established at 20-foot intervals. Waste rock is stripped where necessary and hauled to waste dumps. Vertical holes are drilled with Joy and Gardner-Denver rotary and wagon drills and are blasted electrically. The broken ore or waste is loaded by 2½-cubic-yard diesel-driven shovels into 20-ton trucks and is transported to stockpiles or to the concentrator. During the year, changes were made in the concentrator. Ore is crushed in a jaw crusher, and a concentrate is made by magnetic separators. This is crushed by secondary cone and gyratory crushers, screened, and the oversize material is sent to a tertiary stage cone crusher. The fine material is conveyed to a storage bin and then to ball mills, where it is ground and classified. Sized material is conveyed to a flotation plant, where a copper concentrate is made. A magnetite concentrate is separated magnetically and is dried and stockpiled for shipment.

In November a portion of the concentrate loading-dock was destroyed. Coarse mill tailings had been piled on marine silts along the shoreline and around the dock. The silts were unable to withstand the load and slid out to sea, carrying a portion of the dock with them.

Stripping and preparation for mining required the removal of 332,300 cubic yards of waste material. In 1956, 280,220 tons of ore was mined and 164,058 tons of magnetite concentrate was shipped. Approximately 130 men were employed. (*See also* p. 129.)

* By R. B. King.

VANCOUVER ISLAND*

QUATSINO (50° 127° S.W.)

Copper

Yreka (Noranda Exploration Company, Limited) British Columbia office, 2256 West Twelfth Avenue, Vancouver. B. O. Brynelson, supervisor; S. G. Bruce, superintendent. This property is on the west shore of Neroutsos Inlet about 2 miles south of Pender Point. The original claims were located in 1898 and 1899, and active exploration and some mining were carried on until 1903. In 1916 work was resumed for about six months. No further work was done until 1951, when the present company began diamond drilling. Since that time two adits have been driven—one at 1,900 feet elevation and the other at 1,750 feet elevation. At the end of the year a third adit at 1,600 feet elevation was started. In the course of development work as little ore as possible is broken as the hillside is too steep for stockpiling of ore. The orebody, a lens-like sulphide zone in skarn, is being delineated by diamond drilling.

Underground development work was stopped temporarily when a rockslide destroyed a slack-line tramway which serviced the upper camp and workings. In 1956, 2,455 feet of drifting and crosscutting and 30,026 feet of diamond drilling were completed. A permanent office-warehouse was built and a shipping-dock was constructed. Twenty-five men were employed.

BENSON (ELK) LAKE (50° 127° S.E.)

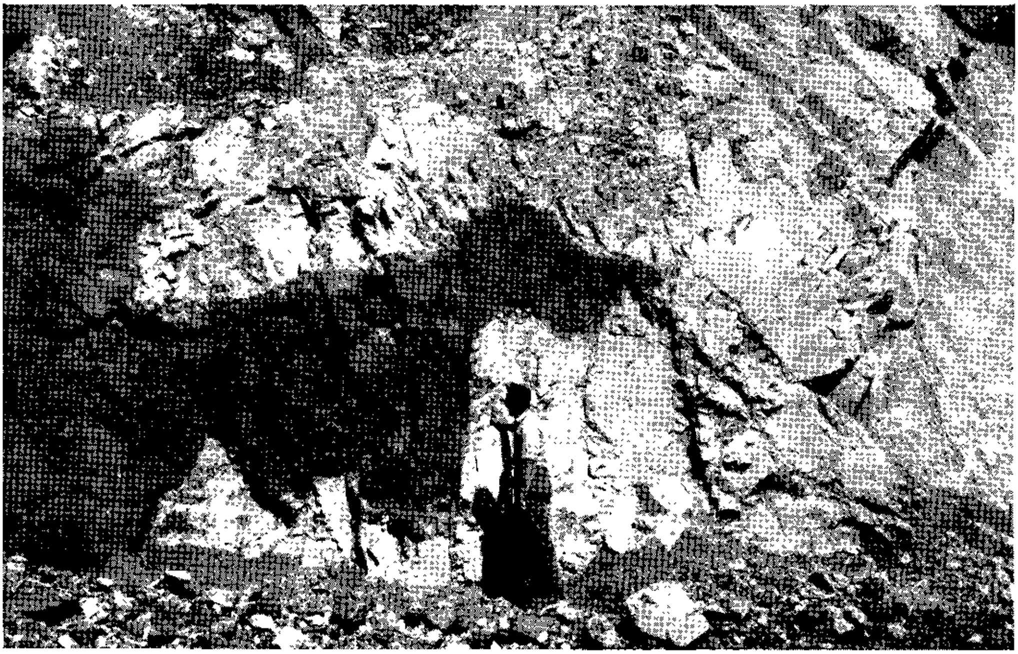
Copper

Old Sport (Coast Copper Company, Limited) Company office, Tadanac. This property, on the southwest shore of Benson (Elk) Lake, consists of fifty Crown-granted claims. The company was incorporated in 1916, and since 1897, when the first locations were made, a considerable amount of underground development work has been done. From 1920 to 1923 little work was done, but in 1924 active development was again undertaken. Work was discontinued in 1931. In 1956 fourteen men were employed for four months in diamond drilling underground. The total drilled was 5,456 feet.

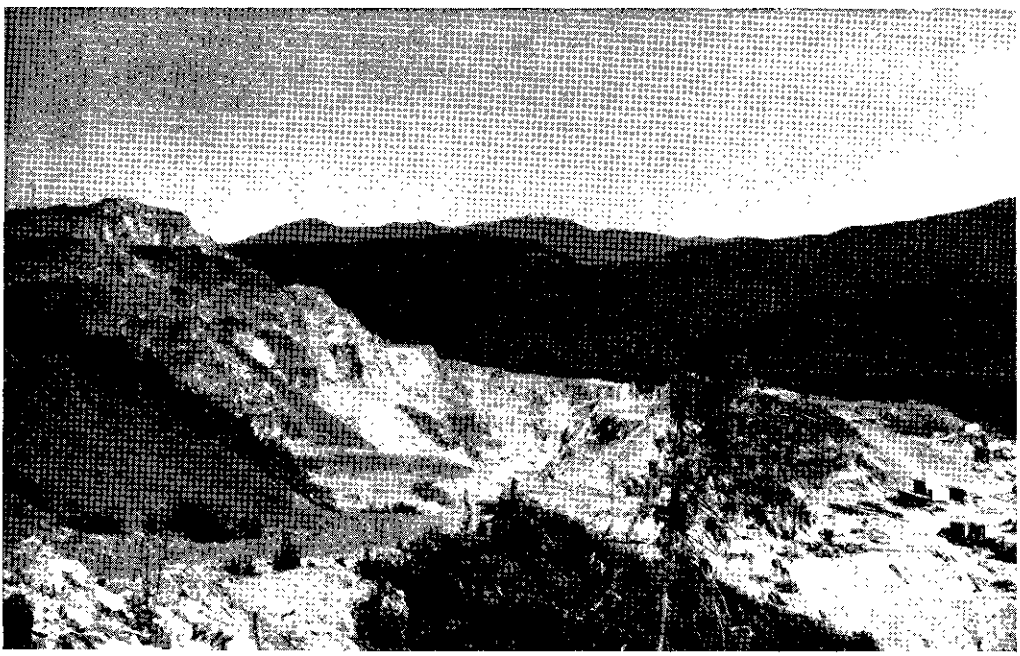
Iron

Empire Development Company Limited Company office, 572 Howe Street, Vancouver; mine office, Port McNeill. S. M. Manning, general manager. This company was formed in 1956 and optioned the property of Quatsino Copper-Gold Mines Limited. The claims are south of Benson and Kathleen Lakes in the Quatsino-Nimpkish area of northern Vancouver Island. Deposits of magnetite occur on the Merry Widow No. 5 claim and the Kingfisher Fractional claim. The property is reached by a 25-mile road from Port McNeill on Broughton Strait. Nearly 13 miles of road was built, and 11.8 miles of regrading was required on an existing logging-road to reach a mill-site on Benson River. Clearing of this area for surface buildings was completed. The company proposes to install a surface tram to service the mine, which is nearly 5,000 feet horizontally and 2,000 feet vertically from the mill-site. Clearing of the mine area and tram area was completed.

* By R. B. King, except as noted.



Magnetite replacing limestone, North Paxton pit.



Iron Hill pit.

TAHSIS INLET (49° 126° N.W.)

Copper

Star of the West (Rosea Copper Mines Ltd.)

Company office, Lake Cowichan. Hector C. Stone, president; Ralph Liebel, managing director. These claims are at Tahsis, on the west shore of Tahsis Inlet. The workings, at 1,400 feet elevation, consist mainly of open-cuts and stripping along a mineralized skarn bed. During 1956 a tractor-road nearly 2 miles long was completed from Tahsis to the workings. A temporary camp was built. Seventeen diamond-drill holes were drilled to test a sulphide zone localized within skarn.

SYDNEY INLET (49° 126° S.E.)

Copper

Indian Chief

This property, consisting of sixteen Crown-granted claims, is on Stewardson Inlet, off Sydney Inlet. Eight of the claims are owned by X.Y.Z. Metals Limited, 612 View Street, Victoria, and eight are owned by H. E. Dendoff, 1356 West Forty-fifth Street, Vancouver. The original claims were first reported to be worked in 1898, and some ore was shipped between then and 1908. In 1917 a concentrator was built, and concentrates were shipped in 1918, 1920, 1922, and 1923. In 1928 and 1929 further diamond drilling was carried on. In 1938 the property was again operated and practically all available copper ore was mined. In 1956 the group was optioned by Newkirk Mining Corporation Limited. Eight diamond-drill holes were drilled to the skarn beds on the Tinnicanum (Lot 580), and Scotlet (Lot 582), Crown-granted claims in the vicinity of the old mine workings. The option was dropped.

UPPER QUINSAM LAKE (49° 125° N.W.)

Iron

Iron Hill (Argonaut Mine) (Utah Co. of the Americas)

Company office, Campbell River. A. F. Geiger, general manager. Iron ore mined and milled at this property near Upper Quinsam Lake is trucked 23 miles to the concentrate-loading dock at Campbell River. In 1956, 9,611 cubic yards of rock was stripped and 124,536 tons of ore was mined from an open pit in which levels are established at regular intervals. The economic limits of stripping had been reached, and the mine was worked as a salvage operation. Work in the open pit ceased on December 22nd, 1956, but clean-up work continued elsewhere.

At the concentrator the ore is crushed in stages and magnetite is removed by magnetic separation. Final recovery of the finer sizes is by a process of wet magnetic separation. During the year minor changes were made in the mill to allow reworking of the tailings accumulated prior to adding wet separators to the mill circuit.

The concentrate is hauled from the mine bunkers to stockpiles at the loading-docks by diesel-driven tractor-trailer units. The average load carried is 50 long tons.

During 1956, 91,746 tons of concentrate was produced from ore mined and 80,148 tons of concentrate was recovered from reworking 521,000 tons of tailings. Of the tonnage stockpiled at the dock, 205,897 tons was shipped. The average number of men employed was 125.

TSOLUM RIVER (49° 125° N.E.)

Copper

Domineer (Mt. Washington Copper Co. Ltd.)

Company office, 1111 West Georgia Street, Vancouver. Gordon C. Murray, president and managing director. This company holds ninety-six claims by record and four Crown-granted mineral claims known as the Domineer group. These claims are on Mount Washington, at the headwaters of Tsolum River, and are 14 miles northwest of Courtenay. During the year 2 miles of road was built from an existing road to the Domineer group. Some surface trenching was done on sulphide zones in skarn beds. On the Murex claims five open-cuts were made to trace a mineralized zone over a length of 1,000 feet and a width of 250 feet. Five hundred feet of diamond drilling was done.

COWICHAN LAKE (48° 124° N.E.)

Copper

Blue Grouse (Cowichan Copper Co. Ltd.)*

Head office, 620 Howe Street, Vancouver; mine office, Lake Cowichan. Oswood G. McDonald, president; H. R. Shuttleworth, mine manager; D. C. Rotherham, geologist. This property consists of three Crown-granted mineral claims and sixty claims held by record. It includes two old properties, the Blue Grouse and Sunnyside, and is on the south side of Cowichan Lake about 3 miles by motor-road northwest of Honeymoon Bay.

Operations of the Cowichan Copper Co. Ltd. are outlined in the Annual Reports for 1952, 1953, 1954, and 1955. Earlier history and an account of the geology of the property are in British Columbia Department of Mines Bulletin No. 37, Geology of the Cowichan Lake Area, by J. T. Fyles.

The property currently is being explored on two levels designated the 1100 (formerly 950) level and 1340 (formerly 1178) level, and two sublevels—the 1280 and 1430 levels. In 1956, on the 1100 level, 1,108 feet of crosscutting and 200 feet of drifting were done; a raise 1,000 feet from the 1100 level portal was driven to the 1340 level, and an intersected skarn zone opened from it by 300 feet of drift at the 1280 sublevel. The total development work included 4,300 feet of drifting and crosscutting, 1,100 feet of raising, and 18,000 feet of diamond drilling.

A total of 3,075 tons of ore was shipped in 1956, containing 1,541 ounces of silver and 350,261 pounds of copper.

The deposit occurs in basaltic flows, tuffs, and agglomerates of the Franklin Creek volcanic formation. Sutton limestone is exposed at the north end of the 1430 level and carbonaceous beds, probably part of the Sutton formation, at the west end of the main crosscut on the 1340 level. The Franklin Creek and Sutton rocks are intruded by irregular bodies of feldspar porphyry.

Formational contacts within the mine area strike northwest to northeast and dip 25 to 50 degrees eastward and westward. Only a few undisturbed contacts were observed, however, as most are more or less sheared or fractured. A contact between a flow rock and a fragmental bed near the southwest end of the 1100 crosscut indicated a small southwesterly plunging synclinal fold. Marker beds to outline the folding have not been recognized.

A zone of garnet-epidote-actinolite skarn forms a southwesterly plunging pipe-like body extending from surface to the 1100 level. The skarn is mineralized with chalcopyrite, pyrite, and pyrrhotite, which occur irregularly in it as stringers and small masses.

Similar mineralization in highly epidotized flow rocks that contain no garnet has been exposed on the 1100 level. The epidote alteration appears to have followed extensive fracturing.

Galena and sphalerite were seen in the Sutton limestone but not elsewhere in the mine.

The origin of the pipe-like skarn body has been obscure. The skarn evidently is a replacement of volcanic rock, probably fragmental in nature, but the shape and attitude of the body show that it is not a simple replacement of a bed or group of beds. There is evidence that the replacement was controlled by fracturing. Two shear zones were noted at the exposure of the skarn at surface—one striking north 10 degrees west and dipping 45 degrees west, the other striking north 80 degrees west and dipping 35 degrees south;

* By N. D. McKechnie.

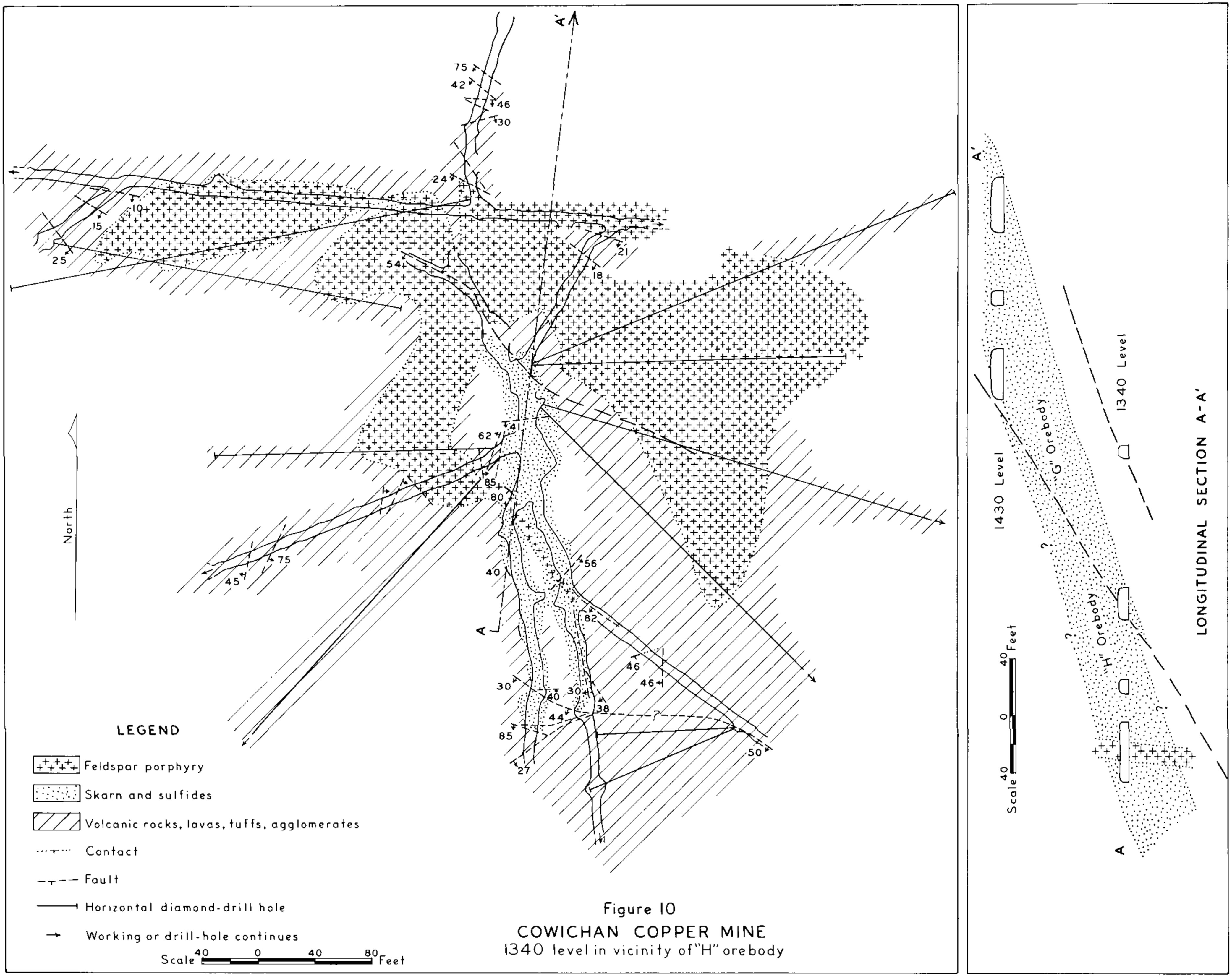


Figure 10
COWICHAN COPPER MINE
1340 level in vicinity of "H" orebody

the former has also been recognized at the hangingwall of the zone on the 1340 level. The line of intersection of the two shears rakes 34 degrees in a direction south 32 degrees west. This corresponds almost exactly to the rake of the skarn pipe, south of a post-mineral fault, between the 1430 and 1100 levels. The strike of the skarn is north 10 degrees west and the dip 40 degrees west.

These conditions would obtain if the zone now represented by skarn were the expression of a conjugate shear pattern of strike north 10 degrees west, dip 45 degrees west and strike north 80 degrees west, dip 35 degrees south. The intersection of the shears is the common intersection of the three planes of the conjugate system, including that of the tension fractures, and its inclination is the rake of the system. Depending on circumstances such as surrounding rock pressures, direction of easiest relief, and internal rock stresses, one or other of the conjugate shears usually will develop more strongly than the other. Less commonly, under conditions of diminished pressure, the dominant shear may locally develop as a zone of tensional fractures. These tensional fractures, which form theoretically an *en échelon* series, actually constitute a tensional or breccia area within a zone that elsewhere is a locus of shearing. This means that the zone has the strike and dip of the dominant shear direction and rakes parallel to the line of intersection of the conjugate shears; this line is the intermediate strain axis of the conjugate system.

This parallelism of the skarn zone with west-dipping shearing and with the line of intersection of conjugate shears indicates that the zone represents a zone of reduced pressure and of fracture. A reduction of pressure could be localized on or near an axis of folding in the volcanic rocks, and could recur, possibly along the strike of the dominant shear. The foregoing analysis is admittedly speculative and cannot be proved with the data now available, but speculation on the structural origin of an important orebody can be an aid to development.

Post-mineral slips and faults are numerous in the mine area. Two strike directions predominate, northwest-southeast and north-south; dips mostly are less than 50 degrees. One such fault, striking very irregularly west-northwest and dipping about 35 degrees south, cuts through the skarn zone at the 1340 level and produces a horizontal displacement of the skarn of about 15 feet. On the footwall side of the fault the skarn zone dips about 70 degrees west and rakes 15 degrees southwest, whereas on the hangingwall side, as previously noted, the dip is 40 degrees and the rake 35 degrees. This could mean that there has been considerable movement on the fault and that the skarns on either side are not parts of the same body. However, there is evidence that the displacement of the skarn probably is small. The projection of the skarn on the longitudinal section (Fig. 10) indicates a vertical displacement about equal to the horizontal one, an unlikely agreement if the displacement is much more than that indicated. Furthermore, the fault is very variable in attitude and is not with certainty traceable very far to the northwest, neither of which facts suggests extensive movement on the fault plane. The existence of near-parallel faults, near by on the 1340 level and down dip on the 1100 level, suggests the existence of a fault zone in which movement has been taken up on a number of irregular and discontinuous breaks, each representing a limited movement. The skarns on either side of the fault, therefore, probably are parts of the same body.

The structural and time relationships of the feldspar porphyry to the skarn are not clear. As shown on Figure 10, its outlines are very irregular; on surface it follows in general a northwest trend across the mine area. Tongues of porphyry cut the skarn, and in one place at least, near surface, skarn apparently stops against the porphyry. In thin section the rock shows considerable alteration to epidote, sericite, and carbonates; no copper sulphides were found in it. No inclusions of mineralized skarn were found in it.

Ten separate copper occurrences have been indicated in underground workings and in diamond-drill holes. Of these, only those designated as the " G " and " H " orebodies, the skarn zones on the footwall and hangingwall sides respectively of the post-mineral fault just described, have been opened extensively. The "G" body is exposed at surface, on the 1430 level, and for a few feet on the 1340 level; the "H," which probably is a continuation of the same body, is exposed on the 1430, 1340, and 1280 levels and for a few feet on the 1100 level. The "E" body, seen by the writer only on the 1100 level, is indicated as extending to the 1340 level and is being further explored. It differs from the others in the absence of garnetite skarn.

The ore developed to date is chiefly in the G-H orebody. As indicated on the longitudinal section, the boundaries of the orebody between levels are not known with any certainty, so that its actual dimensions are only approximately known. It is estimated that this orebody may contain about 125,000 tons. No samples were taken. The bulk of the ore shipped to date obviously has been taken from the G-H body. This amounts to 13,270 tons and averages 6.2 per cent copper. The material probably was selected to some extent and certainly was higher in grade than would be expected from ordinary stoping in which dilution would be a factor. No estimates of tonnage and grade of the "E" body, nor of the tonnage possibilities of other exposures of mineralization, were possible to the end of 1956.

Lorry This group of claims, held by record, is 3 miles south of Mesachie Lake. In 1955 Copper Ridge Silver Zinc Mines Limited did some underground development, and later the claims reverted to the owner, W. F. McLaren. During 1956 Mr. McLaren began rehabilitation of the workings and installed machinery in preparation for mining and shipping chalcopyrite ore.

Fraser* The Fraser group consists of sixteen mineral claims on the northwest side of Long Creek, a southwesterly flowing tributary of Robertson River about 5 miles south of the village of Mesachie Lake. The group is about 2 miles from the river. It is held by record by W. G. Fraser, of Nanaimo.

The rocks are volcanic flows of intermediate to basic compositions interspersed with minor fragmental types which are characterized by small irregular lenses and nodules of epidote. The rocks probably are part of the Franklin Creek volcanic formation (*B.C. Dept. of Mines*, Bull. 37). They are cut by dykes and sills of granite and diorite.

The mineralization, exposed on the Hillcrest claim, is of pyrrhotite, chalcopyrite, and minor pyrite in an andesitic flow. The mineralization is exposed continuously for about 100 feet and is again shown in a cross-trench about 40 feet to the southwest, so that it has an apparent length of some 140 feet. The zone is well oxidized. The attitude of the mineralization is not clear, but at the exposure it appears to trend about northeast by north and to dip steeply to the southeast. A granite dyke seen near the northeast end of the exposure appears to be younger than the mineralization.

Nitinat (48° 124° N.W.)†

Copper

The Nitinat area, extending northeastward some 35 miles from the west coast of Vancouver Island and about 5 miles west of Cowichan Lake, is a region comprising the watershed of Nitinat River and Nitinat Lake. It includes the Caycuse River, a major stream flowing west into Nitinat Lake. It is accessible for automobiles by a logging-road which follows the south side of Cowichan Lake from the village of Lake Cowichan. Motor-roads branch from this road southwestward along the east shore of Nitinat Lake to the Caycuse River and northeastward up the Nitinat River to Parker Creek. Access by boat is through the outlet of Nitinat Lake, just northwest of Clo-oose village, to the head of the lake, about 15 miles distant.

* By N. D. McKechnie.
† By N. D. McKechnie and R. B. King.

The region is underlain by Triassic and older volcanic and sedimentary rocks of the Vancouver group, the Sutton limestone, the Franklin Creek volcanics, and the Sicker group, cut by Jurassic-Cretaceous intrusive rocks related to the Saanich granodiorite. Occurrences of minerals of copper, lead, and zinc have been known for about sixty-five years, the earliest discoveries having been made at the headwaters of the Nitinat River.

Descriptions of the geology and mineral deposits are given in the following publications: C. H. Clapp, *Geol. Surv., Canada,* Mem. 13, Southern Vancouver Island; *Minister of Mines, B.C.,* Ann. Repts., 1893, 1895, 1899, 1916, 1922, 1931, 1932, 1936, 1953; J. T. Fyles, *B.C. Dept. of Mines,* Bull. 37, Geology of the Cowichan Lake Area.

Starting in 1956, explorations were undertaken by companies organized and directed by Oswood G. McDonald, of Vancouver. Their operations are described below under the appropriate company names.

Nadira Mines Limited

Company office, 620 Howe Street, Vancouver. H. H. Harder, manager; J. F. Kendall-Leicester, geologist. The property includes fifty-two claims, held by record, at and north of the headwaters of Horse Creek, a westward-flowing tributary of Parker Creek which enters the Nitinat River 7 miles northeast of Nitinat Lake. Descriptions of the mineralization and local geology have been given in the Annual Reports for 1931 (p. 165) and 1932 (p. 202) under Southern Cross, and for 1953 (p. 170) under Bornite; the latter is the most complete.

In 1942 Bralorne Mines Limited did some surface work and diamond drilled six holes on surface showings in the area. In 1956 portable camp buildings were put on the property by the present company, a geophysical survey was made, and a total of 11,902 feet was diamond drilled in forty-three holes. The rocks are greenstones, with minor interbeds of limestone, of the Vancouver group intruded by feldspar porphyry. In the mineralized zone the volcanic rocks are extensively altered to a skarn composed of ilvaite (a black silicate of calcium and iron) and brown garnet. The mineralization, chiefly chalcopyrite with minor bornite, is associated with skarn.

The principal showing, at about 1,450 feet elevation on the north side of the divide between the northwest and southwest forks of Horse Creek, is a well-mineralized skarn zone on the footwall side of a lenticular feldspar porphyry body which strikes north 20 degrees east and dips 75 degrees eastward. The showing is traceable for a strike length of about 200 feet and is exposed at the southerly end to a width of about 40 feet. The greenstone here is amygdaloidal and the sulphides occur in vesicles as well as along numerous fine fractures in the skarn. A fault striking north 30 degrees east and dipping 60 degrees east is exposed on the footwall side of the showing.

Four diamond-drill holes were drilled from two places about 200 feet lower in elevation and between 450 and 500 feet east of the showing. Two holes at 35 and 50 degrees respectively below horizontal were drilled from each place. All four holes passed under the downward projection of the showing, but none showed appreciable mineralization. All four cut the fault. Feldspar porphyry was identified in only one hole but not in the hole immediately above, so it could not have been part of the body exposed at surface. All four cores showed a reversal of dip of the volcanics from east to west on the footwall side of the fault. In two of the holes the dip was shown to be east in the immediate footwall and reversed farther west. This indicates a small anticline on the footwall side of the fault; if this is a minor structure due to the fault movement, then the east side moved down relative to the west. Nothing was found to suggest the direction of horizontal movement.

Skarn zones, some showing sulphide mineralization, recur to the northwest for some 500 feet, but little work has been done on them.

Avallin (48° 124° N.W.) O. G. MacDonald, manager. This group of seventy-eight claims, held by location, are in the Nitinat River drainage area. During the year a geophysical survey was made and 1,048 feet of diamond drilling was done on an anomaly.

Tanitin (48° 124° N.W.) O. G. MacDonald, manager. This group of ninety-six claims, held by record, are on Parker Creek and the Nitinat River. During the year a geophysical survey was carried out and 1,074 feet of diamond drilling was done on an anomaly. Some surface work was done and 12 feet of adit was driven on a copper and magnetite mineralized zone.

Jordan River (48° 124° S.E.)

Sunloch and Gabbro (Sunro Mines Limited) Head office, Tadanac; mine office, Jordan River. Capital: 3,500,000 shares, no par value. These two adjacent properties are on the Jordan River about 1 mile upstream from the settlement of River Jordan. The present workings are reached by a branch road, 1 mile long, that leaves the Provincial highway from Victoria about half a mile east of River Jordan post office.

The Sunloch property of thirty Crown-granted claims, controlled by The Consolidated Mining and Smelting Company of Canada, Limited, and the Gabbro property of twenty Crown-granted claims, owned by Gabbro Copper Mines Limited, were consolidated under the name of Sunro Mines Limited.

On November 1st an access road was started to a portal site about 100 feet above the river and 1 mile from its mouth. This adit is to explore the downward extension of the chalcopyrite mineralization in shear zones in the basalt and gabbro.

IRON-ORE DEPOSITS IN COASTAL AND SOUTHWESTERN BRITISH COLUMBIA

By W. R. Bacon

The 1952 Report of the Minister of Mines contained an account of the magnetite deposits of British Columbia then being mined or explored. The present report is of a supplementary nature, dealing mainly with developments subsequent to 1952.

In 1952 operations were confined to the contact metamorphic deposits of Vancouver Island and Texada Island. The report of that year included detailed accounts of the Prescott, Paxton, and Lake deposits on Texada Island; the Iron Hill, Quatsino, and F.L. deposits on Vancouver Island; a brief report on the Iron River deposit, Vancouver Island; and a note concerning diamond drilling of the Head Bay deposits, Vancouver Island.

In 1956 the Iron Hill operation was in its final phase. Mining continued on Texada Island in the Prescott, Paxton, and the recently developed Yellow Kid pits, but the Lake deposit was mined out in 1955. The F.L. deposit remained idle, but the Quatsino deposit was being readied for production, and exploration was resumed at Iron River. Elsewhere a promising iron prospect on Tasu Sound, Moresby Island, was being diamond drilled.

Since 1952 some attention has been given certain deposits that are not of contact metamorphic origin. Included are the taconite* deposits of the Ladysmith area and Saltspring Island, and the magnetite-bearing pyroxenite masses of the Tulameen area. In order to emphasize the fact that the deposits under discussion are of various origins, they are grouped according to their geological type. The main characteristics of the three types of deposits are as follows:—

Contact metamorphic:—

(1) Magnetite is generally associated with skarn in which brown garnet is commonly the dominant mineral.
(2) The deposits occur along or close to contacts between folded metamorphosed rocks and Coast intrusive rocks.
(3) The deposits occur adjacent to limestone, or in limestone.
(4) The deposits are highly irregular in outline and generally terminate abruptly.
(5) The grade is relatively high, ranging from 35 per cent to nearly 60 per cent iron.

Taconite:—

(1) Exceedingly fine-grained magnetite and minor specularite and hematite occur in lenticular beds of chert and red jasper.
(2) The known deposits occur in the Sicker sediments.
(3) The deposits are regular in outline.
(4) The grade of the few deposits that have been investigated is low, generally 25 per cent iron or less.

Pyroxenite:—

(1) Magnetite occurs as segregations and disseminated grains and in veins in pyroxenite.
(2) The deposits are undoubtedly large, and their limits would be economic rather than geologic.
(3) Maximum grade appears to be of the order of 20 per cent iron.

Contact Metamorphic Deposits

Moresby Island

Tassoo (Wesfrob Mines Limited)

(52° 132° N.E.) The Tassoo property is on the south side of Tasu Sound. It is being explored by St. Eugene Mining Corporation Limited. Figure 11 shows the claims of immediate interest; with the exception of the Ella and China Boy, all are owned by Wesfrob Mines Limited.

* Taconite is a term applied to ferruginous cherts. It was used originally in the iron ranges of the Lake Superior region.

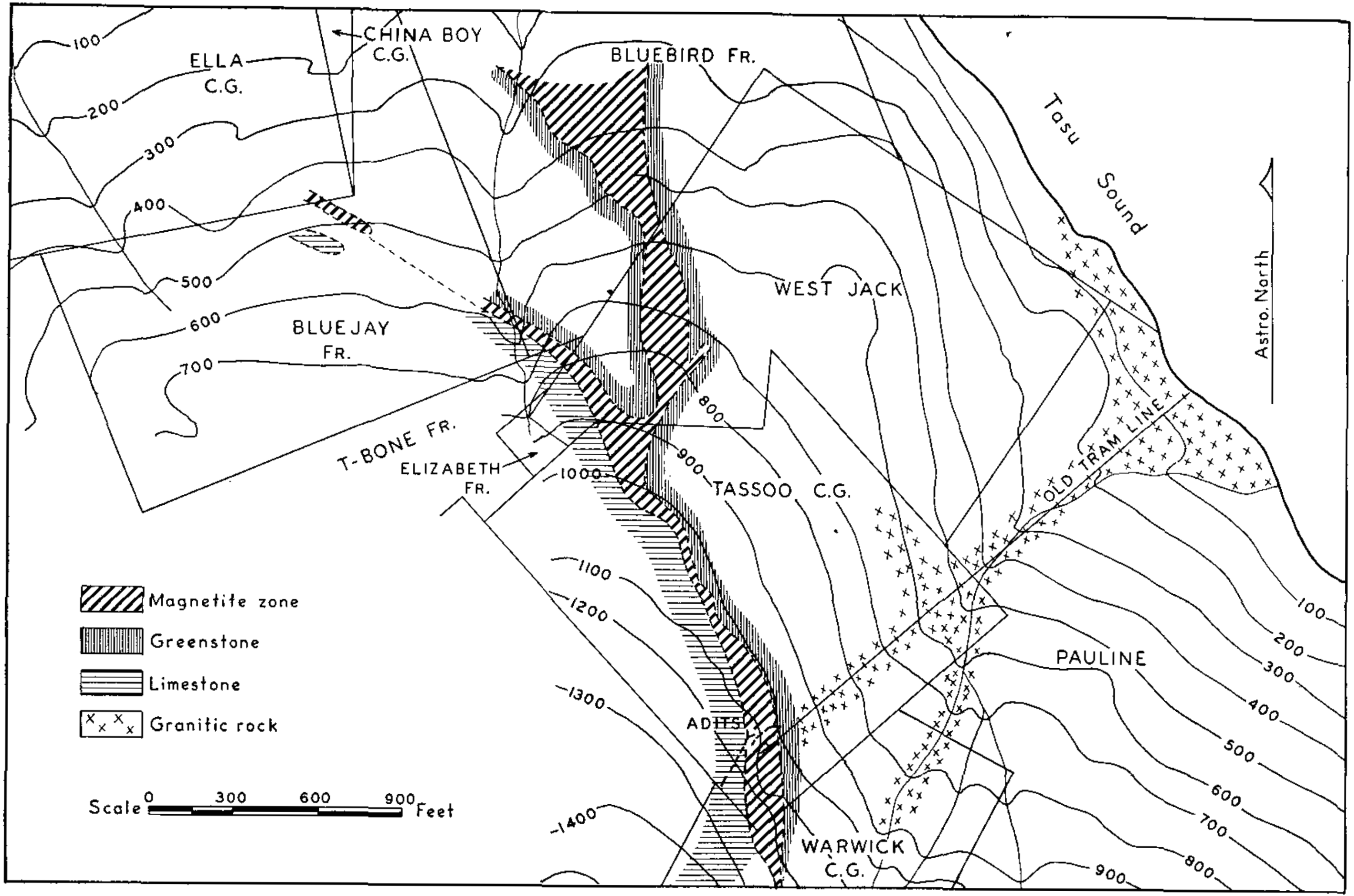


Figure 11. Plan showing Tassoo magnetite zone.

In 1908–09 surface work was done on the property, and in 1913 an adit was driven to explore the ground beneath outcrops of magnetite containing disseminated chalcopyrite. An aerial tramway was installed from the workings eastward to the beach, and shipments of ore totalling 5,180 tons were made during the years 1914 to 1917.

The writer examined the property in early July, 1956, shortly after the commencement of a diamond-drilling programme.

The showings are on a heavily wooded slope. Natural outcrops are not common, but much of the overburden is at most a few feet deep. Abundant magnetite float occurs on the slope.

Both granitic rock and limestone occur in the immediate vicinity of the Tassoo deposits. The magnetite occurs extensively in greenstone and along the contact between greenstone and a band of limestone of unknown thickness. A large piece of magnetite from the underground workings was observed to contain fragments of limestone, a fact which suggests that some of the magnetite may have formed by replacement of this rock. Irregular patches of skarn, consisting of epidote and brownish-pink garnet, occur in the greenstone. The development of skarn is comparatively meagre, but in every way the setting of the Tassoo deposits is typical of the principal magnetite deposits of the coastal area of British Columbia.

Company geologists have traced the zone of mineralization shown in Figure 11 by mapping the position of widely separated outcrops and abundant float and by use of the dip needle. Continuity of mineralization remains to be proved, particularly for that part of the zone which is entirely in greenstone. Here presumably the magnetite is related to fractures or possibly to brecciation, of which there is evidence in some of the exposures. With regard to this part of the zone, an additional feature of uncertainty is the quantity of andesite, basalt, and feldspar porphyry dykes in the greenstone, for, as far as is presently known, these dykes are unmineralized.

As a rule the magnetite is fine grained and massive, but in places it is crystalline. Pyrite, pyrrhotite, and chalcopyrite occur erratically and generally in very minor amounts. In the adit from which shipments were made, however, the magnetite contains an appreciable amount of chalcopyrite. This adit, known as the upper adit, is at an elevation of 1,165 feet. It has been driven southwestward a distance of 300 feet, intersecting greenstone, two bands of limestone, of which the thickest is 25 feet, and six mineralized bands, from 4 to 28 feet wide.

The ore shipments came largely from the 28-foot mineralized band, which is 96 to 124 feet from the portal. This band has been stoped for a length of 75 feet to an approximate height of 25 feet above the floor of the adit. A winze on the southern margin of the band is reported to be 40 feet deep. A very minor amount of material has been mined from the sixth and last band encountered in the adit, at 253 to 271 feet from the portal. The ore shipped averaged 1.6 per cent copper, 0.27 ounce silver per ton, and 0.02 ounce gold per ton. The initial shipment of 1,136 tons is reported to have contained 62 per cent iron (*Minister of Mines, B.C.*, Ann. Rept., 1914, p. 162).

A second adit, called the lower adit, was driven at an elevation of 1,037 feet, from a point 160 feet east and 37 feet north of the portal of the upper adit. The lower adit was driven approximately south 65 degrees west for a distance of 204 feet. It is entirely in greenstone but is not long enough to reach the mineralized bands in the upper adit, from which the ore shipments were made.

An easily accessible, very impressive zone of magnetite mineralization appears to be indicated on the Tassoo property. Should magnetite bodies of sufficient size be found to ensure a profitable iron-mining operation, the copper content may be significant, if there is sufficient copper to justify inclusion of flotation as part of the milling procedure.

To December 21st, 1956, thirty-nine AX holes totalling 9,837 feet and twenty-five packsack holes averaging about 35 feet had been drilled.

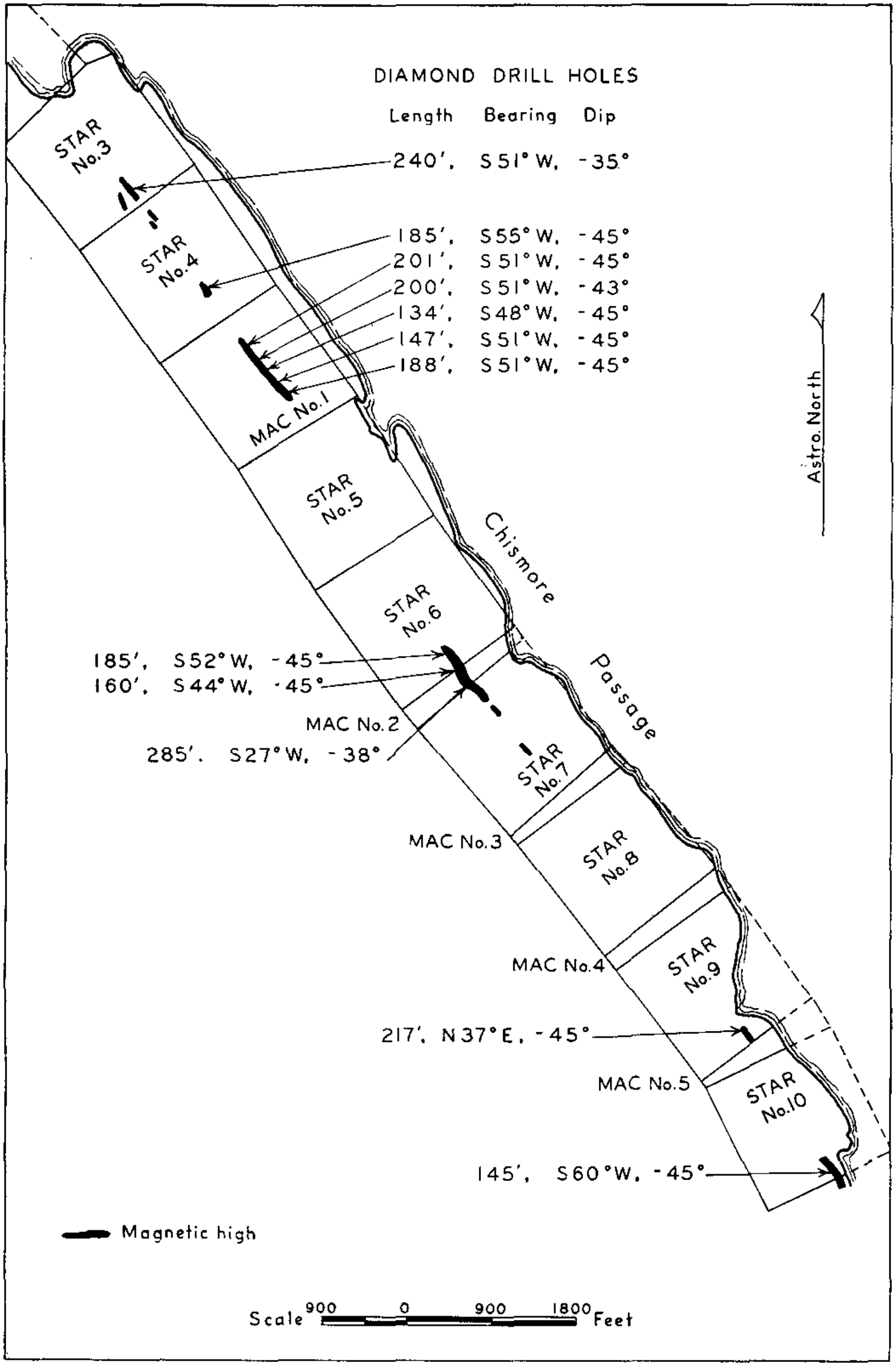


Figure 12. Star group, Porcher Island.

Porcher Island

Star (Utah Co. of the Americas)

(54° 130° S.E.) Utah Co. of the Americas is the assessed owner of ten Crown-granted mineral claims, Star Nos. 1 to 10, on the northeast coast of Porcher Island. The company also holds by record one full and five fractional claims (Mac No. 1, Mac Nos. 2 to 6 fractional) that were located in 1955 to fill gaps between certain of the Star claims.

Following a magnetometer survey of the claims in 1955, the company investigated the more promising magnetic anomalies by diamond drilling. Twelve holes were drilled, totalling 2,285 feet.

A good description of the magnetite occurrences on the Star group is in "The Iron Ores of Canada, Volume 1, British Columbia and Yukon," pages 21 to 24.

Dark-grey to greenish-grey, generally well-bedded rocks outcrop along the northeast coast of Porcher Island. The dark-grey bands are quite siliceous. Chlorite and, to a lesser extent, biotite and actinolite are conspicuous in the greenish-grey rocks, some of which appear distinctly tuffaceous. Epidote is common and in places abundant; brown garnet is less common. A little magnetite was noted in veinlets in the massive garnet, but neither the garnet nor the epidote is closely associated with the magnetite deposits.

The rocks strike northwestward and dip northeastward at angles of 60 to 70 degrees. They have been described as schists, and undoubtedly this term is generally applicable over a larger area, but in the vicinity of the deposits an appreciable percentage of the rock is not markedly schistose. The schistosity, where present, is essentially parallel to the bedding.

The magnetite is very fine grained. It occurs in conformable streaks and lenses in the more schistose parts of the greenish-grey rocks. In a very few places it occurs as a narrow band of solid mineral. A minor amount of fine pyrite is commonly present in the better-mineralized areas. Minute amounts of chalcopyrite were noted.

The locations of the magnetite-bearing zones investigated by diamond drilling are shown in Figure 12. The drilling indicated, to a depth of 150 feet, at least several hundred thousand tons of magnetite-bearing rock with a grade of the order of 35 per cent iron. The drilling emphasized, however, the streakiness and lenticularity of the occurrences. The magnetite is in lenses commonly separated by greater thicknesses of waste. The lenses are generally less than 15 feet in maximum thickness.

Texada Island

Texada Mines Ltd.

(49° 124° N.W.) Registered office, 626 West Pender Street, Vancouver. A. D. Christensen, San Francisco, president; B. L. Alexander, general manager; J. K. Halley, assistant manager; J. Yuill, mine superintendent; L. Smillie, mill superintendent. In the first four years of operation the company exported approximately 1,250,000 long tons of magnetite concentrates averaging 56.7 per cent iron, 1.18 per cent sulphur, and 0.18 per cent copper. The ore was exported to Japan, except for 114,000 tons shipped to West Germany. Concentration was relatively simple, involving crushing, grinding, and dry magnetic separation. Because the flow-sheet contained no positive procedure to remove the copper and sulphur content of the mill-feed, it was necessary to blend carefully ore that contained appreciable sulphides (pyrite, chalcopyrite, pyrrhotite) in order to ensure that the product shipped met the specifications of the purchaser.

Production has come from the open pits shown in Figure 13. The Lake deposit was mined out in 1955, but an important reserve has been established in the Yellow Kid deposit. The successful development of the Yellow Kid deposit is the result of systematic exploration based on awareness of the nature of the ore occurrences, for the size and grade of the surface showings were anything but impressive.

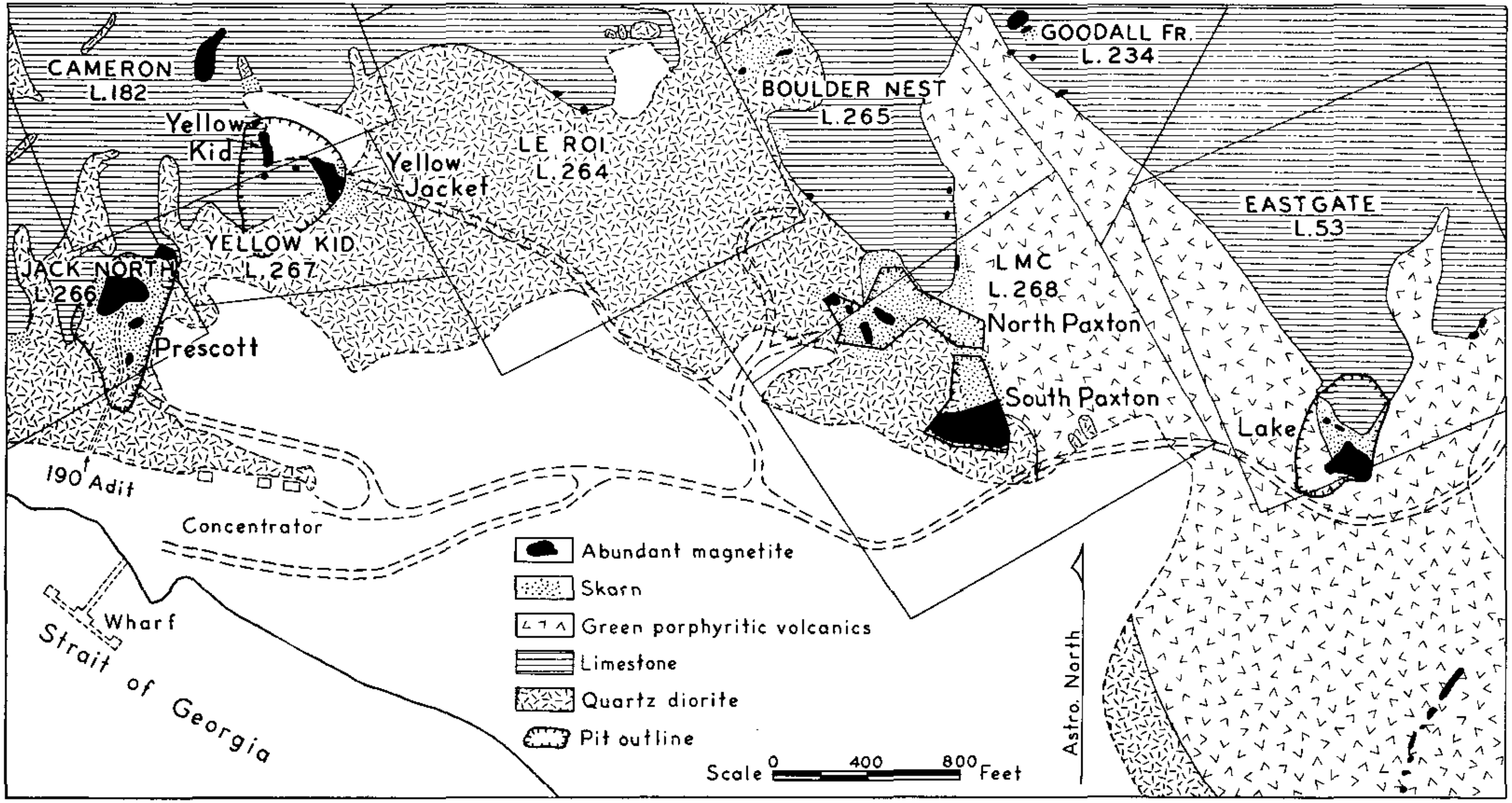


Figure 13. Texada Mines Ltd. Main pit outline (July, 1956) superimposed on geological plan of unmined surface. (*Geol. Surv., Canada,* Map 110A with minor modifications.)

Production in the immediate future will come largely from the Yellow Kid, Paxton, and Prescott pits. Because all three deposits contain significant amounts of sulphides, the milling procedure has been radically changed. The old mill serves mainly as a crushing plant, although it also rejects coarse waste. A new mill completed in September, 1956, contains two 8- by 8-foot Marcy ball mills, each capable of grinding 65 tons per hour, and flotation cells that produce a copper concentrate. Wet, rather than dry, magnetic separation is employed. Water for the new mill is piped from Paxton Lake, but during dry periods it may be necessary to supplement this supply with sea-water. The B.C. Electric transmission-line across Texada Island into the camp-site at Gillies Bay has been completed, and conversion from diesel to electric power has been made.

Vancouver Island

Iron River (Utah Co. of the Americas)

(49° 125° N.E.) The Iron River deposits are in the Esquimalt and Nanaimo Railway Belt Land Grant. They are in Lot 242, 11 miles southwest of Campbell River. The property is accessible by road. The property has been leased by The Argonaut Co. Ltd. and is now leased by that company's parent organization, Utah Co. of the Americas, from the owner, Canadian Collieries (Dunsmuir) Limited. The lessees made a magnetometer survey of the property, diamond drilled the most promising areas, and have mined a little ore from the West deposit for mill test purposes.

Figure 14 shows the deposits and the location of the diamond-drill holes. The West deposit has been known for years and is described in " The Iron Ores of Canada, Volume 1, British Columbia and Yukon," pages 71 to 73. The presence of the East deposit was indicated by the magnetometer survey and confirmed by diamond drilling.

Outcrops of greenstone, garnetite, and limestone occur in the area of Figure 14, and granodiorite outcrops to the east. To the west and southwest of the deposits, all these rocks are overlain by Upper Cretaceous sandstones and conglomerates which are younger than the deposits.

The West deposit outcrops on a knoll surrounded by glacial drift, and there is little surface indication of the East deposit. Because of the lack of outcrop and the fact that the drill core was not available at the time of examination (August, 1956), it is not possible to discuss the geological setting of the deposits, other than to observe that the magnetite is intimately associated with the garnetite.

The magnetite in the West deposit is generally fine grained, but some coarse crystalline material is also present. Hematite, chalcopyrite, and pyrite occur in minor amounts. In addition to garnet, small patches of calcite were noted in various specimens of ore.

From information generously supplied by both owners and lessees, it appears that the West deposit is a particularly irregular one, any section of which is crudely lenticular. It plunges northeastward at approximately 30 degrees but does not extend as far in this direction as Holes 11 and 12. It persists to a maximum depth of 175 feet below the surface.

The East deposit appears to trend northeastward and dip northwestward at approximately 45 degrees.

More drilling is required, particularly on the East deposit, before the ultimate tonnage available in both deposits can be stated, but to date about 800,000 tons grading 36 per cent iron, 0.9 per cent sulphur, and 0.35 per cent copper can be classified as probable ore. Of this amount, roughly three-quarters is contained in the West deposit.

Glengarry and Stormont (Canadian Collieries (Dunsmuir) Limited)

(49° 126° N.W.) The company owns the Glengarry, Stormont, and Texas Crown-granted mineral claims, and holds by record the Dundas group of four claims and the Russell group of eight claims. The company also owns Lot 62 (35 acres) covering a wharf-site at Head Bay, which is the northern extremity of Tlupana Arm, Nootka Sound. The claims extend northwestward along a low ridge to the west of the Sucwoa River, which drains southeastward

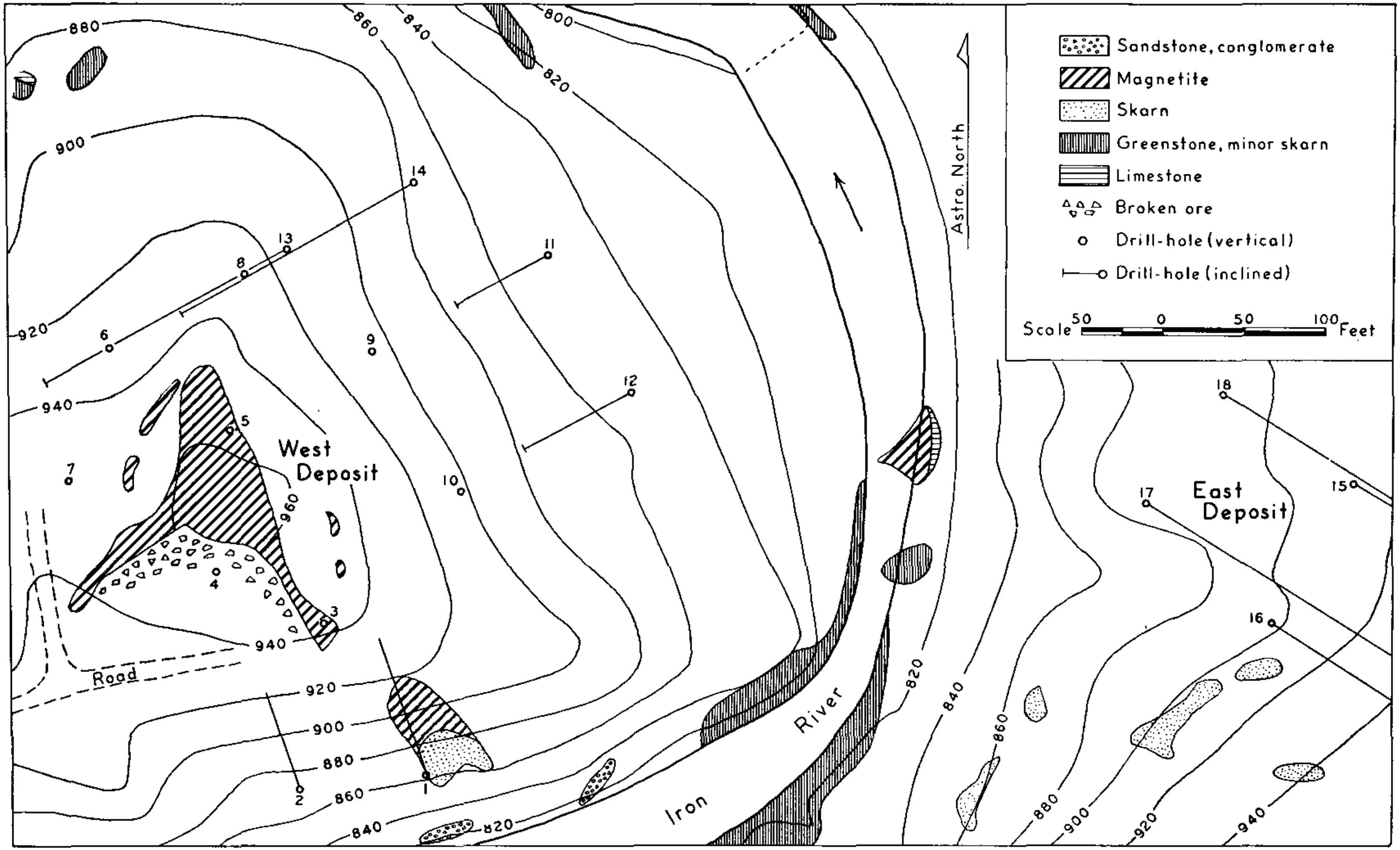


Figure 14. Plan showing Iron River deposits.

into Head Bay. The showings are at elevations from 250 to 430 feet above sea-level in heavily wooded country. All are within 2 miles of Head Bay.

The majority of the numerous showings are on the Glengarry and Stormont claims (*see* Fig. 15). The occurrence of iron here has been known for more than fifty years. A report on the occurrences known in 1924 is in " The Iron Ores of Canada, Volume 1, British Columbia and Yukon," pages 231 to 235.

The property is underlain by limestone and greenstone and presumably by granitic rock at no great depth. The magnetite is intimately associated with garnet, and the deposits as a whole are considered to be largely replacements of limestone. Most of the magnetite is remarkably free of pyrite or any other sulphide.

A considerable amount of surface work has been done on the showings in past years. In 1951 and 1952, 115 short holes, totalling 6,972 feet, were diamond drilled to explore the various showings.

According to information supplied by Canadian Collieries (Dunsmuir) Limited (N. R. Whittall, president), the drilling indicated the presence of 360,000 tons of ore averaging 42.7 per cent iron. The ore is in eleven distinct localities (*see* Fig. 15), as follows:—

Locality	Tons	Grade (Per Cent Iron)
A	8,500	52.5
B	9,000	50.0
C	23,500	35.6
D	58,000	37.5
E	5,750	40.3
F	174,000	40.7
G	15,400	50.9
H	33,000	55.4
I	24,800	45.2
J	6,000	50.7
K	2,000	50.8

Klaanch

(50° 126° S.W.) This property consists of a single northwestward-trending row of eight Crown-granted mineral claims. The claims are about 5 miles south of Nimpkish Lake. The group marks the site of the first mining activity (in 1897) in the Quatsino-Nimpkish area.

The property covers a northwestward-trending contact between limestone on the southwest and greenstone on the northeast. Skarn, magnetite, pyrite, and some chalcopyrite occur in the contact area. From scattered exposures the approximate position of the contact is inferred for a length of 9,000 feet.

The Iron Crown and Rhoda are the southeasternmost claims of the group. They are held under option by A. H. Upton, of Vancouver.

A magnetometer survey of the Iron Crown claim was made by E. Lindeman in 1907, and from the results of the survey he concluded that there were three magnetite deposits or groups of deposits on this claim. Following a similar survey of the claims, approximately 11,000 feet of diamond drilling was done during 1954 and 1955.

The following notes on the Iron Crown and Rhoda are from reports of J. M. Black, consulting geologist, that were made available by Mr. Upton.

Because outcrops other than magnetite are scarce, knowledge of the environment of the deposits has been gained largely from the drill cores. Apparently the setting is typically contact metamorphic, with diorite intruding greenstone and limestone. Skarn, consisting of garnet and epidote, is developed in the greenstone. The magnetite deposits appear to be replacements of greenstone and, possibly, to a lesser extent of limestone. Waste within the deposits consists of unreplaced greenstone, skarn, limestone, calcite, quartz vein material, and pyrite. Minute amounts of chalcopyrite, hematite, and pyrrhotite are also present.

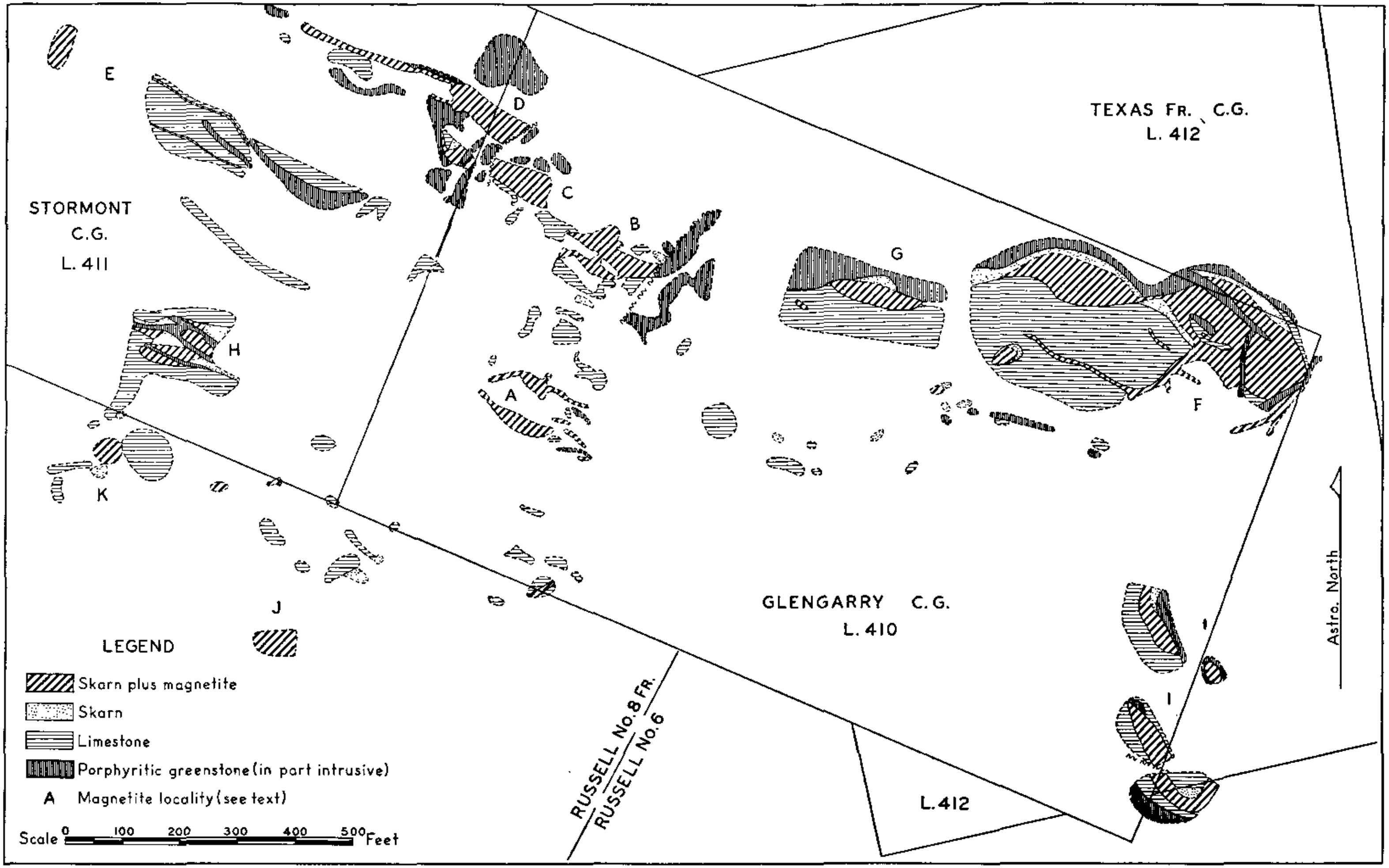


Figure 15. Head Bay deposits. (From map supplied by Canadian Collieries (Dunsmuir) Limited.)

Four orebodies, referred to as the River, Road, South, and East, have been drilled. The River and South bodies are partly exposed, but the Road and East bodies are completely covered by overburden. An estimated 1,800,000 tons of ore, averaging 46.2 per cent iron and 1.33 per cent sulphur, is considered as proved. The bodies are favourably situated for open-pit mining.

[Reference: *Canada Department of Mines,* Iron Ore Occurrences in Canada, Vol. 2, 1917, pp. 14–15, and Map 442; *Geol. Surv. Canada,* Summ. Rept., Pt. A, 1930, p. 131.]

TACONITE DEPOSITS*

Ladysmith

Lady A

(48° 123° N.W.) Several deposits of taconite are known near Ladysmith, and those at the locality known as the Lady A have been diamond drilled. This locality is 8 miles southwest of Ladysmith and is accessible by 12.4 miles of logging-road.

The taconite at the Lady A locality is 1½ miles due west of the top of Coronation Mountain on either side of Chipman Creek, a southward-flowing tributary of Chemainus River. The showings are at an elevation of about 2,000 feet above sea-level, near the bottom of the logged-off valley of Chipman Creek. The deposit on the west side of Chipman Creek is called the A deposit and that on the east side of the creek, about one-quarter of a mile southeast of the A deposit, is called the C deposit.

In 1953 the Lady A deposits and others of similar type were brought to the attention of Canadian Collieries (Dunsmuir) Limited by M. E. Broan, former manager at Iron Hill. As a result, Ladysmith Development Ltd., a wholly owned subsidiary of Canadian Collieries (Dunsmuir) Limited, was formed to explore the Lady A deposits, and did so by diamond drilling during the summer of 1953. Mr. Broan was in charge of this work.

The Lady A deposits are lenses of taconite in cherty sediments of the Sicker group (see *B.C. Dept. of Mines,* Bull. 37, pp. 13–15). Locally the sediments strike northwestward and dip northeastward at about 50 to 60 degrees. The deposits consist of bands of exceedingly fine-grained magnetite and minor amounts of specularite and hematite in grey chert and red jasper. Jasper is more common in the C deposit than in the A.

The A deposit is exposed near the bottom of the valley of Chipman Creek in an area of limited outcrop. It strikes northwest, dips about 50 degrees northeast, and outcrops over a strike length of 350 feet and a maximum width of 60 feet. The company reports that twelve holes totalling 1,278 feet were diamond drilled to test the deposit. Most of the holes were vertical and drilled along two rows running parallel to the strike of the taconite. One row of holes was drilled on the hangingwall side of the outcrop, and a second row 100 feet northeast of the first. A few other holes were drilled at random.

Although the drilling did not completely delimit the deposit, it showed that it has an average thickness of less than 30 feet, and the company estimated it to contain 360,000 tons with an average grade of 25 per cent iron.

The C deposit outcrops at the base of bluffs on the north side of a fan of slide material which fills the bottom of a creek tributary to Chipman Creek. Like the A, the C deposit strikes northwest and dips 60 degrees northeast. The taconite is exposed for a strike length of 175 feet and has an apparent thickness of about 50 feet, but the hangingwall is poorly defined and the footwall is covered with slide material. Two horizontal holes were diamond drilled from the lower side of the outcrop to crosscut the deposit. The first of these holes was drilled beneath the northwest exposure of the taconite, and the entire 117 feet of the hole was in taconite. The second horizontal hole, 125 feet southeast of the first, was 158 feet long and was also entirely in taconite. The true thickness of the northeastward-dipping taconite band is not calculable from these

* By W. R. Bacon and J. T. Fyles.

holes, which were collared above the footwall and apparently did not reach the hanging-wall, but a thickness at the elevation of the holes of as much as 150 feet is indicated. A third hole, 198 feet long, was drilled from the first set-up in a northwesterly direction downwards at 45 degrees, and a fourth hole, 197 feet long, was drilled from the second set-up in a northwesterly direction downwards at 60 degrees. Both these holes, drilled down the dip of the band, were entirely in taconite.

In the two horizontal holes the average grades were 16.4 and 9.5 per cent iron. In the two inclined holes the corresponding average grades were 20.2 and 30.5 per cent iron. The relatively high grades obtained in the inclined holes emphasize the banded nature of these deposits. The inclined holes probably followed bands of higher than average grade and, in the opinion of the writers, the horizontal holes give the best indication of the average grade of the deposit.

The C deposit is probably larger than the A, but more drilling is required before accurate tonnage and grade estimates can be made.

Should these deposits be considered as a source of iron, magnetic separation would appear to be the logical process of concentration. In this process the fineness of the magnetite might pose a recovery problem.

Saltspring Island (48° 123° N.W.)

E.B.V. This taconite deposit occurs on the west slope of Mount Sulivan on seven claims held by E. B. Valleau, of Duncan. The deposit is at an elevation of about 825 feet above sea-level, 1 mile northwest of Musgrave. The rocks enclosing the taconite are predominantly green schists belonging to sedimentary members of the Sicker group (see *B.C. Dept. of Mines*, Bull. 37, pp. 13–15). Bedding and schistosity in rocks near the occurrence are essentially parallel; the strike is northwest and the dip 70 to 80 degrees southwest.

The deposit consists of lenticular bands of jasper interlayered with schist. The jasper contains bands and lenses of magnetite and smaller amounts of specularite and hematite and is cut by irregular veins and stringers of white quartz.

The taconite outcrops at intervals along a sloping hillside and has a strike length of about 500 feet and a maximum width of about 10 feet. Four chip samples taken by the writers from various points along the deposit assayed 5.96, 10.20, 19.59, and 26.45 per cent iron.

PYROXENITE DEPOSITS

Tulameen (49° 120° S.W.)

Lodestone Mountain Claims have recently been located by American interests in the Lodestone Mountain-Olivine Mountain area. This area is 15 miles due west of Princeton and can be reached by 21 miles of road through Coalmont and Blakeburn, thence by 3 miles of trail to Lodestone Lake. The area is between 5,500 feet and 6,200 feet in elevation. It is mainly sparsely wooded, open country.

Lodestone Mountain and much of the ground between Lodestone and Olivine Mountains is underlain by pyroxenite.* The principal constituent of the pyroxenite is augite, but over large areas magnetite is prominent. The magnetite occurs as disseminated grains, as segregations, and in irregular veinlets and stringers. In a few places, veins of magnetite several feet wide were observed.

Outcrops are plentiful around Lodestone Mountain and on the ridge south of Olivine Mountain. Nine samples from various outcrops indicate a rather uniform iron content. The samples assayed from 16.4 to 20.5 per cent iron, and the average of the nine was 18.5 per cent iron. Average content of titania (TiO_2) was 1.5 per cent.

* *Geol. Surv., Canada*, Memoir No. 26.

Placer

CONTENTS

ATLIN*

Spruce Creek (59° 133° N.W.)

Noland Mines Limited

This underground operation is at the confluence of Dominion Creek with Spruce Creek and is 12 miles by road from Atlin. For several years up to November, 1955, the mine had been worked by five partners, A. V. Mattson, T. R. Mattson, D. S. Mattson, R. F. Smith, and J. D. Ward, under agreement with Noland Mines Limited. In November, 1955, the mine was closed down owing to failure to locate the extension of the paystreak in the Tertiary channel upstream from the intersection of a grey gravel cross-channel. However, about the end of May, 1956, the mine was reopened as a salvage operation by A. V. Mattson, T. R. Mattson, and D. S. Mattson under a new agreement with Noland Mines Limited.

Production in 1956 came entirely from the salvaging of old pillars in the area bounded by Nos. 25 and 29 crosscuts, approximately 1,200 feet east of the shaft.

* By A. R. C. James.

A summary of mine production follows:—

	Cubic Yards Excavated	Per Cent
Reclaiming old drives	575	22.5
Pillar salvage	1,937	76.0
General clean-up	38	1.5
Totals	2,550	100.0

A total of 2,550 cubic yards of gravel was extracted and washed. Recovery: 1,533.03 crude ounces of gold, yielding 1,237.95 fine ounces of gold and 197.84 fine ounces of silver.

Enterprise Placers Three partners, Clyde Day, Floyd Wilson, and John Acheson, continued to work ground leased from Spruce Creek Placers Limited on Spruce Creek about 1 mile downstream from the Noland mine. Work in 1956 was mainly confined to removing overburden and excavating a drainage ditch in preparation for mining two recently acquired leases upstream. These include the ground under the old Spruce Creek Hotel, now demolished. Approximately 100,000 cubic yards of material was moved and 66 fine ounces of gold was recovered. A Bucyrus-Erie stripping shovel and a Northwest Model 8 dragline were used for this operation. Work commenced in May and finished early in November.

Wright Creek (59° 133° N.E.)

Atlin Placers Limited C. T. Dorflinger, manager. This company holds leases on Wright, Otter, Quartz, Union, and Casino Creeks. Work in 1956 has been confined to Wright Creek, a north-flowing tributary of Surprise Lake. The property is 16 miles by road from Atlin and is at an elevation of 4,000 feet. In 1954 test-holes drilled 30 to 40 feet apart across the valley were reported to have found bedrock at 135 feet in the centre of the valley and to have found encouraging values near bedrock. At the end of 1954 an unsuccessful attempt was made to sink a shaft, which was abandoned at a depth of 36 feet; the ground around it was bulldozed out and a drain 800 feet long was built to carry away excess water. A new vertical two-compartment shaft was collared in 1955 about 100 feet north of the line of test-holes. In 1956 this shaft was completed down to bedrock at 136 feet, and a total of 180 feet of development heading was done in a northwesterly direction from the shaft bottom. It is understood that only about 10 ounces of gold was recovered. A crew of three men was employed.

McKee Creek (59° 133° S.W.)

Three partners, Joe and Luigi Piccolo and George Watt, hydraulicked about 80,000 cubic yards of gravel on McKee Creek. Gold recovery was 149 fine ounces. Work commenced in early May and ended in mid-October.

Pine Creek (59° 133° N.E.)

Fred Giesen worked alone on Pine Creek at Discovery. The operation comprises partly open-pit mining and partly drifting. One hundred and fifty-eight cubic yards of gravel was sluiced. Gold recovery was 6 fine ounces.

OMINECA*

Manson Creek (55° 124° N.W.)

Art Hyndman drove a short tunnel on his placer property on Manson Creek. He used a wheelbarrow and a chute to remove the gravels, which were washed in a sluice-box.

* By J. W. Patterson.

Nat Porter worked alone on his placer property on Kildare Creek at its junction with Manson Creek.

GERMANSEN RIVER (55° 124° N.W.)

In the pit on the late G. H. Loper's hydraulic property on the north side of Plughat Creek about 1 mile from Germansen Landing, A. Pendle and two men lowered 145 feet of sluice-boxes about 8 feet in bedrock. In addition, a 24-foot spillway and 185 feet of pipe trestle 16 feet high were constructed.

CARIBOO*

HIXON CREEK (53° 122° S.W.)

Hixon Placers Inc.

Company office, 2032 Third Avenue, Seattle, Wash.; mine office, Hixon P.O. H. W. Hargood, president; C. J. Norris, superintendent. The property, consisting of twenty-one placer leases, is 3 miles by road from Hixon on the Cariboo Highway. A 12-foot diversion dam was built on Hixon Creek about 6,000 feet above the present placer workings to provide water for hydraulicking at a 200-foot head. More than three-quarters of the pipe-line was laid, 25,000 cubic yards of gravel was hydraulicked, and construction was started on a bunk-house, a cook-house, an office, and a 2,000-gallon water-tank. Six men were employed.

WILLOW RIVER (53° 121° S.W.)

Mink Gulch.—N. Broswick hydraulicked 2,000 cubic yards of gravel in Mink Gulch, a tributary of Williams Creek.

Provincial Exploration (1952) Ltd.—Head office, 800 Hall Building, 789 West Pender Street, Vancouver; mine office, Barkerville. M. R. Benischke, president and manager. M. R. Benischke and two employees surveyed the company's leases at Barkerville, built some road, and dug four open-cuts.

L & L Dredging.—In 1956 the Lowhee leases on Conklin Gulch and Williams Creek were under option to L. A. Prosser. He employed a crew of twenty-nine men supervised by dredge-master K. R. Kumle. A dragline dredge, previously operated by Kumhila Exploration Co. Ltd., was put into operation on Conklin Gulch about 1 mile southeast of Barkerville. The work in Conklin Gulch terminated early in the season. On Devlin Bench on Williams Creek, one-half mile north of Barkerville, a diesel-electric Bucyrus-Monighan walking dragline with a 4½-cubic-yard bucket was used to strip overburden. In the pit a Lima dragline with a 3½-cubic-yard bucket was used to dig gravel which was washed in a floating steel-pontoon washing plant. A Bucyrus 27T drill and a Hillman Prospector drill were used to test additional ground along Williams Creek.

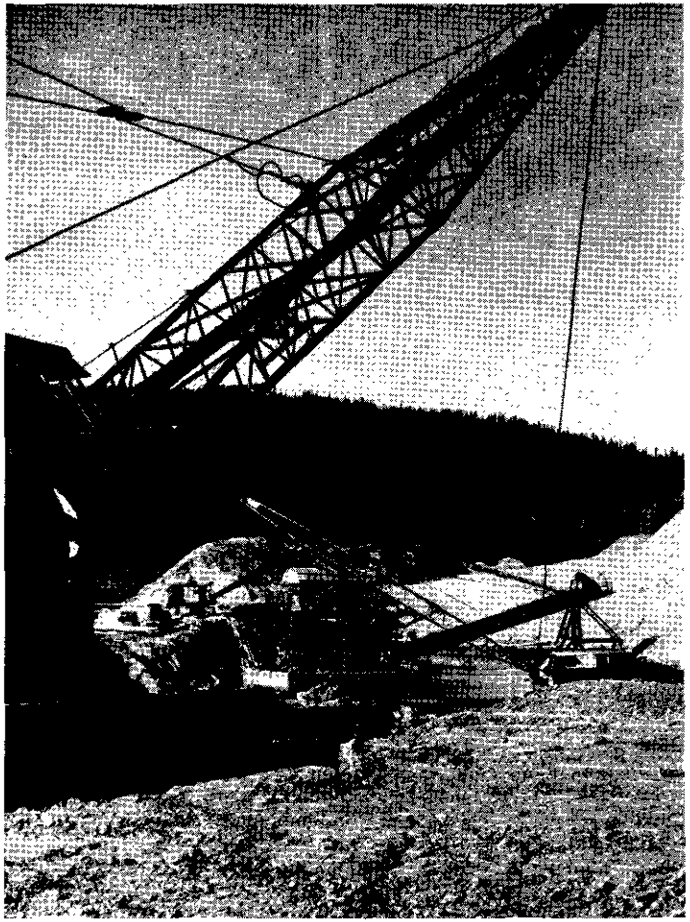
Placer Creek.—H. C. Christensen hydraulicked 400 cubic yards of gravel on Placer Creek at the south end of Jack of Clubs Lake.

Lowhee Creek.—R. E. MacDougall, in partnership with F. Jamieson and O. K. Nason, hydraulicked about 20,000 cubic yards of gravel on Lowhee Creek. A bulldozer was used to stack the tailings. Four men were employed.

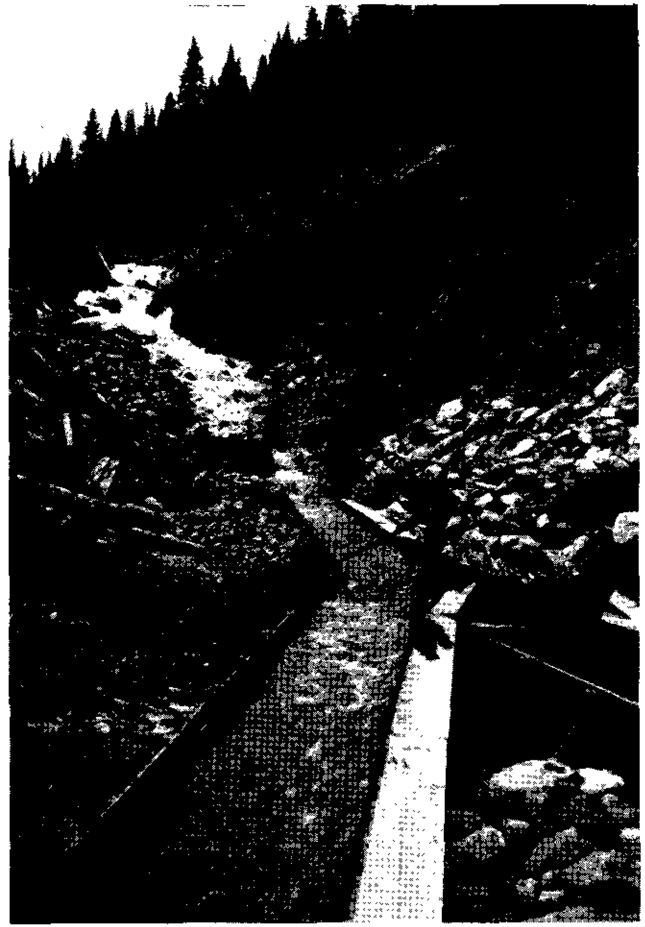
The Golden Ketch Placers Ltd.—C. F. Gierhartz and five employees hydraulicked 3,000 cubic yards of gravel on ground near the junction of Burns Creek with Slough Creek. This ground formerly was worked by R. E. MacDougall, of Wells.

Dramont Mines, Inc.—Company office, 10335 Forty-eighth Avenue N.E., Seattle, Wash.; mine office, Wells. J. E. Ritchie, president. A. C. Johnson and two employees operated a No. 4 monitor in the Dragon Creek pit.

* By J. W. Patterson.



Dragline operation, Devlin Bench.



Placer-mining on Dragon Creek.

Beaver Pass Gold Placers.—R. Macaulay and a partner hydraulicked 4,000 cubic yards of gravel on Kee Khan Creek, a tributary of Tregillus Creek.

Rucheon Creek.—J. H. Feyer hydraulicked 5,000 cubic yards of gravel on Rucheon Creek on a lease owned by the late T. Fry.

Hyde Creek.—C. L. MacColm hydraulicked on the Hyde Creek bench lease owned by O. R. Hougen, of Vancouver.

Nine Mile Creek.—C. W. Piener sluiced 200 cubic yards of gravel on Nine Mile Creek.

Two Bit Creek.—T. M. Dunlop and H. E. Reid did some test work on their leases on Two Bit Creek.

Antler Creek (53° 121° S.E.)

Antler Creek.—A. Bindschedlar and four employees did some drifting and sluicing on Antler Creek about 3 miles from its mouth.

Antler Mountain Gold Ltd.—A. W. Ludditt and three employees hydraulicked 1,500 cubic yards of overburden on Grouse and Quartz Creeks. Some open-cutting was done also.

Cunningham Creek.—D. Jorgenson sluiced 300 cubic yards of gravel on Cunningham Creek.

Beggs Gulch.—H. C. Wade worked alone on his property in Beggs Gulch.

Cottonwood River (53° 122° S.E.)

Mostique Creek.—Mr. and Mrs. P. J. Macdonald hydraulicked 7,000 cubic yards of overburden at the old Slade Placer pit at the junction of Mostique (Mosquito) Creek with Lightning Creek.

Lightning Creek (53° 121° S.W.)

Channel Placers, Inc.—Between May 21st and July 12th the Amador pit was worked by six men supervised by D. H. Wells; between July 15th and September 24th it was worked alone by E. Kellogg, who had an option agreement with Channel Placers, Inc. During these two periods 70,000 cubic yards of gravel was removed from the pit and 6,250 square feet of bedrock was cleaned.

Houseman Creek.—Mr. and Mrs. Leroy Biggs worked on three leases on Houseman and Lightning Creeks.

Last Chance Creek.—V. McFadden and two partners drifted 112 feet in gravel on their placer property on Last Chance Creek near Stanley. The drifting was done from the bottom of the 90-foot shaft which was sunk in 1948 by the late A. Brown.

Quesnel River Area (52° 121° N.W.)

Likely.—A. Carbillet sluiced 2,500 cubic yards of gravel on two bench leases near Likely.

Cedar Creek.—P. W. Ogden and a son, A. Ogden, operated a 3-inch monitor on the north bank of Cedar Creek half a mile above its junction with Quesnel Lake. About 3,000 cubic yards of overburden was removed.

Cariboo River.—D. A. and H. C. Millar and one partner hydraulicked 5,000 cubic yards of overburden and gravel on a bench on the south side of Cariboo River near Murderer Gulch.

Keithley Creek (52° 121° N.E.)

Keithley Creek.—E. F. Lang did some drilling on the east bank of Keithley Creek one-quarter of a mile downstream from Snowshoe Creek. This work was done on a lease owned by C. H. Pitt, of Vernon.

T. Payne ground-sluiced for a short period on his lease near the junction of Four Creek with Keithley Creek.

Nigger Creek.—T. Payne, with a small hydraulic plant, moved 900 cubic yards of gravel on his lease at the headwaters of Nigger Creek, a tributary of Cariboo Lake.

Harvey Creek Mines Limited.—On Nigger Creek, B. Boe and four men ground-sluiced 150,000 cubic yards of overburden and gravel.

FRASER RIVER*

Lillooet Area (50° 121° N.W.)

Black Beaver Placers Ltd.—W. H. Miller and two employees did some testing of gravels on two leases on the east side of the Fraser River about 9 miles below Lillooet.

Fountainview

This lease is on the Fraser River opposite the Pacific Great Eastern Railway station at Fountain. Early in 1956 J. H. McKee, of Vancouver, purchased the lease from A. K. Greenway, of Lillooet. Since then the 3 miles of road from the Bridge River road has been repaired and some preparations have been made to begin placer-mining. The operation of a gold-recovery machine was tested. The machine was set up in June. Three small buildings were built to serve as cook-house, bunk-house, and office. About five men were employed.

Watson Bar Creek (51° 122° S.E.)

E. H. Rosenau and five men ground-sluiced 30,000 cubic yards of gravel on placer leases on the north fork of Watson Bar Creek. Two hundred feet of bedrock at a depth of 25 feet was uncovered.

BRIDGE RIVER*

Hurley River.—(50° 122° N.W.) W. Haylmore and one man did some drifting on his lease on Hurley River near Gold Bridge. They sluiced 200 cubic yards of gravel.

COLUMBIA RIVER†

Kirbyville Creek (51° 118° N.W.)

West Columbia Gold Placers Ltd.

Company office, 2360 Abbott Street, Kelowna. J. H. Buckland, president. This company owns Special Placer Mining Lease No. 462, an area of 3.9 square miles on the west side of Columbia River at the confluence of Kirbyville Creek and across from the confluence of Goldstream River. The property is reached by boat from Mile 56 on the Big Bend Highway, north of Revelstoke. Activity in 1956 was restricted to exploratory drilling.

FORT STEELE‡

Maus Creek.—(49° 115° N.E.) G. R. Castles, of Lethbridge, and one man cleaned and retimbered the shaft at the Maus Creek Placers. Twenty-five cubic yards of gravel was removed from the north drift, and a small amount of gold was recovered.

SPILLIMACHEEN‡

Columbium and Uranium

Bugaboo (Quebec Metallurgical Industries Ltd.)

(50° 116° N.W.) Company office, Billings Bridge, Ont.; mine office, Spillimacheen. W. D. Hubler, general superintendent; R. C. Gegg, superintendent. This company, a subsidiary of Ventures Limited, holds one special placer lease at the headwaters of Bugaboo Creek. In addition, five leases and three special leases are

* By J. W. Patterson.
† By J. W. Peck.
‡ By J. E. Merrett.

held on Vowell Creek, a tributary of the Spillimacheen River, and eight leases and two special leases are held on Forster Creek, a tributary of Columbia River. Access to the Bugaboo operation is by 25 miles of rough road from Spillimacheen on the Kootenay Central Railway.

The purpose of the operation was to extract for metallurgical testing the columbium- and uranium-bearing minerals (pyrochlore, euxenite, and uranothorite) occurring in the post-Glacial outwash gravels derived from erosion of the Bugaboo granite stocks. Test drilling completed in 1955 indicated a concentrate-bearing zone approximately 300 feet wide extending along the creek for a distance of 3 miles.

Work commenced in April with the ploughing of snow from and repairing of the road. Three prefabricated metal buildings were erected to serve as bunk-house, office, and power-house. A 100-kw. diesel-electric generator was installed in the power-house to provide power for the operation of the concentrating plant and for the pumping of water. As the concentrating plant was of a temporary nature, it was assembled without provision for housing.

Gravel was removed from the creek banks with a shovel-loader and trucked to a small storage bin where a grizzly screen separated the large rocks. The gravel then passed over two 4-foot circular screens where all material of plus one-eighth inch in size was discarded. The undersize feed was pumped by a 5-inch sand-pump to a battery of twenty spiral classifiers. The collected materials of high specific gravity were pumped by two 1½-inch sand-pumps to four Wilfley-type concentrating tables which operated in closed circuit by means of four 1-inch sand-pumps. A wet magnetic separator was placed within this circuit in order to remove as much magnetite as possible without removing other magnetically attractive particles. The fine product from the closed-circuit section was discharged to a storage bin and dried in batch lots on an oil-fired heater. The dried concentrates were shipped to the company's Ontario laboratory for separation of the contained metals. The concentrating plant operated from August 1st to October 9th, during which time 7,220 cubic yards of gravel was treated and 24,931 pounds of concentrates were produced.

The average number of men employed was eleven.

Structural Materials and Industrial Minerals

CONTENTS

ASBESTOS

Cassiar Asbestos Corporation Limited*

Mount McDame (59° 129° S.W.). Head office, 85 Richmond Street West, Toronto; British Columbia office, Royal Bank Building, Vancouver; mine office, Cassiar. J. B. Christian, general manager; N. F. Murray, general superintendent; C. E. Bronson, plant superintendent; J. Berry, mine superintendent; A. C. Beguin, mill superintendent. The property straddles a 6,300-foot spur of the main ridge 2.2 miles northwest of Mount McDame, and the mill and camp are located immediately to the south of the property in the valley of Troutline Creek at an elevation of 3,540 feet. A gravelled road approximately 80 miles long connects the mine with the Alaska Highway near Watson Lake.

* By A. R. C. James.

The orebody, containing chrysotile asbestos, is an elongated lens-shaped body of serpentine bounded by metamorphosed sedimentary rocks on the west and by interlayered metamorphosed sediments and volcanic flows on the east. The series strikes northward and dips steeply to the east. The main serpentine outcrop extends across a high ridge for a length of 2,000 feet, the width ranging from 50 to 450 feet. A second outcrop of serpentine occurs in the floor of a cirque 1,200 feet north of the main showing. The intervening steep slopes are covered by asbestos fluff and serpentine talus, but the two orebodies are on strike and appear to be part of a single mass. The first claims on this important deposit were located by V. A. Sittler and associates, of Fort Nelson, in 1950, and the first production was in 1952.

The asbestos is mined entirely by open-cut methods, from a series of benches ranging from 15 to 30 feet high. Two TM-500 Joy drills were purchased during the year; these large mobile machines are used to drill 30-foot vertical holes 4½ inches in diameter, the holes being spaced at 8-foot intervals. Eight TM-400A wagon drills are also in use; these machines are used to drill a series of horizontal holes 4 to 5 feet apart and 15 feet in average depth. All detonation of blasts is by primacord to keep foreign material out of the ore. The ore is handled with Eimco 104 and 105 loaders and by a ¾-cubic-yard Northwest shovel. Most of the ore is now put through a grizzly and primary crusher on the " hill " at 6,176 feet elevation. From this point it passes down chutes to the tram-line buckets and is transported over 3 miles to the mill. The mining of ore in 1956 was begun on April 26th and ended on October 27th. The breaking of waste continued until November 17th. The mining season in 1956 was more than ten weeks longer than the 1955 season. Production of ore was 339,993 tons, a 52.5-per-cent increase over the previous year. A total of 416,527 tons of waste was broken.

Underground development work was done from the adit at the 6,000-foot level with a view to exploring the extent of the orebody and increasing proved ore reserves. A total of 731 feet of crosscutting and 640 feet of drifting along the hangingwall side of the orebody was done during the year.

The present mill rate is from 900 to 1,000 tons a day, and the mill operates the year round. In general the ore circuit in the mill is as follows: Mine ore is passed through a grizzly feeding the jaw crusher, then passed over a Dillon screen with the oversize going to a 4-foot cone crusher. The ore is then passed through the drier units and carried by conveyors to a dry-rock storage shed. The mill-feed from the dry-rock storage is passed over a Dillon screen, then over a series of gyratory screens with a 3-foot cone crusher in the primary circuit. Milling is by a dry process, the fibre being freed from the rock by impact method, aspirated from the screens by means of exhaust fans, and collected and cleaned by cyclone collectors. The discharge of reject fines from the screens is by gravity through a number of ducts to conveyors which discharge to tailing storage. The operating and supervisory staff in the mill totals about twenty persons. A total of 284,877 tons of ore was milled in 1956. Production figures of fibre as supplied to the mining statistician by the company head office were as follows:—

Grade	Tons
Crude No. 1	73.15
AAA	531.25
AA	734.70
3K	5,576.60
AC	5,039.40
4K	8,771.25
Total fibre produced	20,726.35

There were forty staff employees at Cassiar in 1956, and the crew employed on all operations ranged from 200 in the winter months to 360 in the summer.

The most important item of new construction completed in 1956 was the aerial tram-line, which started operating on May 24th. This is a Breco continuous powered aerial tram almost 3 miles long, designed to carry ore at 100 tons per hour from the mine at 5,800 feet elevation to the mill at 3,540 feet elevation.

The following additional construction was completed in 1956:—

A mine dry, 30 feet by 70 feet, 1½-story.

Extension to dry-rock storage building which will double the storage capacity. This extension is 170 feet long, 225 feet wide, and 80 feet high.

A new garage and compressor-house at the mine.

A six-bed hospital, which is excellently equipped and of the most modern design.

A community church.

A school and teacher's quarters.

Seven new Pan Abode dwellings.

The year was unfortunately marred by two fatal accidents. On May 22nd Ivo Bortoluzzi, aged 27, was killed by being struck on the head by a piece of flying rock from the cirque chute. On August 20th Herbert Laber, aged 26, was killed when the truck he was operating went over the edge of the 6160 bench and fell 167 feet down the face of the mountain. Eight other accidents involving a week or more of lost time were reported and investigated. An accident-prevention committee, presided over by the plant superintendent, meets monthly and reviews all accidents and carries out safety inspections of the whole property.

Letain Asbestos (Conwest Exploration Company Limited)*

King Mountain (58° 128° S.E.). Company office, 1001, 85 Richmond Street West, Toronto. F. M. Connell, president. This property comprises twenty-three claims held by location and is about 3 miles northeast of King Mountain, near the headwaters of Ferry Creek, which flows north into the Turnagain River. It is reported that these claims cover promising showings of asbestos fibre. In 1956 a limited amount of open-cutting was done to outline the area of fibre-bearing serpentine. It is reported that the results of this work, both as to size and grade of material, were encouraging, and a continuation of this development in 1957 is anticipated. A crew averaging six men was employed under the supervision of A. E. Storey.

BARITE

Mountain Minerals Limited†

Company office, Meech Building, P.O. Box 273, Lethbridge, Alta. R. A. Thrall, managing director; William MacPherson, superintendent. This company owns one barite quarry 7 miles west by road from Parson siding and another 5 miles west by road from Brisco, both in the Windermere Valley, south of Golden.

The Parson quarry (51° 116° S.W.) operated for a two-month period, during which time 1,470 tons of barite was shipped to the company's processing plant at Lethbridge.

The Brisco quarry (50° 116° N.E.) operated for an eleven-month period, during which time a crew of five men quarried and shipped 9,965 tons of barite to the Lethbridge plant.

Surface stripping in a northeasterly direction from the lower quarry, commenced in 1955, extended the outline of the barite outcrop approximately 150 feet. Three diamond-drill holes totalling 250 feet were drilled immediately southwest of the face of the upper quarry. These holes located the extension of the barite zone, which in that area is covered to considerable depth with hardpan.

A primary crushing unit, loading-conveyor, and railway spur were constructed at the Kootenay Central Railway at Brisco. A 100-horsepower electric motor and a 20- by

* By A. R. C. James.

† By J. E. Merrett.

36-inch jaw crusher were installed to do the crushing. Power was obtained from the British Columbia Power Commission's transmission-line through that area.

Millwhite Mud Services*

Windermere (50° 115° S.W.). Company office, M. and N. Building, Houston, Texas. Canadian subsidiary, Pacific Western Mud Service Ltd., 631 Ninth Avenue West, Calgary, Alta. This company optioned the Lucky group of four mineral claims from T. Cameron, of Windermere. The claims are located on the west slope of the Stanford Range, 1 mile east of the Cranbrook–Radium Highway, 6 miles south of Windermere.

Approximately one-half mile of road was constructed from a logging-road to an outcrop of barite exposed at an elevation of 4,000 feet on a steep hillside. Surface stripping over an area 40 feet wide and 60 feet long disclosed several massively crystalline lenses of barite in an easterly striking zone within dolomite. It was reported that other outcrops of barite were exposed at intervals uphill along this zone. A small barite outcrop is exposed 100 feet northwest of the main cut. It is estimated that within the stripped area at least two-thirds of the exposed rock is barite. Lead and copper mineralization was seen on the freshly exposed surfaces. No shipments of barite were made.

BUILDING-STONE

Andesite

Haddington Island Quarry†

(50° 127° N.E.) Company office, J. A. and C. H. McDonald Limited, 1571 Main Street, Vancouver; quarry, Haddington Island. Andesite is quarried to obtain dimension stone for building purposes. The quarry face is about 75 feet high and slopes about 45 degrees, following the main jointing feature of the deposit. Stone is undercut by drilling and blasting at the floor of the quarry; the ends of the stone are formed by a secondary joint system; the other sides are cut by blasting. Drilling is done with air machines using conventional steel, having a spade-shaped bit. Holes are drilled 3 to 4 inches apart for shaping the stone and are blasted with black powder. Two derricks are used to move the stone to scows, by which it is transported to Vancouver for finishing.

Granite

Kootenay Granite Products Limited.*—Sirdar (49° 116° S.W.) Company office, 603 Eighth Avenue West, Calgary, Alta.; quarry office, Sirdar. Some modifications were made in the crushing circuit, but no quarrying or crushing was done at this plant.

Valley Granite Products Ltd.†

Cheam View (49° 121° S.W.). Company office, 410 Mayfair Avenue, Chilliwack; plant, Bridal Falls. Kenneth Jessiman, general manager. The quarry and crushing plant are 11 miles east of Rosedale. The quarry is mined in two benches, each about 15 feet high. Vertical blast-holes are drilled with jackhammers. Rock is broken to approximately 8 inches and is piled under temporary shelters and dried with open-flame kerosene burners. The dried rock is loaded into wheelbarrows and transported to a dry process, crushing and screening plant. The plant produces turkey, chicken, and bird grits, stucco-dash, sand-blasting material, filler for asphalt roofing, and sand material for automotive vehicles. Twelve men were employed.

Little Mountain Quarry†

Chilliwack (49° 121° S.W.). This pit is on the north slope of Mount Shannon and about 1 mile northeast of Chilliwack. It is operated intermittently by the Fraser Valley Dyking Commission to obtain rock to repair dykes along the Fraser River. Rock is broken by coyote-hole methods and is loaded by shovels on to trucks and transported to the dykes.

* By J. E. Merrett.
† By R. B. King.

Indian River Quarries Limited*

Granite Falls (49° 122° S.W.). Company office, 1255 West Pender Street, Vancouver; quarry office, Granite Falls. John M. Carnsew, superintendent. Granite is quarried to obtain jetty-rock, riprap, and rubble. Rock is broken from the quarry face by benching. Broken rock is loaded by shovels into wire-rope nets which serve as a coarse screen. These are transported by a steam-driven derrick and loaded directly on to scows. Eight men were employed.

Gilley Bros. Limited*

Pitt River (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster; quarry office, Pitt River. J. H. Gilley, general manager; Francis J. MacDonald, superintendent. Quartz diorite is quarried to obtain rock for jetties, dykes, and concrete aggregate. Rock is broken from a quarry face, which is nearly 100 feet high, mainly by a coyote-hole method of mining. Broken rock is loaded by a 2-cubic-yard diesel-driven shovel into 12-cubic-yard-capacity trucks and is transported to a crushing plant. The crushing plant consists of a 42- by 60-inch jaw crusher which discharges crushed rock over an inclined 6-inch grizzly to a conveyor belt for loading scows. Undersize material (—6-inch) is stockpiled. Hydro-electric power to run the plant is produced on the property. Twenty-five men were employed.

Vancouver Granite Co. Limited*

Nelson Island (49° 124° N.E.). Company office, 744 West Hastings Street, Vancouver; quarry, Nelson Island. Dimension stone for building purposes and monuments, jetty-rock, and rubble are mined at this quarry. The rock is drilled to size following a mineral lineation pattern and then wedged or blasted for removal. Derricks are used to move the stone to scows, by which it is transported to Vancouver for cutting and finishing. Approximately 1,200 tons of stone was produced from April 1st to November 5th, 1956. Seven men were employed.

Slate

McNab Creek Slate Quarry*

Howe Sound (49° 123° N.E.). Head office, Richmix Clays Limited, 2890 East Twelfth Avenue, Vancouver; quarry, McNab Creek. G. W. Richmond, manager. Slate is quarried for flagstones, roofing granules, and filler. Rock is broken from a 30-foot quarry face by drilling and blasting horizontal holes. Broken slate is hand-loaded into scows. The product is shipped to Vancouver for grading and sizing. During 1956, 491 tons of slate was mined.

CLAY AND SHALE

Bear Creek Brick Company*

Surrey (49° 122° S.W.). Head office, Victoria Tile & Brick Supply Co. Ltd., Vancouver; plant, Archibald Road, Surrey Municipality. James McBeth, plant manager. Surface clay is mined from a shallow pit adjacent to the plant by a ½-cubic-yard gasoline shovel. The clay is transported to a hopper and, from this, elevated to the plant by small cars on an inclined railway. The bricks are formed by a wet process and placed in hacks to be weather-dried. Wood-fired scove kilns are built for burning bricks.

Port Haney Brick Company Limited*

Haney (49° 122° S.W.). Company office, 846 Howe Street, Vancouver; plant, Haney. E. G. Baynes, president; J. Hadgkiss, plant manager. Plastic clay is mined from a low pit face beside the plant by a ½-cubic-yard gasoline-driven shovel and is transported by truck to a covered air-drying area. The clay is dried in a rotary wood-fired kiln and conveyed to a dry pan for grinding. Brick and tile are formed by a stiff-mud extrusion process and dried in a controlled-temperature drying-room. The products are

* By R. B. King.

burned in down-draught beehive kilns. During 1956, 14,402 tons of clay products were produced. Sixty men were employed.

Mainland Clay Products Limited* Barnet (49° 122° S.W.). Head office, 8699 Angus Drive, Vancouver; plant, Barnet. D. Pitkethly, general manager. Surface clay is mined intermittently from a pit adjacent to the plant and is transported to a covered air-drying area. Some fireclay is obtained from Kilgard. Bricks are formed and dried in a heated drying building. Common brick, Roman brick, and firebrick are burned in rectangular oil-fired kilns. Seven men were employed.

Clayburn Company Limited* (49° 122° S.E.) Head office, 302 Credit Foncier Building, Vancouver; plants, Kilgard and Abbotsford. R. M. Hungerford, managing director; P. S. Jagger, plant manager. Two plants are operated by this company: one, in which sewer-pipe and flue-lining are manufactured, is at Kilgard; the other, in which facebrick, refractories, special refractory shapes, and refractory specialties are made, is at Abbotsford.

In the Kilgard plant, sewer-pipe and flue-lining are extruded through dies, pre-dried, and burned in oil-fired down-draught beehive kilns. In the Abbotsford plant, bricks are dry-pressed or extruded through dies, hand set on cars, and passed through a drier. From the drier the bricks pass into an oil-fired continuous kiln 300 feet long. Some of the clay used in the manufacture of refractories is precalcined in a 150-foot oil-fired rotary kiln. The rotary kiln is also used for bloating of certain clays.

Clay is mined from shale members of the Huntingdon formation on Sumas Mountain. Three underground mines and two open pits produce shale for the plant. Room-and-pillar method of mining is used in the underground mines, and extensive use is made of roof-bolting for ground support. Holes are drilled with tungsten-carbide-tipped augers which are driven by air-operated drills. Black powder is used in blasting down the shale. Scrapers, operated by 30-horsepower electrically driven hoists, are used to move broken shale directly to mine cars. Trucks haul the shale from the portals to both plants. In the open pits, clay is mined in 20-foot benches by drilling and blasting vertical holes. Broken clay is loaded on trucks for haulage to the plants.

Clay mined during 1956 totalled 89,495 tons, of which 52,474 tons was used in the production of facebrick and firebrick and 17,893 tons was used for sewer-pipe and flue-lining. Clay mined for use in the rotary kilns was 19,128 tons. Twenty men were employed.

Richmix Clays Limited* Kilgard (49° 122° S.E.). Office and plant, 2890 East Twelfth Avenue, Vancouver; quarry, Kilgard. G. W. Richmond, manager. Stripping and mining of fireclay are carried on intermittently at this property. Clay is drilled and blasted, then loaded by a diesel-driven shovel on to trucks and transported to markets. During 1956, 2,896 tons of fireclay was shipped.

Fairey & Company Limited† Vancouver (49° 123° S.E.). L. T. Fairey, manager. This company produced a variety of fireclay blocks and shapes and high-temperature cements. Local and imported raw materials were used.

Deeks-McBride Ltd.* Bazan Bay (48° 123° N.E.). This company purchased the property of Bazan Bay Brick & Tile Company Limited near Sidney, Vancouver Island, and became the Clay Division of Deeks-McBride Ltd. Surface clay is mined by scrapers and stockpiled for drying. It is then ground in a dry pan and elevated to a storage hopper. Brick and tile are formed by a stiff-mud extrusion process and dried in a temperature- and humidity-

* By R. B. King.
† By J. W. McCammon.

controlled drying-room. The products are burned in an oil-fired shuttle-type kiln. Common brick, building-tile, and drain-tile are produced. Ten men were employed.

Baker Brick & Tile Company Limited*

Victoria (49° 123° S.E.). Office and plant, Victoria. J. V. Johnson and D. E. Smith, joint managers. Surface clay is mined near the plant by gas shovel and transported by truck to storage bins. The clay is air-dried, ground, and formed into shapes by a soft-mud extrusion process and dried with waste heat from kilns. Down-draught kilns are used to burn the ware. Flower-pots, drain-tile, structural tile, flue-lining, and Roman brick are manufactured. During 1956, 4,000 tons of clay was mined. Twenty men were employed.

GYPSUM

Columbia Gypsum Co. Ltd.†

Windermere (50° 115° S.W.). Company office, 576 West First Avenue, Vancouver; quarry office, Athalmer. A. E. Portman, superintendent. During a seven-month period a crew of eight men quarried and crushed 38,653 tons of gypsum rock at the deposit on Windermere Creek, 10 miles from Lake Windermere station at Athalmer on the Kootenay Central Railway. Of the 34,729 tons shipped, approximately 45 per cent was shipped to the Canada Cement Company, Exshaw, Alta. The remainder was shipped to the Columbia Gypsum Company, Austin, Wash.; Ideal Cement Company, Irvin, Wash.; and the Lehigh Portland Cement Company, Metaline Falls, Wash. During the year considerable work was done to improve the quarry road by straightening, widening, and, where possible, reducing adverse grades.

Gypsum Lime and Alabastine, Canada, Limited‡

Falkland (50° 119° N.W.). Head office, Paris, Ont.; British Columbia office, 1105 West Pender Street, Vancouver. W. M. Tulley, British Columbia manager; Robert Thomson, quarry superintendent. During the first few months of the year, gypsum was produced from the company's quarries at Falkland. In June operations were suspended and had not been resumed at the end of the year. During the period of operation the production of gypsum averaged approximately 350 tons daily, and twenty-eight men were employed. The gypsum was shipped to the company's processing plants at Port Mann and Calgary.

LIMESTONE AND CEMENT

The Consolidated Mining and Smelting Company of Canada, Limited‡

Fife (49° 118° S.E.), Head office, Trail; quarry, Fife. G. S. Ogilvie, property superintendent; Oscar Tedesco, quarry foreman. The limestone quarried here is shipped to Trail for use as flux in the smelter. The quarry is alongside the Kettle Valley branch of the Canadian Pacific Railway, half a mile north of Fife. The limestone is blasted from the quarry face and is mechanically loaded into trucks and hauled to a loading-bin at the railway. Compressed air for drilling is supplied by two compressors with a total capacity of 560 cubic feet per minute. New construction during the year included a blacksmith-shop, compressor-house, and a dry-house. Operations were continuous throughout the year. The quarry was operated on a two-shift basis, and twelve men were employed. The limestone shipped in 1956 amounted to 73,778 tons.

Agassiz Lime Quarry*

Agassiz (49° 121° S.W.). Hiram Cutler, owner. Agricultural limestone, crushed rock, and chicken grit are produced from this quarry and crushing plant. Limestone is blasted from low quarry faces and is transported by a ¼-cubic-yard loader from the quarry

* By R. B. King.
† By J. E. Merrett.
‡ By E. R. Hughes.

to the crushing plant. During 1956 nearly 1,400 tons of limestone was produced. Three men were employed.

Fraser Valley Lime Supplies.*—Popkum (49° 121° S.W.) Arthur Isaacs, superintendent. Limestone is blasted from the quarry face, hand-loaded into trucks, and transported to a crushing plant. During 1956, 4,700 tons of limestone was quarried. Six men were employed.

Beale Quarries Limited* Vananda (49° 124° N.W.). Head office, 744 West Hastings Street, Vancouver; quarry office, Vananda. W. D. Webster, superintendent. On March 1st, 1956, Lafarge Cement of North America Ltd. bought control of the quarry. Limestone is quarried to produce pulp rock for paper-mills, agricultural limestone, crushed limestone, and stucco products. The quarry is worked on levels with faces about 15 feet high. Wagon drills are used to drill holes for blasting. Broken rock is loaded with two ¾-cubic-yard diesel-driven shovels and transported by truck to a crushing plant. At the end of the year heavier equipment was added, including a 3-cubic-yard Bucyrus shovel, a Joy Heavyweight Champion drill and two Euclid 63-T trucks.

Approximately 129,000 tons of limestone was produced in 1956. Of this, 85,000 tons was shipped as pulp rock and 44,000 tons as crushed limestone. Thirty-four men were employed in the quarry and plants.

W. S. Beale (1955) Ltd.* Vananda (49° 124° N.W.). Office and quarry, Vananda. Stanley Beale, manager. This quarry is at Marble Bay, near Vananda. The quarry is worked with one face nearly 80 feet high and sloping nearly 45 degrees to the horizontal. One section is being prepared for use of long vertical holes in which churn drills will be used. Blasted rock is loaded with a ½-cubic-yard diesel-driven shovel and transported by trucks to a coarse screen. Pulp rock is loaded on to scows; spalls are stockpiled. Seven men were employed.

McKay Quarry* Vananda (49° 124° N.W.). Don McKay, owner. This quarry is on the main road about 2 miles south of Vananda. White limestone is mined and sold for stucco-dash and whiting. Open-pit mining with low benches allows a selective recovery of the white limestone. Grey limestone is also sold for pulp rock. During 1956, 3,000 tons of white limestone and 4,500 tons of grey limestone were produced.

Gypsum Lime and Alabastine, Canada, Limited* Blubber Bay (49° 124° N.W.). Head office, 50 Maitland Street, Toronto 5, Ont.; British Columbia office, 1105 West Pender Street, Vancouver; limestone quarry, Blubber Bay; lime plants, Blubber Bay and Vancouver. Arthur Pitt, plant manager, Blubber Bay. Limestone is quarried approximately 2 miles from the Blubber Bay plant. The quarry is worked in levels with faces nearly 25 feet high. Wagon drills and Gardner-Denver rotary drills are used to drill horizontal and vertical blast-holes. Broken rock is loaded by diesel-driven shovels on to trucks and hauled to the Blubber Bay plant. There the limestone is crushed, sized, and stockpiled for use in lime-burning facilities at Blubber Bay and Vancouver, and also for sale.

Products are crushed stone, including sized rock, spalls, and fines or screenings, quicklime (lump, crushed, and pulverized), and hydrated lime. Stone is supplied to such industries as pulp and paper, cement, smelting and refining, iron and steel, agriculture, etc. Lime is supplied for building, mining, pulp and paper, chemicals, agriculture, steel, and sugar industries.

New crushing, screening, stone-handling, and mechanical loading facilities, including a reclaiming system and new loading-dock, were completed in 1956 at Blubber Bay, and substantially increased production capacity. Lime-burning facilities at Blubber Bay are currently being increased and will be finished early in 1957.

* By R. B. King.

Total number of men employed at Blubber Bay in 1956 was sixty.

British Columbia Cement Company Limited*—Head office, 500 Fort Street, Victoria. N. A. Tomlin, managing director; R. E. Haskins, general superintendent. Quarries are operated at Bamberton (48° 123° N.W.) and Cobble Hill (48° 123° N.W.) on Vancouver Island and at Blubber Bay (49° 124° N.W.) on Texada Island to produce limestone and greenstone, used in manufacturing cement.

At Blubber Bay the quarry faces range from 70 to 85 feet in height. A churn drill is used to drill vertical blast-holes. The holes are spaced at 20-foot centres, have 25 feet of burden, and are drilled 9 feet below grade line of the quarry floor. Broken rock is loaded by diesel-driven shovels into 15-ton-capacity trucks and transported to a crushing plant. Rock from the crushing plant is stockpiled, and when required is loaded by conveyor-belt to scows for shipment to the cement plant at Bamberton.

At Cobble Hill the quarry face is about 70 feet high. A churn drill is used to drill vertical blast-holes which have a 26-foot spacing and burden. Broken rock is loaded by a diesel-driven shovel into 15-ton trucks and transported to the Bamberton plant. Construction of a private road, approximately 9 miles long, from Cobble Hill to Bamberton was started during the year.

At Bamberton, rock is mined by drilling horizontal holes with wagon drills. Broken rock is loaded by electric and diesel-driven shovels and transported to the crushing plant by trucks.

During 1956, 691,926 tons of limestone and 127,250 tons of greenstone were mined. Of this, 212,585 tons of limestone was quarried at Bamberton, 186,300 tons of limestone was quarried at Blubber Bay quarry, and 293,041 tons was quarried at Cobble Hill. The greenstone was mined at Blubber Bay and Bamberton. Forty-seven men were employed.

Alaska Pine & Cellulose Limited*—Jeune Landing (50° 127° S.W.). Head office, 1111 West Georgia Street, Vancouver. Nils Erickson, quarry superintendent. This quarry is on the east shore of Neroutsos Inlet about 1¼ miles north of Jeune Landing. Limestone is quarried for pulp rock for the Port Alice pulp plant. The limestone is worked by advancing a low face and using air-leg types of drills for drilling blast-holes. Broken rock is loaded by a ½-cubic-yard diesel-driven shovel and transported by truck to a ramp, where it is dumped over a scalping grizzly. The coarse material is loaded on scows and fine material is stockpiled. The loading-dock was completely rebuilt and enlarged. During 1956, 17,000 tons of limestone was shipped and 5,000 cubic yards was crushed and stockpiled for roads and fill at Port Alice. Three men were employed.

MARL

Cheam Marl Products Ltd.*—Popkum (49° 121° S.W.). Office, Chilliwack. A. M. Davidson, manager. Marl is mined from a deposit on the east shore of Cheam Lake by a diesel-driven dragline and by scrapers. The marl is sold wet or semi-dry. Three men were employed.

Popkum Marl Products Limited*—Popkum (49° 121° S.W.). W. A. Munro, manager. Marl and humus are mined by this company from a deposit near Cheam Lake. Humus is removed first and then marl is mined by a diesel-driven dragline. Some of the material is dried in an oil-fired rotary kiln. Wet, semi-dry, and dry humus and marl are produced. Three men were employed.

* By R. B. King.

SAND AND GRAVEL*

Abbotsford Gravel Sales Ltd.—Abbotsford (49° 122° S.E.). This pit is 7 miles west and 6 miles south of Abbotsford. Gravel is mined by shovel and scraper from the pit and is either sold as pit run or is crushed, washed, and sized in an adjacent plant. A ready-mix plant furnishes concrete for local sales. Four men were employed.

Dueck's Gravel Pit—Clearbrooke (49° 122° S.E.). Dueck Building Supplies Ltd., owner. This pit is about 1 mile north of Clearbrooke. Sand and gravel are dug from gravel faces about 15 feet high by an overhead loader and transported to a bucket elevation, by which they are elevated to a washing plant. Pit and washed and sized gravel are produced. A ready-mix plant furnishes concrete for local sales. Three men were employed.

Foster's Gravel Pit—Aldergrove (49° 122° S.E.). C. N. Foster, owner. This pit is about 3 miles south of Aldergrove. Sand and gravel are mined from low faces by a front-end loader. Pit-run gravel is sold locally. One man was employed.

Border Sand and Gravel Company—White Rock (49° 122° S.W.). Office and plant, Boundary Road, R.R. 4, White Rock. T. Lapierre, manager. Gravel is mined by blasting low gravel faces or loading loose gravel with an overhead loader. The gravel is transported to a plant for washing and sizing or is sold as pit-run gravel. Three men were employed.

Colebrook Sand & Gravel Company Limited—Cloverdale (49° 122° S.W.). Office and plant, Bayview Road, R.R. 1, Cloverdale. F. Bray and J. Bray, owners and operators. Sand and gravel are mined by an overhead loader, loaded on to trucks and hauled to a semi-portable washing and screening plant. Sand and gravel for fill, concrete, and plaster are produced. Two men were employed.

Corporation of the District of Surrey.—Cloverdale (49° 122° S.W.). Several gravel pits are operated within this township for the purpose of road maintenance and construction. Gravel is mined by diesel-driven shovels or by scrapers and is crushed in portable crushers or used as pit-run gravel.

Corporation of the Township of Langley.—Murrayville (49° 122° S.W.). Several gravel pits are operated within the township for the purpose of road maintenance and construction. Gravel is mined by diesel-driven shovels and is transported to crushers by trucks or is used directly as pit-run gravel.

Hornby General Machinery Company.—Langley Municipality (49° 122° S.W.). Office, Cloverdale; pit, Gobsell Road. Harry Hornby, owner. Run-of-pit gravel is mined intermittently by a small diesel shovel from low pit faces. Gravel is sold locally. One man was employed.

Langley Gravel and Contracting.—Langley Prairie (49° 122° S.W.). H. Gibson Clarke, owner. Gravel is mined from a pit on the corner of Bradshaw and Berry Roads. An overhead loader mines gravel from a low face. Run-of-pit gravel is sold locally.

Richmond Bulldozing Co. Ltd.—Port Mann (49° 122° S.W.). Office, 659 No. 4 Road, Lulu Island. S. E. Adernack, manager. This company is operating a pit near Port Mann. Gravel is mined from a low face by a diesel-driven shovel and is either crushed and screened to supply sized products or is sold as pit run. Two men were employed.

S.U.B. Quarries Ltd.—Port Mann (49° 122° S.W.). Office, 611 No. 3 Road, Brighouse. Gravel is mined by digging low gravel faces with diesel-driven shovels. Most of the production is supplied as pit-run gravel to a crushing plant and ready-mix plant adjacent to the pit. Five men were employed.

* By R. B. King.

Jack Cewe Blacktop Ltd.—Coquitlam (49° 122° S.W.). Jack Cewe, manager. This pit is about 3 miles north of Coquitlam on Pipe Line Road. Gravel is mined from a low gravel face by a diesel-driven shovel and is trucked to a portable crusher. Run-of-pit gravel and crushed products are sold locally or used by an adjacent asphalt road-materials plant. During 1956 approximately 30,000 tons of material was mined. Six men were employed.

Gilley Bros. Limited (Maryhill Division)—Coquitlam (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster. J. H. Gilley, general manager; E. Johnston, superintendent. This pit and plant is on the Fraser River near Coquitlam. Sand and gravel are mined from 30-foot faces by a 2½-cubic-yard diesel-driven shovel and trucked by 12-cubic-yard trucks to a crushing plant. Crushed rock is distributed to two washing plants. Sand, gravel, and crushed products produced from this property are transported by scows to markets. Forty-five men were employed.

S. and S. Gravel Pit—Coquitlam (49° 122° S.W.). N. P. Stromgren and C. B. Scott, owners. This pit is on Pipe Line Road north of Coquitlam. Gravel is mined from a high gravel face by digging with a diesel-driven shovel or an overhead loader and is either crushed in a portable crusher or sold locally as run of pit. Four men were employed.

Trouten Pit—South Westminster (49° 122° S.W.). Office and plant, 10987 Sandell Road, R.R. 11, New Westminster. William Trouten, owner and operator. Gravel is mined from high faces by blasting and loaded by diesel-driven shovels on to trucks. A small portable crushing unit is operated intermittently. Four men were employed.

Corporation of the Municipality of Burnaby.—Burnaby (49° 122° S.W.). S. Thompson, works superintendent. The pit, on Stride Avenue, is operated by E. R. Taylor Construction Co. Ltd. for the Municipality of Burnaby. Gravel is mined by digging with a 1-cubic-yard diesel-driven shovel. It is loaded into trucks and transported to a portable crusher or is used as run-of-pit gravel.

Deeks-McBride Ltd.—Company office, 1051 Main Street, Vancouver. J. W. Sharpe, general manager. Two gravel pits and crushing plants were operated during 1956 by this company. One pit is near Coquitlam (49° 122° S.W.) and the other near the mouth of Seymour Creek (49° 123° S.E.).

At the Coquitlam pit, gravel is dug with a 1-cubic-yard-capacity dragline and is transported by a conveyor-belt to a jaw crusher and then to the washing plant. The washed and sized gravel is stored in steel bunkers and is sold locally or used in a ready-mix cement plant. Ten men were employed.

At the Seymour Creek plant, gravel is mined by a ¾-cubic-yard dragline at the edge of Burrard Inlet. Gravel is transported by conveyor to the washing plant. Crushed, washed, and sized gravel is shipped by scow or truck. Thirty men were employed.

Highland Sand and Gravel Company Limited—Lynnmour (49° 123° S.E.). Company office, Lynnmour. W. J. Barrett-Leonard, manager. This company operates two plants—one at Lynnmour and one at 2962 Lambert Road, Langley Municipality. At the Lynnmour plant, sand, gravel, crushed products, road materials, concrete blocks, and tiles are produced by this company. Material is dug from low gravel faces by a ¾-cubic-yard diesel-driven shovel and is transported by truck to a crushing, screening, and washing plant.

At the Langley plant, gravel is mined by scraping, using two 1½-cubic-yard crescent scrapers driven by an electrically powered double-drum donkey-engine. Gravel is conveyed to the plant, where it is washed, crushed, and sized.

During 1956 a total of 172,600 cubic yards of material was handled by these plants, which involved the following products: Crushed rock, 42,358 cubic yards; sand and gravel, 34,044 cubic yards; crushed fill, 96,198 cubic yards.

Maclynn Gravel Co. Ltd.—Lynnmour (49° 123° S.E.). Company office, Keith Road, Lynnmour. A. D. MacMillan, owner and operator. Gravel is dug by dragline from the bottom of Lynn Creek. The run-of-pit gravel is sold locally. Four men were employed.

Hollyburn Trucking and Excavating Contractors.—Lynnmour (49° 123° S.E.). Office, 1473 Clyde Street, West Vancouver. Arthur Knight, manager. Gravel is dug from the bottom of Lynn Creek by a dragline and is sold locally as run of pit. Ten men were employed.

Capilano Crushing Co. Ltd.

West Vancouver (49° 123° S.E.). C. W. Bridge, general manager. This company operates three crushing and washing plants—plant No. 1 at 606 Marine Drive, West Vancouver; plant No. 2 at 33 East First Avenue, Vancouver; and plant No. 3 on the foreshore of the Capilano River.

At plant No. 1, gravel is mined from the bed of the Capilano River by a 1-cubic-yard diesel-driven dragline and transported to the plant for crushing, washing, and sizing. During 1956, 122,956 cubic yards of material was handled. Twelve men were employed.

Material for the other two plants is mined by a clam-shell bucket operating from a taut-line cableway. Gravel is either loaded on to scows and transported to plant No. 2 or loaded on to trucks and transported to plant No. 3.

During 1956, 346,803 cubic yards of material was produced from plant No. 2 and 38,206 cubic yards was produced from plant No. 3. Fifteen men were employed at plant No. 2 and twelve men in plant No. 3.

Routledge Gravel Ltd.

West Vancouver (49° 123° S.E.). Office, Lower Capilano Post Office. T. C. Routledge, president. This company operates two pits—one on the Indian reservation at the lower end of Lower Capilano Road, and the other at the mouth of Lynn Creek, the site of the former Coldwater Sand and Gravel Co. Ltd. In both pits gravel is scraped by a 7-cubic-yard scraper from underwater deposits and is conveyed to crushing, screening, and washing plants. Sixteen men were employed.

Construction Aggregates Ltd.—Britannia Beach (49° 123° N.E.). Company office, 628 Carnarvon Street, New Westminster. During the latter part of 1956 ten men were employed in construction of a crushing and washing plant at a gravel pit near Britannia Beach.

Hillside Sand & Gravel Limited

Hillside (49° 123° S.E.). Ray Kehoe, superintendent. This pit is on the west shore of Howe Sound and is accessible by road from Gibsons Landing. Gravel is mined by washing with a constant flow of water cascading over the high pit face. Gravel is mined by a ¾-cubic-yard diesel-driven shovel, loaded into 15-cubic-yard Euclid trucks, and transported to a crushing and washing plant.

The screening and crushing section of the plant was rebuilt. A Syntron screen was installed to screen out −4-inch material, and the +4-inch product is crushed in a 30- by 42-inch jaw crusher. A conveyor-belt removes this material to a large storage pile. Conveyor-belts in tunnels under this pile move the material to the washing plant.

Washed and sized gravel is loaded on to scows for transportation. Fifteen men were employed.

Butler Brothers Supplies Ltd.

Royal Oak (48° 123° N.E.). Office and plant, Keating Cross-road. Claude Butler, manager. Gravel is dug from gravel faces by diesel-driven shovels and an overhead loader. It is transported to a washing and sizing plant or is sold as pit run. A ready-mix plant furnishes concrete for local sales. In 1956, 246,074 tons of gravel was mined. Six men were employed.

McIntyre and Harding Gravel Company Limited

Saanich (48° 123° N.E.). Company office and plant, Royal Oak Post Office, Saanich. Gravel is mined by hydraulicking or is dug directly from gravel faces by ½-cubic-yard diesel-driven shovels and is transported by trucks to a chute and grizzly. It is then conveyed to a washing and screening plant. Sand, gravel, and washed and sized products are produced. A concrete plant for making concrete bricks, building-blocks, and drain-tile is also operated. Twenty-five men were employed.

Evans, Coleman & Johnson Bros. Ltd. (Producers Sand & Gravel (1929) Limited)

Albert Head (48° 123° S.E.). Company office, 900 Wharf Street, Victoria; plant, Royal Bay. A. Parker, plant superintendent. Sand and gravel are mined by using a scraper on a slack-line cableway to loosen packed gravel from the steep, high face. The gravel is loaded by a 1¼-cubic-yard shovel into a hopper, where it discharges on a conveyor-belt and is conveyed to the plant. Gravel is crushed, screened, washed, and classified. During 1956, 433,600 cubic yards of material was mined, which was made up as follows: Sand and gravel, 363,000 cubic yards; crushed rock, 12,600 cubic yards; crushed road gravel, 58,000 cubic yards. Twenty-five men were employed.

A. V. Richardson Ltd.

Duncan (48° 123° N.W.). Company office, Duncan. Sand, gravel, and crushed products are produced by this company from a pit on the Cowichan road nearly 4 miles from Duncan. Gravel is mined by digging with an overhead-loading machine and also by scrapers. Gravel is either used directly as fill or road dressing or is washed and sized in an adjoining plant and used for concrete. During 1956, 17,500 cubic yards of gravel was produced. Three men were employed.

SILICA

Rimrock Mining Corporation Limited*

Cranbrook (49° 115° S.W.). Registered office, 530 Rogers Building, Vancouver; general office, 809 Eighth Avenue West, Calgary, Alta.; mine office, Cranbrook. Donald J. Fulton, president. The property is composed of fifty-four recorded claims at the south end of the ridge between Kiakho and Jim Smith Lakes and includes the Bert group, held for several years by Umberto Frisina, of Cranbrook. It is reached by 5 miles of road west from Cranbrook.

A zone of intense silicification about 50 feet wide is exposed more or less continuously for at least 600 feet in outcrops and open-cuts. Recent exploration by surface stripping is reported to have considerably extended the length of this occurrence. This zone, which strikes roughly east and dips steeply north, follows a strong fault which has thrown the Creston formation into contact with the Aldridge formation. The brecciated quartzites are intensely silicified and contain a little vein quartz and small amounts of pyrite and gold.

Work commenced in December with the construction of 1 mile of bush road connecting to the Kiakho Lake road and 2,000 feet of stripping by bulldozer along the mineral outcrop. The stripped section is wide enough to permit the operation of four-wheel-drive vehicles along its length. One diamond-drill hole 80 feet in length was drilled to investigate the continuity of the deposit at depth.

[Reference: *Geol. Surv., Canada,* Mem, 207, 1937, p. 51.]

* By J. E. Merrett.

Oliver Silica Quarry*

Oliver (49° 119° S.W.). Pacific Silica Limited; W. M. Hemphill, president, 3300 First Avenue, Seattle, Wash.; Ivan A. Hunter, manager, Oliver. This silica quarry is on the Gypo mineral claim, owned by The Consolidated Mining and Smelting Company of Canada, Limited, and is 1 mile north of the village of Oliver and from 800 to 1,200 feet west of the main highway. A new quarry, No. 2, was started immediately west of No. 1, and about 300 feet higher in elevation. Additions were made to the crushing and screening facilities at the No. 1 plant, and 1,000 square feet of additional storage space was provided for the sacked product of the plant, which comprises stucco-dash, roofing-rock, poultry grit, and truck sander grit. The sacked material from this plant, amounting to 6,365 tons, was shipped to Vancouver, Vancouver Island, and Alberta.

The No. 2 plant was built in 1956 for the purpose of processing rock for bulk shipments. The new plant consists of a 20- by 36-inch jaw crusher with apron feeder, one 3- by 10-foot Simplicity 1½-deck scalper screen, and one 4- by 10-foot Simplicity three-deck secondary screen. Belt-conveyors and bunkers were installed to accommodate four sizes of rock, varying from 5-inch to —¼-inch. Production at this plant started on October 1st. The product is trucked from the plant to the Great Northern Railway at Oroville, Wash., and from there it is shipped to metallurgical plants in Washington and Oregon. Bulk shipments from plant No. 2 during the last three months of the year amounted to 11,461 tons.

At No. 1 pit the silica is quarried by Pacific Silica Limited. At No. 2 pit the quarrying is done on contract by the Interior Contracting Company Limited. Twenty men were employed.

SLAG

Granby Slag Dump*

Grand Forks (49° 118° S.E.). The old Granby Company smelter-slag dump at Grand Forks is owned by the City of Grand Forks. The mining, sorting, loading, and hauling of the material is done by the Grand Forks Cartage Company Limited. Slag is blasted from benches 20 feet high at the south end of the dump. After blasting, the slag is hand-loaded and passed over a vibrating screen, and then is hauled by truck to the railway. A total of approximately 120 tons was shipped. Two men were employed at intermittent periods.

Greenwood Slag Dump*

Greenwood (49° 118° S.W.). P. Falkoski owns part of the northern end of the slag at the old British Columbia Copper Company's smelter at Greenwood. The slag is blasted from the face of the dump, mechanically loaded into trucks, and hauled to the railway. Approximately 280 tons of slag was shipped to Vancouver for use in the manufacture of rock-wool insulation. A crew of from two to four men worked at intermittent periods.

Crofton Slag Dump†

Crofton (48° 123° N.W.). This slag dump from the old Crofton smelter is owned jointly by Mrs. R. F. Castle and H. B. Elworthy. Slag is broken by blasting and then loaded on scows. Slag is used for sand-blasting. Mining is done intermittently, and 11 cubic yards was removed in 1956.

* By E. R. Hughes.
† By R. B. King.

Petroleum and Natural Gas

By S. S. Cosburn

CONTENTS

PRODUCTION

On October 30th, 1956, the Boundary Lake field was officially declared an oilfield—British Columbia's first.

The first commercial oil wells in the history of British Columbia were put on continuous production in June, 1956. By the year's end the Province had ten commercial oil wells and ninety-four gas wells, all in northeastern British Columbia.

Texaco Exploration Company, as operator for the Northern Foothills Agreement group, completed five oil development wells in the Boundary Lake oilfield in 1956. This made a total of six oil wells in that field, all producing from the Triassic Schooler Creek formation.

Four oil wells in the Fort St. John gas area were put on production during the year, three producing from the Triassic and one from the Permo-Pennsylvanian.

By the end of 1956 the ten oil wells had delivered by truck 148,454 barrels of crude oil to the Dawson Creek refinery, Texaco Exploration Company produced 107,439 barrels of 34 degrees A.P.I. gravity crude oil from the Boundary Lake field, while from the Fort St. John field Pacific Petroleums Ltd. produced 31,919 barrels of 39 degrees A.P.I. gravity crude oil from the Triassic "C" sand and 9,096 barrels of 42 degrees A.P.I. gravity crude oil from the Permo-Pennsylvanian.

Gas production from three wells supplying the village of Fort St. John totalled 187,846 thousand cubic feet. Of this amount, Pacific Fort St. John wells Nos. 19 and 26 produced 162,516 thousand cubic feet from the Triassic "A" member and Pacific Fort St. John No. 31 produced 25,330 thousand cubic feet from the Cadomin formation.

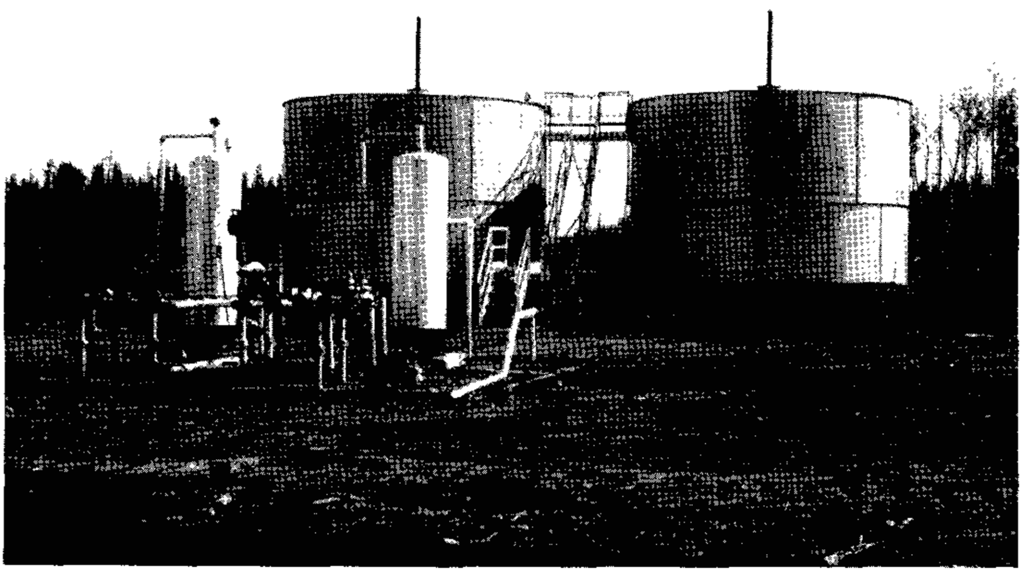
The development of oil and gas resources in the Peace River District during 1956 showed a definite increase over any previous year. The year 1956 marked the opening of a refinery in Dawson Creek, the initial construction of an absorption plant at Taylor, installation of much of the required Fort St. John field gathering system, and the completion of 70 per cent of the Westcoast Transmission Company's pipe-line to Vancouver and the International Boundary.

EXPLORATION SUMMARY

Geological and geophysical exploration was concentrated in northeastern British Columbia east of the Rocky Mountains, and a limited amount was done in the southeastern part of the Province in the Fernie district.

Seventy-two seismic parties were reported to have conducted surveys throughout the area extending from Monkman Pass to the northern boundary of the Province east of the Rocky Mountains. In addition, photogeologic studies and air-borne magnetometer surveys were made over a large area, and numerous test-holes were drilled by several companies for structural data.

Running pressure test at well-head, Pacific Imperial Boundary Lake 1.
Separator and storage tanks in background.



Tank farm, Boundary Lake field.

Surface geological surveys continued, mostly in the foothills and front ranges of the Rocky Mountains.

Footage drilled increased 70 per cent over the 1955 total to 397,703 feet. Seventy-nine wells were operated during the year, of which eight were completed as oil wells, thirty-six were completed as gas wells, fifteen were abandoned, and at the end of the year twenty were drilling. These wells were all in northeastern British Columbia, except two drilling in the New Westminster district.

The high rate of gas discovery continued in 1956 throughout the area from Dawson Creek to Fort Nelson. Of the twenty-four wildcats drilled, twelve new gas areas were indicated by the completion of the following twelve successful wildcat gas wells: Gulf States Bougie Creek No. 1, Imperial Pacific Kilkerran 12-31, Imperial Pacific Parkland 6-29, Phillips Kobes No. 1, Richfield Canadian Decalta Big Arrow Creek No. 1, Shell-Gulf Klua Creek No. 1, Texaco N.F.A. Boundary Lake No. 2, Texaco N.F.A. Boundary Lake No. 3, Texaco N.F.A. Buick Creek No. 10, Union Snyder Creek No. 1, White-Lloyd Alaskan Highway No. 1, and White-Lloyd Blueberry No. 9.

Wells Operated, 1956

Well Name	No.	Date Spudded	Date Completed	Total Depth	1956 Footage	Results
Canada Southern and Associates Kelly Lake	1	Nov. 1, 1955	Jan. 10, 1956	7,401	277	Abandoned.
Gulf States Bougie Creek	1	Apr. 5, 1955	June 8, 1956	9,501	2,951	Gas well, Mississippian.
Gulf States Evie Lake	1	July 4, 1955	Jan. 24, 1956	7,615	------	Abandoned.
Gulf States Prophet River	1	Oct. 28, 1956	------	------	6,663	Drilling.
Hercon Key Evans	1	Feb. 12, 1956	------	------	7,658	Drilling.
H.B.-B.A.-Union Milligan	2	Jan. 5, 1956	Jan. 27, 1956	3,500	3,500	Abandoned.
H.B.-B.A.-Union Milligan	3	Feb. 2, 1956	Feb. 28, 1956	3,952	3,952	Abandoned.
Imperial Pacific Parkland	6-29-81-15	Dec. 20, 1955	Sept. 20, 1956	11,618	11,584	Gas well, Devonian.
Imperial Pacific Kilkerran	12-31-78-14	Dec. 22, 1955	Sept. 29, 1956	12,040	12,001	Gas well, Permo-Pennsylvanian.
Imperial Pacific Groundbirch	5-5-84-24	Oct. 22, 1956	------	------	4,744	Drilling.
Imperial Pacific Siphon Creek	1-26-86-16	Nov. 4, 1956	------	------	6,990	Drilling.
Imperial Calvan Farrell Creek	9-L-94-A-5	Nov. 8, 1956	------	------	4,532	Drilling.
Pacific Fort St. John	43	May 6, 1956	Sept. 3, 1956	6,659	6,659	Gas well, Triassic "A" and "B."
Pacific Fort St. John	44	Apr. 2, 1956	July 2, 1956	6,700	6,700	Gas well, Permo-Pennsylvanian.
Pacific Fort St. John	45	May 5, 1956	Aug. 4, 1956	7,105	7,105	Oil well, Permo-Pennsylvanian.
Pacific Fort St. John	46	May 11, 1956	July 26, 1956	6,577	6,577	Gas well, Triassic "D."
Pacific Fort St. John	47	May 19, 1956	July 27, 1956	6,371	6,371	Gas well, Permo-Pennsylvanian.
Pacific Fort St. John	48	Aug. 6, 1956	Sept. 14, 1956	4,950	4,950	Abandoned.
Pacific Fort St. John	49	May 30, 1956	Aug. 26, 1956	6,690	6,690	Gas well, Triassic "D."
Pacific Fort St. John	51	June 23, 1956	Aug. 1, 1956	4,816	4,816	Gas well, Triassic "D."
Pacific Fort St. John	52	June 11, 1956	July 23, 1956	4,849	4,849	Gas well, Triassic "D."
Pacific Fort St. John	53	Sept. 10, 1956	Oct. 23, 1956	4,905	4,905	Gas well, Triassic "D."
Pacific Fort St. John	54	Sept. 2, 1956	Nov. 8, 1956	6,297	6,297	Gas well, Triassic "A."
Pacific Fort St. John	55	July 6, 1956	July 26, 1956	3,915	3,915	Gas well, Triassic "A."
Pacific Fort St. John	56	July 28, 1956	Aug. 26, 1956	3,877	3,877	Gas well, Triassic "B."
Pacific Fort St. John	58	Aug. 9, 1956	Sept. 7, 1956	3,206	3,206	Gas well, Cadomin.
Pacific Fort St. John	60	Aug. 3, 1956	Sept. 14, 1956	4,901	4,901	Gas well, Triassic "D."
Pacific Fort St. John	61	Aug. 4, 1956	Oct. 21, 1956	6,590	6,590	Gas well, Triassic "D."
Pacific Fort St. John	62	Aug. 8, 1956	Aug. 28, 1956	3,835	3,835	Gas well, Triassic "A" and "B."
Pacific Fort St. John	63	Oct. 27, 1956	Dec. 26, 1956	6,702	6,702	Abandoned.
Pacific Fort St. John	64	Sept. 3, 1956	Sept. 29, 1956	4,028	4,028	Gas well, Triassic "A."
Pacific Fort St. John	65	Sept. 15, 1956	Oct. 23, 1956	4,709	4,709	Gas well, Triassic "D."
Pacific Fort St. John	66	Aug. 30, 1956	Oct. 27, 1956	6,347	6,347	Gas well, Permo-Pennsylvanian.
Pacific Fort St. John	68	Sept. 20, 1956	Nov. 23, 1956	6,257	6,257	Gas well, Permo-Pennsylvanian.
Pacific Fort St. John	69	Sept. 20, 1956	Nov. 9, 1956	4,849	4,849	Gas well, Triassic "D."
Pacific Fort St. John	71	Oct. 5, 1956	Nov. 14, 1956	4,453	4,453	Gas well, Triassic "A."
Pacific Fort St. John	72	Nov. 1, 1956	------	------	5,090	Drilling.
Pacific Fort St. John	73	Oct. 29, 1956	Nov. 21, 1956	3,759	3,759	Gas well, Triassic "A" and "B."
Pacific Fort St. John	74	Nov. 1, 1956	Dec. 20, 1956	4,935	4,935	Gas well, Triassic "A."
Pacific Fort St. John	75	Nov. 15, 1956	------	------	3,071	Drilling.
Pacific Fort St. John	76	Nov. 16, 1956	Dec. 12, 1956	4,395	4,395	Oil well, Triassic "C."
Pacific Fort St. John	78	Nov. 14, 1956	Dec. 14, 1956	4,515	4,515	Oil well, Triassic "C."
Pacific Fort St. John	79	Nov. 27, 1956	------	------	4,970	Drilling.
Pacific Fort St. John	80	Nov. 27, 1956	------	------	4,492	Drilling.
Pacific Fort St. John	81	Dec. 16, 1956	------	------	3,874	Drilling.

Pacific Imperial Red Creek	82	Dec. 28, 1956	......	......	622	Drilling.
Pacific Imperial Boundary Lake	1	Dec. 29, 1956	......	......	944	Drilling.
Phillips Kobes	1	June 30, 1955	May 18, 1956	7,769	1,113	Gas well, Triassic and Mississippian.
Phillips Kobes	A1	May 28, 1956	......	......	7,634	Drilling.
Phillips Townsend	A1	Feb. 26, 1956	......	......	6,940	Drilling.
Phillips Highway	2	June 27, 1956	......	......	8,435	Drilling.
Richfield-C.F. des P.-Caliph Grizzly Valley	1	Jan. 18, 1956	......	......	8,900	Drilling.
Richfield-Canadian Decalta Big Arrow Creek	1	Jan. 31, 1956	Mar. 16, 1956	5,070	5,070	Suspended, gas well in Triassic.
Seavan Hazelmere Kuhn (name changed at 1,394 feet to Royal Can-Van-Tor-Bighorn Kuhn)	1 1	Oct. 15, 1955 Aug. 26, 1956	Nov. 7, 1955 Aug. 31, 1956	(1,394) 1,422	 28	Suspended.
Shell-Gulf Klua Creek	1	Jan. 23, 1956	May 11, 1956	8,893	10,013	Suspended, gas well, Devonian.
Stanolind-Lingrell	1	Nov. 4, 1955	Aug. 15, 1956	12,512	8,412	Abandoned.
Stanolind-Sheep Creek	1	Oct. 12, 1955	Apr. 28, 1956	8,247	3,762	Abandoned.
Texaco N.F.A. Boundary Lake	2	Aug. 22, 1955	Feb. 25, 1956	10,740	1,919	Gas well, Triassic.
Texaco N.F.A. Boundary Lake	3	Feb. 9, 1956 Nov. 30, 1956	Mar. 26, 1956 Dec. 23, 1956	5,562	5,562	Gas well, Triassic.
Texaco N.F.A. Boundary Lake	5	Oct. 20, 1956	Nov. 11, 1956	4,650	4,650	Abandoned.
Texaco N.F.A. Boundary Lake	A6-31	July 1, 1956	July 23, 1956	4,319	4,319	Oil well, Triassic.
Texaco N.F.A. Boundary Lake	A14-6	Nov. 19, 1955	Jan. 8, 1956	4,319	......	Oil well, Triassic.
Texaco N.F.A. Boundary Lake	A14-31	May 19, 1956	June 15, 1956	4,337	4,337	Oil well, Triassic.
Texaco N.F.A. Boundary Lake	A16-31	Nov. 13, 1956	Dec. 14, 1956	4,294	4,294	Oil well, Triassic.
Texaco N.F.A. Boundary Lake	A16-36	Oct. 10, 1956	Nov. 4, 1956	4,381	4,381	Oil well, Triassic.
Texaco N.F.A. Beatton River	2	Nov. 21, 1956	......	......	5,342	Drilling.
Texaco N.F.A. Buick Creek	10	Aug. 20, 1956	Oct. 1, 1956	4,563	4,563	Gas well, Triassic.
Texaco N.F.A. Hay River	1	Jan. 26, 1955 Feb. 9, 1956	Mar. 17, 1955 Mar. 18, 1956	7,409	1,860	Abandoned.
Texaco N.F.A. Thetlaandoa	1	Dec. 30, 1955	Mar. 22, 1956	8,080	7,866	Abandoned.
Union Snyder Creek	1	July 26, 1956	Sept. 12, 1956	4,847	4,847	Gas well, Nikanassin.
Union Aitken Creek	1	Sept. 23, 1956	Nov. 6, 1956	4,982	4,982	Abandoned.
Union Aitken Creek	2	Nov. 17, 1956	Dec. 27, 1956	4,831	4,831	Abandoned.
White-Lloyd Blueberry	8	Feb. 7, 1956	Mar. 23, 1956	4,222	4,222	Abandoned.
White-Lloyd Blueberry	9	Mar. 20, 1956	May 5, 1956	4,562	4,562	Gas well, Nikanassin.
White-Lloyd Blueberry	10	May 12, 1956	Aug. 31, 1956	7,142	7,142	Gas well, Mississippian.
White-Lloyd Blueberry	11	Sept. 19, 1956	......	......	7,048	Drilling.
White-Lloyd Halfway	2	May 22, 1956	June 9, 1956	3,037	3,037	Abandoned.
White-Lloyd Halfway	3	June 21, 1956	......	......	7,701	Drilling.
White-Lloyd Alaskan Highway	1	Apr. 3, 1956	May 25, 1956	4,824	4,824	Gas well, Nikanassin.

WELL SAMPLES

Unless otherwise directed, any operator who drills a well for petroleum or natural gas is required to take samples of the bit cuttings representing interval depths of 10 feet or lesser intervals. The samples are to be washed, dried, and accurately labelled, and shipped prepaid to the Department of Mines, Stratigraphic Laboratory, Victoria, B.C.

The operator may be required to take samples by means of a core barrel.

All cores taken must be put in suitable boxes, accurately labelled, must be properly protected and stored, and must be delivered as required.

So far as possible, cores taken in 1956 were examined and logged in the field. All core from wells drilled in northeastern British Columbia is being stored in the Dawson Creek area. Those companies without core storage facilities in the Dawson Creek area may store their core in the Department of Mines core storage depot (Pan Abode building) in Pouce Coupe.

Samples of well cuttings are received at the Stratigraphic Laboratory in Victoria at frequent intervals during the drilling of each well. A part of each 10-foot logged sample is washed, dried, and logged, and is then stored in a glass bottle in sequence with other samples from the same well, so that a complete set of samples from each well is available for examination. A part of each 10-foot sample is sent to the laboratory of the Geological Survey of Canada in Calgary. During 1956, 18,935 samples were washed and bottled in Victoria.

Inspection of Lode Mines, Placer Mines, and Quarries

By H. C. Hughes, Chief Inspector of Mines

CONTENTS

PRODUCTION

The output of metal mines for 1956 was 8,824,440 tons. This tonnage was produced from seventy mines, of which forty produced 100 tons or more.

FATAL ACCIDENTS

During 1956 there were fourteen fatal accidents connected with actual mining operations in metal mines and quarries. This was seven more than in 1955. There were 5,464 persons employed below and above ground in metal mines and 1,043 persons employed in concentrators in 1956.

The ratio of fatal accidents per 1,000 persons employed in mines and concentrators was 2.15, as compared with 1.13 in 1955.

Tonnage mined per fatal accident during the last ten-year period was 697,049 tons.

The following table shows the mines at which fatal accidents occurred during 1956, with comparative figures for 1955:—

Mine	Mining Division	Number of Fatal Accidents	
		1956	1955
Giant Mascot	Golden	..	1
Mineral King	Golden	3	..
Sullivan	Fort Steele	2	..
Akokli Tungsten	Nelson	..	1
Jersey	Nelson	1	..
Sunshine Lardeau	Revelstoke	1	..
Bralorne	Lillooet	..	3
Pioneer	Lillooet		1
Britannia	Vancouver	..	1
Yreka	Nanaimo	1	..
Torbrit Silver	Skeena	1	..
Cassiar Asbestos	Liard	2	..
Tulsequah	Atlin	2	..
Big Bull	Atlin	1	..
Totals		14	7

The following table classifies fatal accidents as to cause and location:—

Cause	Number	Location
Fell over cliff at waste dump	1	Surface.
Burned in bunk-house fire	1	Surface.
Struck by rock from surface chute	1	Surface.
Electrocuted	1	Underground.
Drowned	1	Surface.
Drawn into ore-pass by run of ore	3	Underground.
Backed truck off dump	1	Surface.
Crushed between car and post	1	Underground.
Blasted	2	Underground.
Overcome by gas	2	Underground.
Total	14	

A brief description of all fatal accidents follows.

Thomas Meade, aged 55 years, Canadian, single, and employed as a miner at the Yreka mine, Quatsino, was instantly killed when he fell from the 1750 level dump to the rocks about 72 feet below on February 15th, 1956, at about 10.20 a.m.

The 1750 level was started on the only small flat area available near that elevation. Cribbing was used to build up sufficient area for a dump, and a suitable working area had been laid out. The portal is reached by climbing down ladders on the cliff side from the 1900 level. The dump opening is about 20 feet long and a guard-rail is provided for the car to dump against to stop it from going over the cliff. There is also a ring on the car and a chain with a hook on it, attached to a tie. The hook is hooked into the ring as an additional precaution when the car is being dumped.

The outer ends of the ties at the dump come to the edge of the cliff. The cliff slopes at 85 degrees for about 75 feet, after which the slope is flatter.

An air trammer and a 3-ton Ajax side-dump car were used to haul muck from the tunnel.

The only witness to the accident was Albin Danielson, who was handyman at the camp and an experienced miner. He went to the 1750 level about 10.10 a.m. to sharpen bits. Meade was taking the car into the tunnel with the air motor for his first trip. The motor was generally left underground to prevent freezing. When Meade came out he mentioned to Danielson that the muck was high grade and that some of it stuck to the bottom of the car. Danielson looked in and saw about 10 inches of muck in the car. (This would represent between one-half and 1 ton). Meade picked up a short-handled shovel and entered the car without moving it away from the dump. Danielson did not see Meade lock the dump handle, nor did he notice if the dump door was latched. He turned to his work and heard Meade scraping muck on the car bottom. He then heard the car dump, the shovel rattle, and a loud shout. He stepped to the portal end of the car and saw Meade strike on the rocks below. Help was obtained immediately, but when Meade was reached, about 800 feet below the portal, there was no sign of life.

An inquest was held at Port Alice on February 17th and 18th, and the Coroner's jury returned the following verdict:—

"We, the jury sworn to inquire into the death of Thomas Meade, miner, employed at Yreka Mines Limited, Quatsino Sound, find that Thomas Meade came to an accidental death between 10 and 10.20 a.m. from falling out of a mine dump wagon at the 1750 level, result of which he received multiple injuries. It would appear an extensive fracture of the right side of the skull resulted in instant death, the body being recovered at approximately 800 level. We feel that had the safety device provided on this dump wagon been used, this accident would have been avoided."

John Ronning, aged 62, Canadian, and employed as a blacksmith at the Spider mine of the Sunshine Lardeau Mines Limited at Camborne, was presumed to have been suffocated in a bunk-house fire at the Spider camp on May 13th, 1956, about 5.30 a.m.

The bunk-house was a modern frame building, insulated and sheathed with asbestos siding and an aluminium roof. It was 115 feet long and 30 feet wide and contained sixteen rooms, each accommodating two men. The rooms opened off a central corridor and there was a door to the outside at each end. About the centre of the building there was a washroom on one side of the corridor and a recreation-room and furnace-room, with an oil-fired furnace, on the other.

The following evidence was brought out at the inquest:—

About 12.30 a.m. on May 13th, 1956, Ronning and two other men were driven from Beaton to Camborne by taxi. Apparently all three men were under the influence of liquor; Ronning to the extent that he was not able to walk without assistance. They were left in the washroom and recreation-room of the bunk-house. About 5.30 a.m. one of the men in the bunk-house was awakened by smoke. He opened the door from his room to the hall, but the fire was so far advanced that he had to escape through the window. He turned in a fire alarm, which was answered promptly, and every attempt was made to extinguish the fire. However, it was so far advanced that it could only be prevented from spreading to other buildings.

When the fire was put out, a body, so badly burned that it could not be recognized, was found where the recreation-room was located. A check of all men in the camp accounted for everyone but John Ronning. It is presumed that a match or cigarette was responsible for the fire, as there was no evidence to show that it started in the furnace-room.

An inquest was held in Revelstoke on May 30th, 1956, and the Coroner's jury returned the following verdict:—

" That the body that was found on the morning of the 13th day of May, 1956, in the remains of the bunk-house situated at the Sunshine Lardeau Mines, Beaton, British Columbia, is presumed to be that of John Ronning.

" The deceased is presumed to have met his death on the 13th day of May, 1956, by suffocation caused by the intense smoke of the fire of unknown origin which destroyed said bunk-house on that date."

Ivo Bortoluzzi, Italian, aged 27, single, and employed as a driller by Cassiar Asbestos Corporation Limited, died as a result of injuries received when he was struck on the head by a rock from the cirque chute at the open-pit mine on May 22nd, 1956, about 6.20 p.m.

The cirque chute is 600 feet long and has an average slope of 34 to 35 degrees. It is constructed of semi-circular steel sections 42 inches in diameter and 12 feet long, the sections being joined by fish plates. The top end is widened out to form a lip, and the ore is pushed into the chute by a bulldozer. The lower end is open and the ore discharges on to a stockpile.

Damage to chute sections by falling rock is fairly common and, depending on the dampness of the ore, hang-ups in the chute are of frequent occurrence. Thus it is necessary to have a small crew available to dislodge hang-ups and repair the chute at any time. Bortoluzzi was in this crew.

Immediately before the accident, some ore had been sent down the chute and a hang-up had occurred near the lower end. The shiftboss, Frank Clarke, was at the top of the chute and the maintenance crew at a point of safety near the lower end. Some large rocks were pushed down the chute in the hope of dislodging the hang-up, but without success. Steps were taken to have loose material cleared from the lip of the chute, and it was thought to be safe. The maintenance crew then made their way down alongside the chute toward the hang-up, when a rock, about 25 pounds in weight, rolled over the lip of the chute and went on down. Clarke shouted a warning to the maintenance crew, all of whom apparently heard him. At this time Bortoluzzi was 97 feet from the lower end of the chute. The falling rock, by now travelling at a very high velocity, jumped out of the chute and struck him on the side of the head before he could get out of the way. He was immediately taken to the camp hospital but died of a fractured skull about four hours later, without regaining consciousness.

An inquest was held at Cassiar on May 25th, 1956, and the jury returned the following verdict:—

" Ivo Bortoluzzi came to his death at 9.35 p.m. on May 22nd as a result of being struck down by a falling rock while working approximately 97 feet from the bottom of Cassiar Asbestos Corporation's ore-chute leading from the top of McDame Mountain to the cirque. We recommend that (1) further safety education be undertaken with the men working, (2) have careful scaling be done at the top of the chute, and (3) a gate at the top of the chute be installed as soon as possible."

In addition to the recommendations given in the verdict of the Coroner's jury, it is suggested that a warning system be installed to warn all personnel to keep clear when ore is being pushed into the chute and that the sides of the chute be scaled frequently to prevent rocks from rolling in, especially while the snow is melting.

It was noted that Bortoluzzi was not wearing a hard hat at the time of the accident. This is something of a problem at Cassiar, since the strong and bitterly cold winds which frequently blow around the summit of the mountain often make it impractical to wear anything but a parka. In any case, it is very doubtful whether a hard hat would have saved Bortoluzzi in this case, since the rock struck him fairly low on the head.

Alex. S. Chernoff, aged 44, Canadian, single, and employed as a first-class electrician by Canadian Exploration Limited, Salmo, was apparently instantly killed when he was electrocuted at No. 410 underground substation in the Jersey mine on July 26th, 1956, at about 11.30 a.m.

Chernoff, in company with Earl Gilbert McLean, electrical foreman, arrived at the transformer-station about 11.25 a.m. A combination magnetic starter, formerly operating a fan motor, was to be removed for use elsewhere. Energy is supplied to this starter from a 440-volt 3-phase distribution panel containing five breaker switches. McLean lifted the lid and observed they were all in the " off " position except the top left-hand one, which controlled the lights in the transformer-station and near-by workings. McLean turned this switch off and then on again as a check of the "on " and " off " positions. (There is a certain amount of confusion with this type of distribution panel as the upper switches are " off " when up and the lower one " off " when down.) McLean lowered the panel cover and told Chernoff, who was beside him, to proceed with the removal of the starter. He then left the transformer-station to investigate a raise near by which would be their route of travel. Returning in about two minutes he found Chernoff lying on his back, his left hand grasping the end of three wires which he had apparently just removed from the starter box. McLean looked into the distribution panel and found the lower right-hand switch controlling the electricity to the starter in the " on " position. He turned it off and removed the wires from Chernoff. Help was obtained and artificial respiration applied until the arrival of Dr. Carpenter from Salmo about 1.10 p.m., who pronounced the man dead.

The deceased was an experienced, qualified electrician and had worked for Canadian Exploration Limited for the past five years. There is no explanation as to why he turned on the breaker switch after McLean left, unless he checked the position and became confused. He had a tester with him but apparently did not use it.

The autopsy showed an abrasion over the left eye and deep electrical burns on both hands. The doctor, after listening to the evidence, stated he believed that death was due to respiratory failure.

An inquest was held at Salmo at 7.30 p.m. on August 1st, 1956, and the Coroner's jury returned the following verdict:—

" We, the jury, find the deceased Alex. Sam Chernoff met his death by electrocution at the 410 substation located in the 4200 level of the Canadian Exploration Jersey Mine on July 26th at approximately 12 noon, 1956. Electrocution due to the deceased's misjudgment of the switch controlling the current which fed the box on which he was working. This jury recommends that a more visual identification be used to determine the ' off ' and ' on ' position of the switches in these darkened areas."

The recommendation of the jury is agreed with. The words " on " and " off " cannot be observed in this type of distribution panel after it has been in use underground for a short period. The difference in the " off " positions of the upper and lower switches is most confusing to a layman, and apparently in this case to a qualified electrician. The electrical superintendent of Canadian Exploration Limited pointed out that this type of distribution panel in use in Japan had installed in it little neon lights for each switch. He suggested that this might be incorporated in Canadian models. Another suggestion is that part of a switch be recessed behind a sliding door, which would have to be lifted to put a switch in the " on " position. The distribution panel in question had been approved by the Canadian Standards Association, and it is therefore recommended that the above suggestions be brought to the attention of that association.

Harold M. Stanley, aged 46, Canadian, married, and employed as a truck-driver by Lipsack Enterprises Limited, was apparently drowned when the truck in which he was riding plunged into the Tulsequah River after failing to make the turn at the east end of the Tulsequah River bridge, on August 6th, 1956.

Lipsack Enterprises Limited has a contract to haul ore from the Big Bull and Tulsequah Chief mines to the concentrator for the Cominco operations at Tulsequah.

At the time of the accident, Stanley was riding as a passenger in the cab of a truck driven by his supervisor, Benjamin C. Montpellier, who is in charge of Lipsack operations at Tulsequah. They were hauling ore from the Big Bull mine to the mill, a total distance of 6 miles. The company-owned gravel road was in good condition and grades are not severe. The approach to the east end of the bridge is made around a gentle S-bend down a 10-per-cent grade, with a 90-degree turn at the lower end on to the bridge. The bridge itself is a pile trestle 15 feet wide, decked with 3- by 12-inch timbers, and with a 6- by 8-inch guard-rail on each side. The truck was a White W.C. 22 tandem vehicle of the " tagalong " type with four pairs of wheels at the rear end, the front two pairs being the driving wheels. The total weight of the loaded truck is about 20 tons, including a 15-ton ore load.

Montpellier stated that as he approached the turn on to the bridge, at an estimated 20 miles per hour, he felt the front end of the vehicle tip up. He lost control of the vehicle and claims to remember nothing more until he was pulled out of the water. There were no other witnesses to the accident. Soon after, Harry Beckman, sawmill operator, drove on to the bridge and noticed a lot of water splashed on to it. He investigated and saw Montpellier clinging to some driftwood which had caught under the bridge. He obtained help and pulled him out, but Montpellier was incoherent, and it was not until they had taken him home that they learned that another man was in the truck at the time of the accident.

Dragging operations finally located the truck lying on its side in 12 feet of water in midstream, to the north of the bridge. It was hauled out, but there was no sign of Stanley, nor could his body be found after dragging operations had been continued for several hours, under extremely difficult conditions. Because of this, no inquest has been held.

The truck was in good mechanical condition.

On August 11th, 1956, Ippazio Damiano Seravezza, aged 26, Italian, single, and employed as a miner; Anton Ornatowiz, aged 38, Polish, married, and employed as a scraperman; and Leslie Horace Rogers, aged 52, Canadian, married, and employed as a shiftboss, died as a result of injuries received when the grizzly in 34-D stope in the Mineral King mine, near Invermere, gave way and they were drawn into the ore-pass below, together with the muck resting on the grizzly.

The 34-D stope was a small stope which was being cut above the draw point from which the ore was to be drawn. The top of the draw point, about 6 by 8 feet, was covered with a grizzly constructed as follows: Two 8- by 8-inch bearing sets in hitches were placed at each end of the long dimension of the opening; three 8- by 8-inch timbers rested on the bearing sets and spanned the opening; and 6- by 8-inch timbers crossing the spanning timbers formed 16- by 18-inch openings. Access to the stope was by means of a short drift from 24 crosscut. The over-all dimensions of the stope were about 38 by 40 feet, and it was about 20 feet high from the grizzly to the back. The ore-pass, about 145 feet long, was driven from 34 crosscut about 110 feet below the bottom of the stope. Ore was drawn through a standard chute in 34 crosscut.

At noon on August 11th, Seravezza completed the drilling and blasting of a total of ten holes in the stope above the grizzly. About 1.30 p.m., M. D. Plecash, the mine foreman, entered the stope and observed that no workmen were present and that the grizzly was covered with muck. He left the stope in search of the crew and, on finding Ornatowiz, instructed him to remove the electrical blasting equipment which had been used. Plecash then met the shiftboss, Rogers, and advised him of the condition of the stope. He instructed Rogers to assist Saravezza and Ornatowiz in opening the grizzly, and cautioned him to use care so as to avoid being drawn through the grizzly openings when the muck commenced to flow. He then went to look for Seravezza, but, as he was unable to find him, he returned to the stope to find it empty and the grizzly gone. On closer examination he found Seravezza hanging on his safety rope about 20 feet below the collar of the raise.

Rescue operations were started immediately. Seravezza was drawn from the raise. He was dead, having received a severe blow on the head from a rock. Because of the large amount of loose rock at the raise collar and the shattered ground in the stope as a result of the blast, an attempt was made to get the men out by drawing muck from the chute. This resulted in a hang-up about 30 feet above the chute, and efforts were then directed to getting at the men from the top of the raise. The loose muck was cribbed up and a bulkhead put over the raise. It was also found necessary to erect a timber platform under the loose back in the stope. Assistance was asked for and received from the mine-rescue crew from the Giant Mascot mine and five timbermen from the Sullivan mine. It was necessary to remove the muck with water-buckets, which were passed up the raise and out of the stope through 24 crosscut.

Ornatowiz's body was recovered at 5.30 a.m. on August 13th, and Roger's body about two hours later. The men were both dead when found.

It is believed that when the grizzly caved the three men had either stepped on the broken muck covering it or were so close to the edge that they were swept down in the moving muck.

An inquest was held in Invermere on August 16th, and the Coroner's jury returned the following verdict:—

" We the jury empanelled to inquire into the deaths of Ippazzio Damiano Serravizza, Leslie Horace Rogers, and Anton Ornatowiz whose deaths were caused by an accident at the Mineral King mine situated 27 miles west of Invermere in the County of East Kootenay in the Province of British Columbia August 11th, 1956, at approximately 2 p.m. It is apparent that Ippazzio Damiano Serravizza died instantly as a result of a blow to the head by falling rock as a result of failure of a grizzly.

" It is also apparent that Leslie Horace Rogers and Anton Ornatowiz met their deaths by exposure and shock caused by injuries sustained when they were buried by fallen rock as a result of the same grizzly collapsing.

" Recommendations: We the jury strongly recommend that proper safety equipment be provided and maintained throughout the entire operation and that more adequate supervision of its use be given."

The recommendation of the jury is concurred with.

Rudolf Herbert Laber, aged 26, German, single, and employed as a diesel mechanic at the Cassiar Asbestos mine, died as a result of injuries received when a truck he was backing down a slope went over the edge of the 6160 bench and rolled 167 feet down the side of the mountain on August 20th, 1956, about 4.10 p.m.

The 6160 bench is a new bench being started below the 6175 bench. Access from the 6175 bench is by a sloping ramp about 50 feet long and on a down grade of from 6 to 8 per cent. The truck was an International L-204, of 10-ton capacity, with dual rear wheels and fitted with an air braking system.

On the day of the accident, the truck, after being loaded, had developed engine trouble and was parked near the head of the ramp to the 6160 bench. As the trouble necessitated a major repair job, with removal of the cylinder head, it was decided to unload it by dumping the ore at the face of the 6160 bench. Frank Clarke, shiftboss, arranged with a " Cat." driver, Aime Chagnon, to push the truck to the top of the ramp, from where it would roll down the slope in reverse to the face of the bench. Clarke was about to fetch a truck-driver to steer the truck when Chagnon pointed to Laber and said, " That fellow can steer it." Clarke asked Laber if he could do it and if he had a driver's licence, and he replied in the affirmative. Laber got in the cab and started the engine, but was immediately told to stop it as there was a bad knock. The air brakes were not available, but the ground was covered with stiff mud and the truck would only travel slowly. Chagnon slowly pushed the truck to the brow of the grade. As the truck began to run backward slowly down the grade, Laber steered it correctly at first and then turned the wheels so that the truck went back in the direction of the edge of the mountain. Chagnon shouted to him to swing the wheel over, but Laber paid no attention, and the vehicle, moving very slowly, continued to the edge, hung there for a few seconds and then went over, carrying Laber with it. It fell and slid 167 feet, and Laber was found pinned under the running-board and gas-tank. He was dead on arrival at the hospital. There seems to be no good explanation why he did not steer the truck correctly as he had had experience in driving heavy vehicles.

An inquest was held at Cassiar on August 22nd, 1956, and the Coroner's jury returned the following verdict:—

" Rudolf Herbert Laber came to his death by accident on McDame's Mountain on August 20th, 1956, at 4.10 p.m. We hold no one to blame as there appeared to be no hard and fast rule for operating vehicles at the mine. We of the jury recommend the following:—

"(1) No person other than those with written authorization shall operate any motor-vehicle, caterpillar, or loader at the mine. Authorized persons shall operate only their own vehicles.

"(2) Authorization must be carried at all times by the operator and must be shown on request.

"(3) Authorization shall bear the signature of the test examiner.

"(4) When a non-operative vehicle is being moved, a safety anchor or a winch should be attached from the machine to the vehicle and that a machine should have sufficient power to control both itself and the vehicle being moved.

"(5) We recommend that these precautions be put into effect immediately.

"(6) In view of the possibility of future accidents, we recommend that a qualified first-aid man be stationed at the mine at all times."

Keith Kavanagh, aged 27, Canadian, single, and employed as a mucking-machine operator by Torbrit Silver Mines Limited at Alice Arm, was instantly killed when he was apparently crushed between an ore-car and a post near a grizzly above the ore-pocket on the 800 level on August 29th, 1956, about 7.05 a.m.

On the morning of the accident, Kavanagh was employed at his usual occupation of operating a mucking-machine at a draw point in 801 drift, tramming the full cars with a Mancha battery locomotive and dumping them on the grizzly near the shaft. The cars are of the Granby type and are 5 tons capacity. The track is a 2-foot gauge, and 30-pound rails are used. Forty-five feet back from the grizzly there is a switch with a weighted lever. It is normal practice for operators to stop their locomotives on either side of this switch and throw it, if necessary.

At 7.05 a.m. J. R. McPhee, cage-tender, was at the 800 level pocket when he heard an unusual noise. On investigation he found a Granby car and battery locomotive derailed and partly overturned against a 6- by 6-inch concrete dam for deflecting water from the shaft. Turning to the right toward the grizzly, McPhee saw Kavanagh lying beside the track about 40 feet from the derailed car and locomotive. He appeared to be dead as he had a fractured skull and chest injuries. Help was obtained and Kavanagh was taken to the first-aid room. Here a further examination was carried out and there was no sign of life.

It would appear either that Kavanagh fell off the locomotive, as it was going through an old door frame, and was crushed by the car which continued on, or that he dismounted while the locomotive was in motion, intending to turn the switch and jump on again. The motor was going in reverse and was ahead of the car. The controller was found stuck in the full reverse position. The dog engaging the spring which brings the control lever to the neutral position when the operator's hand is removed was found to be broken, but had been checked by the electrician and found to be in good order two days before. The general condition of the locomotive, car, track, and general area was satisfactory.

An inquest was held at the mine on the afternoon of the accident, and the Coroner's jury returned the following verdict:—

"We, the jury, find that at 7 a.m. on Wednesday, August 29th, 1956, on the 800 level at the Torbrit Silver mine, Keith Kavanagh met his death by accident. We recommend that:—

"(1) A light be installed at the track switch by the grizzly.

"(2) All recommendations made by the Government Inspector are carried out, and all safety regulations rigidly enforced."

George Andrew Ludwick, aged 30, Canadian, married, and Thomas Bud Royko, aged 32, single, employed as miners by The Consolidated Mining and Smelting Company at the Tulsequah Chief mine, Tulsequah, were both instantly killed by a blast in 5247 drift South on November 25th, 1956, at about 2.30 a.m.

The 5247 drift South is an 8- by 8-foot development drift on the 5200 level of the mine and, at the time of the accident, the face was partly in mineralized altered greenstone. On the night of the accident, Ludwick and Royko began work in the drift at 7 p.m., November 24th. They first mucked out one and a half cars and then proceeded to drill the next 5-foot round. They drilled thirty-six holes. At 9.45 p.m. they were visited by H. McDonald, the shiftboss, who found they were nearly drilled off and that everything appeared to be in order. He took their order for two cases of powder and thirty-four 7-foot fuses and left. About 1.30 a.m. two timbermen, D. Gillis and P. O'Rourke, had to do some timbering in the immediate area and noted that the round was drilled off and the face was quite dry. One man was making primers and the other was working on the track. At 2.05 a.m. K. Panter, a miner from the 5249 drift North, came into the place to check so that both crews could blast at 2.30 a.m. Panter noted that the round was loaded and the Thermalite connectors were in place on the fuses. (Fuses are supplied capped at one end and with a Thermalite connector at the other.) Ludwick and Royko agreed with Panter to light their round at 2.25 a.m. Panter returned to his heading and lit his round at the agreed time. He waited at the bottom of the 5200 service raise for a few minutes until he heard the first shots go off and then went out of the mine.

The shiftboss, H. McDonald, on arriving at the surface, found that Ludwick and Royko were not in the dry. He immediately obtained help and went back underground. After some difficulty, due to dense smoke, the face of 5247 drift South was examined and the bodies of Ludwick and Royko were found. The men were apparently dead, and this was confirmed by the mine doctor when they were brought to the portal. After the arrival of the Inspector, the round was mucked out and all materials which might throw some light on the accident were carefully collected. The round consisted of thirty-six holes in all, 5 feet deep and 1⅜ inches in diameter. Four of the holes in the burned cut were not loaded, making a total of thirty-two holes. The explosive used was 75 per cent Forcite. A right back hole and left lifter had not been spit, and the fuses of these two holes were found with the Thermalite connectors cut off and the ends split by a knife ready for spitting. Twenty-eight cut fuse ends varying in length from 1 to 16 inches, with Thermalite connectors attached, were also found, as was an open pocket knife and four used hot wire lighters. The unused powder and fuses were accounted for. There was no sign of any Thermalite ignitercord.

There seems little doubt that for some reason Ludwick and Royko departed from the usual practice at Tulsequah; that is, to use Thermalite ignitercord to fire all drift rounds. Instead, they trimmed the fuse, cutting off the connectors, and then attempted to spit each fuse with hot wire lighters and remained too long at the face.

Both men were experienced miners, although they had only been employed at Tulsequah for eight weeks. Both were familiar with ignitercord, and had used it up to the time of the accident.

An inquest was held in Tulsequah on December 8th, 1956. The Coroner's jury returned the following verdict:—

"We, the jury, agree that death was accidental and we feel there was negligence on the part of the deceased because they trimmed the fuse. If you use Thermalite you do not trim the fuse. We feel in future any miners found trimming fuse should be immediately dismissed."

William Lloyd McLellan, aged 36, Canadian, married, and Trevor Evans, aged 49, Canadian, married, and both employed as timbermen by The Consolidated Mining and Smelting Company of Canada, Limited, at the Sullivan mine, Kimberley, died as a result of being asphyxiated in 36-165 raise between the hours of 11 a.m. and 2.30 p.m. on December 4th, 1956.

On day shift of December 4th, McLellan and Evans were assigned the task of removing two old chutes at 36-185 raise. In order to remove the loose muck before tearing out the chutes, they were supplied with a motor and two cars, as the muck had to be trammed about 800 feet to the ore dump. The 36-165 raise is about midway between the 36-185 raise and the ore dump.

The 36-165 raise and 36-163 raise had been driven to service a stope which is now backfilled with waste and sulphide tailings. Two concrete seals had been put in the subdrifts from the raises to the stope for sulphur dioxide fume control. Six weeks before, the ventilation crew had checked the seals. No leaks were found, nor was any sulphur dioxide detected in the adjacent workings.

At 9.50 a.m. on the day of the accident, the shiftboss, Bill Muir, visited the working-place and spoke to the two men. Everything was in order. At about 1 p.m. Muir again visited the working-place. The motor and ore car were gone and he presumed the men were at the dump emptying a car. As the men did not report off at the end of the shift, Muir and another man went to search for them. A light was seen in 36-165 raise, and

Muir climbed up to investigate, but had to retreat because of bad air. Compressed air was turned into the raise, and Muir went for Chemox equipment and phoned for the doctor and additional assistance. Chemox equipment was put on and the men were removed from a platform about 36 feet up the raise. No pulse was evident, but artificial respiration and oxygen therapy were applied until the arrival of the doctor, who pronounced the men dead.

Air samples taken after the compressed air had been blowing for about an hour gave 8 per cent oxygen at the top of the raise, 12 per cent at the face of the lower seal, and 17 per cent at the platform where the men were found. For four days after the accident the air was tested and progressively decreasing amounts of oxygen were found, until on December 9th the oxygen content of the air at the platform decreased to 3½ per cent. Only negligible amounts of carbon monoxide and sulphur dioxide were found in any of the analyses.

All evidence pointed to the fact that the men had thought the platform in 36-165 raise a good place to eat lunch as it was out of a strong current of air in the drift below. (Their lunch-boxes were found on the platform.) They had been overcome by a lack of oxygen and had died as a result.

An inquest was held, and the final sitting, postponed to get the results of air samples and blood analysis, was held on January 9th, 1957. The jury returned the following verdict:—

"We, the jury, summoned to enquire into the cause of the deaths of Trevor Evans and William Lloyd McLellan, hereby find that Trevor Evans and William McLellan met their death on December 4th, 1956, between the hours of 11 a.m. and 2.50 p.m., on the platform at the junction of 36-165 raise and 36-163 Sub E situated off 3653 XCE in the Sullivan mine, situated in the County of Kootenay, in the Province of British Columbia.

"We also find that the death of Trevor Evans and William Lloyd McLellan was due to carbon monoxide poisoning assisted by a very low concentration of oxygen in the air.

"Riders:—

"No. 1. We, the jury, recommend that all non-working areas be fenced off and signs be posted designating non-entry.

"No. 2. We, the jury, recommend that suitable eating places be made available to the mine employees.

"No. 3. We, the jury, recommend that the rules governing the insertion and removal of clock number pegs be strictly enforced.

"No. 4. We, the jury, recommend that William Muir and Frank C. Lowes be commended for their prompt action following the discovery of the accident."

We do not agree that death was due to carbon monoxide poisoning as no evidence of a sufficient concentration was obtained.

Both men were old employees of the company, McLellan having worked for seventeen years and Evans for thirteen.

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

Fourteen fatal accidents and 180 accidents involving a loss of time of seven days or more were reported to the Department. These were investigated and reported on by the Inspectors of Mines.

The following three tables classify these accidents as to cause, occupation, and as to parts of the body injured.

Accidents Causing Death or Injury Classified as to Cause

Cause	Number of Accidents	Percentage of Total
Blasting	9	4.6
Breaking of staging, ladders	2	1.0
Falls of ground	36	18.6
Falls of material and flying material	11	5.8
Falls from ladders, staging, etc.	2	1.0
Slipping and falling	28	14.4
Lifting and handling material	61	31.4
Machinery and tools	28	14.4
Run of ore or waste	3	1.6
Burns and shock	3	1.6
Gassed	2	1.0
Miscellaneous	9	4.6
Totals	194	100.0

Accidents Causing Death or Injury Classified as to the Occupation of Those Injured

Occupation	Number of Accidents	Percentage of Total
Underground—		
Chutemen	1	0.5
Haulagemen	13	6.7
Miners	103	53.2
Muckers	13	6.7
Timbermen	11	5.7
Repairmen	2	1.0
Trackmen and pipe-fitters	3	1.5
Skip-tenders	2	1.0
Miscellaneous	13	6.7
Supervisors and staff	2	1.0
Surface—		
Shops	11	5.7
Mill	6	3.1
Surface, general	12	6.2
Quarries	2	1.0
Totals	194	100.0

Accidents Causing Injury Classified as to Parts of the Body Injured

Location	Number of Accidents	Percentage of Total
Head and neck	7	3.6
Eyes	3	1.5
Trunk	32	16.5
Back (including shoulders)	26	13.4
Arms (including wrists)	11	5.7
Hands and fingers	34	17.5
Legs and ankles	50	25.8
Feet	11	5.7
Toes	4	2.1
Shock	2	1.0
Fatal	14	7.2
Totals	194	100.0

DANGEROUS OCCURRENCES

Thirty-four dangerous occurrences were reported as required by section 9 of the "Metalliferous Mines Regulation Act" and investigated by the Inspectors of Mines.

Of these occurrences, seventeen were connected with shafts and hoisting, seven with mine fires on the surface, four with explosives, two with caves, two with runs of muck or rockslides, one with haulage, and one with electricity.

The following table lists these occurrences, together with the names of the mines where they occurred and brief details of each:—

Dangerous Occurrences, 1956

Date	Mine	Cause: Hoisting	Haulage	Explosives	Fire	Cave	Electrical	Rock-slide	Remarks
Jan. 20	H.B.			1					Bulldoze detonated near small explosive storage.
Jan. 30	Bralorne	1							Skip lowered on closed spill doors in Crown shaft.
Feb. 8	Bralorne	1							Rope damaged by blast.
Feb. 17	Pioneer	1							Head sheave broke in No. 3 shaft.
Feb. 26	Canadian Exploration				1				Fire destroyed small lunch building.
Feb. 29	Bralorne	1							Cage stopped suddenly, bounce engaged dogs, slack cable kinked.
Mar. 2	Bralorne	1							Hoistman let cage drop on bulkhead.
Mar. 7	Canadian Exploration	1							Rope came off sheave due to ice.
Mar. 27	Iron Hill				1				Power-house destroyed by fire.
Apr. 4	Bralorne	1							815 feet of 3-conductor armoured cable dropped down Crown shaft.
Apr. 12	Reeves MacDonald		1						Draw-bar pin dropped out, causing cars to jack-knife.
Apr. 13	Blue Grouse				1				Fire completely destroyed office, warehouse, dry, machine-shop.
Apr. 15	Britannia	1							No. 1 shaft cage lowered on to temporary bulkhead.
Apr. 22	Bralorne	1							Empire shaft brakes applied too quickly.
May 9	Spider				1				Fire destroyed compressor and buildings at No. 10 portal.
May 9	Silver Giant	1							Bail broke on No. 2 skip.
May 30	Britannia			1					Deepened holes by drilling in bootlegs.
June 15	Sullivan						1		Burns received by arc while testing electrical equipment.
June 20	Highland-Bell				1				Power-house adjoining mill damaged by fire.
July 1	Clayburn					1			Section of mine 80 by 200 feet caved in.
July 12	Pioneer	1							Cage hung up on broken timber in No. 2 shaft.
Aug. 19	Bralorne	1							Kink found in rope in Queen shaft.
Oct. 3	Pioneer	1							Cage and skip pulled through overwind.
Oct. 9	H.B.	1							Cage jammed on diamond-drill rod which fell down shaft.
Oct. 22	Emerald			1					Failure to properly guard blast.
Oct. 22	Copper Mountain				1				Oxygen cylinder on surface caught fire.
Oct. 30	Bralorne	1							Cage fell in Queen shaft—failure of interlock while being repaired.
Nov. 12	Yreka							1	Timber crib failed and sliding rock damaged surface tramway.
Nov. 17	Premier	1							Cable clamps pulled into sheave wheel.
Nov. 20	Premier				1				Mill, warehouse, compressor-house, and repair-shop destroyed by fire.
Nov. 23	Aurum	1							Violent braking engaged safety dogs, rope destroyed.
Dec. 5	Reeves MacDonald			1					Broken steel struck explosive in bootleg.
Dec. 11	Mineral King					1			Muck caved over draw point, partially burying two men.
Dec. 18	Canadian Exploration							1	Run of wet ore in underground crushing chamber.
	Totals	17	1	4	7	2	1	2	Grand total, 34.

A detailed description of each occurrence follows.

On January 20th, 1956, in a slusher drift of the H.B. mine a bulldoze charge fired in the throat of a draw hole detonated a small explosive storage 50 feet away. Apparently the storage was detonated by the impact of a rock which ricocheted from the blast area.

On January 30th, 1956, the warning light indicating to the hoistman that the spill doors at the 1900 level pocket in the Crown shaft at the Bralorne mine were closed failed. The cage-skip combination was lowered on to the doors, and between 80 and 100 feet of hoisting rope coiled on top of the cage. The uncoiling of the rope was done under competent supervision, and no damage to the rope or the cage-skip combination resulted.

On February 8th, 1956, the rope in the sinking compartment of the Queen shaft at the Bralorne mine was damaged by a blast. Three wires were severed and others were nicked. The damage occurred during blasting operations at the 2900 level station. The bucket had not been raised above the level, nor was the protective bulkhead strong enough to withstand the blast.

On February 17th, 1956, the shaft of the head sheave in the East compartment of the No. 3 shaft at the Pioneer mine failed. The head sheave was a 73-inch bicycle-type sheave mounted on roller bearings. The shaft was made of heat-treated chrome steel with a minimum yield point of 90,000 pounds per square inch. The sheave had been in use about seven and one-half years and had hoisted 288,461 tons of muck. The cause of the failure was attributed to the poor design of the shaft and to corrosion. The defective design, which was due to the fact that there was no fillet between the large section comprising the hub of the sheave and the smaller sections for the bearings, was corrected in the new shaft.

On February 26th, 1956, fire of unknown origin destroyed a small lunchroom at the portal of the No. 5 conveyor adit at Canadian Exploration Limited, Salmo. The building was heated by an oil stove. It was the regulation distance from the portal, and no other damage was done.

On February 29th, 1956, the hoistman, lowering a crew in the south compartment of the Crown shaft at the Bralorne mine, for some unknown reason suddenly stopped the hoist. The sudden stop caused the cage to bounce and the slack rope allowed the safety dogs to engage the guides. The hoistman, in trying to lower the cage again, coiled about 60 feet of rope on top of it before he realized what was wrong. He then lifted the cage and lowered it to the 2500 level. Upon examination the rope was found to be kinked at one point. The hoistman had had only three weeks on his own prior to the accident.

On March 2nd, 1956, the skip in the No. 2 compartment of the Queen shaft at the Bralorne mine was dropped out of control on to a bulkhead below the 31 level pocket. At the time of the accident the No. 1 compartment was used for sinking, and the No. 2 used to hoist men and materials and was equipped with a skip. Muck was also handled in the No. 2 compartment and, when this was done, the loaded sinking bucket in the No. 1 compartment was used as a counterweight. The hoist had 36- by 24-inch drums and was equipped with mechanical hand-operated brakes and clutches of the axial-plate type. It also had track-limit switches, man-safety switches, and an overspeed-limit switch linked to the hoist shaft. Investigation revealed that the No. 2 compartment clutch had slipped on previous occasions, due in part to oil and grease getting on the clutch plates and in part to overloading the hoist. On this occasion the hoistman failed to apply the hand-brake in time to prevent the skip from striking the bulkhead, although its speed must have been somewhat retarded. The hoist had been serviced earlier in the day and the clutch was found to be operating satisfactorily. This hoist has been replaced by a larger one with interlocking gravity air engine-operated post brakes, internal expanding jaw-type clutches, and a dynamic braking system.

On March 7th, 1956, the rope came off a flat-lying sheave wheel on the surface incline to the No. 5 conveyor adit at Canadian Exploration Limited, Salmo. This was due to ice building up in the groove. Men were being hoisted at the time. The rope was damaged for some 200 feet and had to be discarded. A shed has been built over the sheave-wheel.

On March 27th, 1956, a fire broke out in the power-house at the Argonaut mine and the building and contents were completely destroyed. The plant was running with an operator on duty, but the fire-extinguishing chemical apparatus available failed to control it. A bulk gasoline storage tank containing about 750 gallons was located on the hillside just above the power-house. Apparently a gasoline line was allowing gas to seep into the building. The gas was ignited by sparking in the generators. The heat of the fire melted diesel-fuel lines, and this fuel was added to the fire.

On April 4th, 1956, 815 feet of 3-conductor armoured 5-kilovolt cable was dropped down the Crown shaft at the Bralorne mine. The cable was to be installed in the shaft between the 2000 and 2500 levels. One end was fastened to the skip by clamps, and the cable was to be pulled up the shaft until it had all been removed from the reel, and then lowered down the manway compartment. The cable slipped from the clamps after it had been pulled some distance up the shaft. The weight of the free end unwound some cable from the reel before it was pulled against the shaft timbers. The bottom half of the cable was damaged, but no damage was done to the shaft. The failure was attributed to the stretching of the neoprene jacket after the clamps had been tightened.

On April 12th, 1956, workmen were being transported in a train along the 1900 level of the Reeves MacDonald mine. The pin connecting the draw-bar of the first car to the locomotive dropped out, allowing the draw-bar to drop between the rails. The sudden stop caused the cars to " jack-knife." An improper draw-bar pin had been used.

On April 13th, 1956, fire broke out in a large two-story building which housed the office, warehouse, dry, repair-shop, and core-shed at the Blue Grouse mine. The building was heated by a barrel-type wood stove set on a concrete slab. Fire-fighting equipment consisted of two 2-inch hoses and chemical extinguishers. The building and contents were completely destroyed, but the near-by compressor-house and portal shed were unharmed.

On April 15th, 1956, the cage in the west compartment of No. 1 shaft in the Britannia mine was lowered on to a temporary safety bulkhead near the 2,000-foot level. Slack cable was let out and a kink developed in the rope. The bulkhead was used to work on the deck on top of the east compartment cage. The cages operate in balance. At the end of the shift the crew signalled the hoistman to raise the east cage to the 1050 level, without removing the bulkhead, thereby causing the west cage to drop on to it. No one was injured.

On April 22nd, 1956, the hoistman at the Empire shaft in the Bralorne mine applied the brakes too quickly, causing the safety dogs of the cage-skip combination to engage the guides in the north compartment. He did not immediately realize what had happened and let out an additional 20 feet of rope before stopping the hoist. He then rewound the slack rope and so caused a kink to form in the rope.

On May 9th fire of unknown origin completely destroyed the compressor building and contents at the No. 10 portal of the Spider mine. No one was on the site and no one observed the fire. The portal sets were damaged slightly.

On May 9th, 1956, the bail of the No. 2 skip in the shaft at the Silver Giant mine broke while muck was being hoisted. An examination revealed a flaw in the channel iron 4 inches below the point where the safety-dog mechanism was bolted to it. Minor damage was done to the shaft timbers.

On May 30th, 1956, two miners were drilling a crosscut round with jack-leg machines at the Britannia mine. Several holes appeared to be drilled by deepening bootlegs from the previous round. One such hole contained explosives which were detonated during drilling. Both men were slightly injured. Their blasting certificates were suspended for six months.

On June 15th, 1956, an electrician received electrical burns in the 2850 crushing-chamber at the Sullivan mine. A relay, connected across the load side of a magnetic contactor controlling a 150-horsepower 550-volt motor, was presumed to have an intermittent open circuit. To test the operation of the relay, the electrician attempted to connect a pair of jumpers from the relay terminals to the supply side of a 100-ampere main switch. The relay was still connected to the 150-horsepower motor, which was not running. The motor, through the jumpers and relay leads, drew its starting current of several hundred amperes, producing an arc at the 100-ampere switch where the electrician was attempting to make the connection.

On June 20th, 1956, at about 8.10 a.m. a fire was discovered in the engine-room at the Highland-Bell mill. The fire was caused by a break in the fuel-line leading to an oil furnace used as a pre-heater to raise the temperature of water used in the flotation circuits. The diesel engine in the power-house was not operating at the time. Due to prompt action, damage was confined to the wall of the mill and to the electrical control panel.

During the week-end of July 1st, 1956, at the fireclay mine of the Clayburn Company Limited, near Abbotsford, a section of the mine about 80 by 200 feet caved in. The mine is worked by room and pillar. The rooms and haulageways are 14 feet wide and up to 18 feet high. Pillars are approximately 50 feet square. Timbering in the haulageways is done with regular drift sets, and in the rooms with roof bolting. Prior to the cave-in the ground was known to be working and water was seeping in through cracks in the roof. The fact that the pillars in the caved area were considerably smaller than those in the rest of the mine was responsible for the caving.

On July 12th, 1956, at the beginning of the day shift at the Pioneer mine, the No. 2 shaft hoistman reported that he thought the west compartment cage was hung up. Upon investigation the cage was found supported on a broken post which was lying across a divider and wall plate a few sets below the 2300 level. The safety dogs had engaged and there was 40 feet of slack rope. The rope was kinked. The previous hoistman reported that, prior to going off shift, he had lowered the west side cage to bring the hoist in balance, which is normal shaft practice. The cage could have settled on the post at this time without the hoistman being aware of it. The shaft timber was closely checked and was repaired where necessary. The timber was installed in 1935.

On August 19th, 1956, a kink was found about 245 feet above the skip in the rope in the north compartment of the Queen shaft at the Bralorne mine during a routine inspection. The kinked portion was cut off before either men or materials were handled. No reason could be found for the kink having formed.

On October 3rd, 1956, the cage-skip combination in the west compartment of the No. 2 shaft at the Pioneer mine was pulled through the overwind limit above the 900 level internal dump, resulting in extensive damage to the skip and three sets of timber. The 900 level dump is conventional except that it can be swung out of the compartment when required. It was protected by an overwind limit which was automatically put in operation when the dump was swung into the shaft. The Lilly control was not set to retard the hoist when the skip was close to the dump, but a bell in the hoistroom warned the hoistman of the skip's approach. The investigation revealed the overwind limit had to be manually set each time the dump was swung into the shaft; the warning bell in the hoistroom did not ring loud enough to be always heard by the hoistman, and the hoistman did not always check the safety devices before using the dump. To prevent a repetition of this accident, the dump is now provided with a retardation limit and two overwind limits. The warning bell was adjusted to ring louder.

On October 9th, 1956, the cage in the H.B. mine shaft became jammed. A short diamond-drill rod was found between the cage and the guide. This rod must have fallen down the shaft some time previously. Special instructions were issued by the management to prevent a recurrence.

On October 22nd, 1956, a miner on the 2200 level of the Reeves MacDonald mine entered a blast area which had not been properly guarded. The miners responsible had their blasting certificates suspended for six months by the Inspector, as well as being laid off for one week by their employer.

On October 22nd, 1956, a fire started at an acetylene cylinder on the 3170 track near the car-repair shop at the Copper Mountain mine. The operator had brought a full bottle of acetylene from the surface skip and had hooked up his hoses and regulator. He then walked about 20 feet to an old mine car which was to be scrapped, lit his torch, and was about to start burning when he heard a roar behind him. Turning around he found the acetylene cylinder on fire. The fire was quickly put out by a carbon dioxide extinguisher. The fusible plug had blown out of the cylinder and the regulator and hose were badly damaged. The operator was experienced and claimed all equipment appeared to be in good order when he started working.

On October 30th, 1956, in the Queen shaft at the Bralorne mine the hoist drum serving the No. 2 compartment became disengaged from both clutch and brake. The No. 2 compartment skip dropped to a point just above the 3300 level before being brought to rest by the safety dogs and the 3300 bulkhead. The rope continued to unwind from the drum and had started to rewind when it was sheared by the sharp edge of the drum where it was connected to it. The entire length dropped on top of the cage. The accident happened while adjustments were being made to the brake, and the hoistman noticed that the teeth of the jaw clutch were not fully engaged. He released the clutch to set it properly just as the mechanic removed the locking pin in the brake engine, thereby releasing the brake. Neither clutch nor brake could be re-engaged. Damage was confined to the lower pair of guide rollers, the safety catch, one kink in the rope, and the 3300 level bulkhead.

On November 12th, 1956, a timber crib holding waste rock at the Yreka mine failed, causing a rockslide. The slide missed all the portals, but crossed the slack-line aerial tramway and did considerable damage to it. No one was injured.

On November 17th, 1956, the muck skip in the Premier Border shaft was hoisted so high that the cable clips entered the sheave-wheel. Three guides, one footwall divider, and some hanging rods were broken. No damage was done to the rope, skip, or sheave. Previous to the incident the hoistman was hoisting from No. 7 level halfway down the shaft with the skip and cage in balance. He received a signal from the cage-tender to go to the No. 8 or bottom level and neglected to adjust the skip before lowering the cage. The overwind did not cut off the power and later was found to have an electrical fault. New limit switches had been on order for some time.

On November 20th, 1956, the Silbak Premier mill, warehouse, compressor-house, and repair-shops were completely destroyed by fire. The fire was caused by the failure of a pressurized fuel-hose supplying fuel-oil to a pre-heating torch, which was being used to pre-heat the mandrel and shaft of the gyratory crusher preparatory to zincing them together. The fuel-oil, under 90 pounds pressure, spread rapidly and was ignited by the heat. The fire caught the bottom of a covered incline skipway and ran with the updraught to the top of the skipway and ignited the surface buildings around No. 4 level portal. An alarm was sounded and all fire-fighting equipment brought into action. Fire-doors in the mine were closed and all men underground were immediately withdrawn via No. 6 level portal. About ten minutes after fire-fighting was commenced the main water-line broke and pressure was greatly reduced. However, the fire was prevented from spreading to the office and bunk-house. Total damage was estimated by the company to be $750,000.

On November 23rd, 1956, an overspeed test was run on the hoist in the Aurum mine. During the test, due to the violent application of the brakes, the safety dogs in the No. 2 compartment engaged the guides. Not suspecting this, the hoistman unwound rope from the corresponding drum when he started the hoist in balance. He continued to let out rope until informed by telephone that the rope was coming out into a shaft station, whereupon he rewound the rope again. In doing so the rope became looped around the upper framework of the skip and, when pulled taut, damaged the rope considerably.

On December 5th, 1956, a miner on the 2200 level of the Reeves MacDonald mine was injured by flying rock as a result of a blast which occurred when the drill steel of his air-leg machine broke and the broken shank struck concealed explosive left in the burned cut of the previous round. The face had been thoroughly washed down, but a small amount of explosive must have remained in the " frozen " cut.

On December 9th, 1956, the mine geologist and a visitor were crossing the 34A stope in the Mineral King mine. As they were passing over No. 4 draw-point, a run of muck in the raise caused the muck to subside over the draw-point. Both men were drawn in and partially buried, but were extricated with very minor injuries.

On December 18th, 1956, a run of wet ore took place in the coarse-ore chute in the underground crushing chamber at the Canadian Exploration Limited operations near Salmo. The steel operating platform collapsed, but the two workmen in attendance were able to retreat to a place of safety.

PROSECUTIONS

There were no prosecutions in metalliferous mines and quarries in 1956.

Several violations of the provisions of the " Metalliferous Mines Regulation Act " in regard to the use of explosives and blasting procedure resulted in the offenders having their blasting certificates suspended for various periods, according to the type of offence.

EXPLOSIVES USED IN MINES

The table below shows the quantities of explosives and blasting accessories used in metal mines and quarries in British Columbia in 1952, 1953, 1954, 1955, and 1956:—

	1952 Total	1953 Total	1954 Total	1955 Total	1956 Total	1956	
						Mines	Quarries
High explosives (lb.)	9,935,946	9,237,700	7,652,574	8,420,791	8,560,000	8,117,000	443,000
Blasting-caps	3,159,900	1,890,000	1,815,250	1,982,900	2,184,000	2,069,000	115,000
Electric blasting-caps	166,740	141,000	232,270	151,685	52,000	42,000	10,000
Delay electric blasting-caps (short period)	250,649	182,771	191,513	283,000	205,000	190,000	15,000
Delay electric blasting-caps (sure-fire delays)	205,140	138,055	70,300	144,875	263,000	263,000	....
Primacord (ft.)	522,000	647,000	824,000	399,000	226,000	166,000	60,000
B-line detonating fuse (ft.)	....	....	....	....	2,436,000	1,715,000	721,000
Safety fuse (ft.)	22,754,200	17,679,000	13,429,800	17,744,900	17,218,000	16,601,000	617,000
Ignitercord (ft.)	146,600	142,000	206,180	418,800	498,000	498,000	....
Ignitercord connectors	114,100	114,000	160,501	371,000	563,000	563,000	....

UNDERGROUND DIESEL EQUIPMENT

There was no significant change in underground diesel equipment in 1956.

The ventilation requirements and procedure for sampling and analysing exhaust gases and mine air have resulted in satisfactory working conditions being maintained where this equipment is used.

AIR-SAMPLING

The use of modern portable equipment for the analysis of mine air and diesel exhaust gases has practically eliminated the necessity for sampling by vacuum bottles and analysis by laboratory methods in metalliferous mines. However, in order to check special conditions, a few samples were taken by vacuum bottles and analysed in company laboratories.

DUST CONTROL AND VENTILATION

Problems in dust control and ventilation have continued to receive the attention of mine operators and Government departments.

Dust counts and ventilation surveys were made by the staff of the Chief Inspector, Silicosis Branch of the Workmen's Compensation Board, and the results of these surveys made available to the Inspectors of Mines.

The results of this work for 1956 have been summarized by the Chief Inspector of the Silicosis Branch. Because of the importance of the work, most of this summary is given here, in order to make it readily available to those in the industry interested in dust control, and also those who may be exposed to silica dust.

"SUMMARY OF DUST CONDITIONS AT BRITISH COLUMBIA METALLIFEROUS MINES DURING THE YEAR 1956

"During the year 1956, seventy-nine ventilation and dust control inspections were made at the metalliferous mines in British Columbia. These were made in the underground workings, crushing plants, assay grinding rooms, and open pits at fifty-one properties, twenty-eight of which were inspected twice. One inspection was made in each of three plants that quarry and crush rock. Two inspections were made at one asbestos mine, the mill being inspected twice and the mine once, as no mining operations were being performed when the survey was made in March. These inspections were made to determine the dust concentrations at the various operations where there was exposure to dust, the general underground ventilation, the condition of exhaust systems, and other measures adopted for the prevention and elimination of dust. Recommendations and instructions were given for preventive measures to be adopted, and for any installations considered necessary to improve conditions found to be unsatisfactory. The rock dust concentrations were obtained with the konimeter and the asbestos dust concentrations with the midget impinger. The procedures followed are similar to those used with the konimeter in Ontario and with the impinger at the asbestos mines in Quebec. The averages of the dust counts are obtained by adding all counts found in the operations under that heading and dividing that sum by the number of samples taken.

"*General*

"When rock is mined, handled, or crushed, dust is produced. The hazard from breathing this dust varies with the concentration and the silica content. A dust concentration of 300 particles per c.c. of air is frequently referred to in our reports. It has been chosen as an objective to work towards. If the average of the dust counts at any one operation has been kept below this figure, there has been a definite effort made to observe the known dust preventive and elimination measures. Some operations still produce higher averages than 300 particles, such as stoper drilling operations, and no known practical method has yet been found that will lower the averages below this figure.

"The figure of 300 particles per c.c. of air is not chosen as representing a condition that would be considered safe in preventing silicosis. It is not known what figure could be chosen as being a safe limit at the present time. It simply means that a great deal of effort and money have been spent on ventilation and dust preventive measures to obtain this result. It is a very great improvement over conditions in the past.

"It must be remembered that the averages given on the subsequent pages do not give an accurate representation of the conditions at each mine throughout the year. Various factors change the conditions. In the mines where ventilation is by natural means, the volume of air passing through the workings will vary with the seasons, also from day to night and even reverse in direction when surface temperature changes are sufficient. These changes in air volume and its direction of flow as well as changes in the amount and kind of work performed will cause variations in the dust concentrations. Surface crushing plants and assay grinding rooms will show a decided variation from several causes. The wetness of the rock coming to the plant and the state of repair in which the exhaust system is kept are the most important factors. The carefulness of the operators in seeing that proper use and care of these exhaust systems is a third factor. Consequently the averages represent the conditions at the time of survey only.

"However, the dust samples are taken with the purpose of obtaining, as accurately as possible, a picture of the conditions at the time the survey is made. At the larger mines the survey covers a period of from two to four weeks and does give a fairly accurate record of the conditions existing. At the medium-sized mine a week or more is spent. One day is the general time spent at the smallest operations, and the record is not representative of the conditions throughout the year. With all these variations, it is surprising to note that the averages in any one mine remain fairly constant from year to year.

"The greater number of dust samples are taken where the men are working and the remainder in atmospheres where the men spend a portion of their time. Occasionally, additional samples are taken to obtain further information. These may be to show the difference in dust production of two or more types of drilling-machines, to show that dust is escaping from exhaust systems, or to show that some abnormal condition exists.

"Dust Concentrations

"A short summary of the conditions found during the year is given below and compared with the results obtained during recent past years.

"1. *Stoper Drilling Operations.*—Stoper drilling operations produced the most consistently higher dust concentrations during the time the men were working. The modern-type drills, both stoper and leyner, have automatic throttles which turn on the water-supply with the air, larger water-tubes which supply more water to the drill, and closer tolerances on the water-tubes which prevent the leakage of air down the drill steel. These features have been instrumental in lowering the amount of dust dispersed into the atmosphere from that dispersed by the older-type drills. The counts at these locations used to be 2,000 or more particles per c.c. of air, but now a considerable number of mines obtain an average of less than 1,000 particles per c.c. of air. The percentage of surveys where the averages were 1,000 or less particles during the past seven years are given here for the purpose of comparison.

Year	Percentage of Surveys Giving Less than 1,000 P.P.C.C. of Air	Year	Percentage of Surveys Giving Less than 1,000 P.P.C.C. of Air
1950	59%	1954	36%
1951	43%	1955	40%
1952	62%	1956	70%
1953	50%		

"2. *Leyner, Jackleg, and Plugger Drilling Operations.*—These operations produce the next higher dust concentrations when the men are working underground and used to produce slightly less than 2,000 particles per c.c. of air. At the present time, most of the mines produce less than 1,000 particles per c.c. The percentage of surveys where the averages were 500 or less particles during the past seven years are given here for the purpose of comparison.

Year	Percentage of Surveys Giving Less than 500 P.P.C.C. of Air	Year	Percentage of Surveys Giving Less than 500 P.P.C.C. of Air
1950	56%	1954	49%
1951	54%	1955	60%
1952	61%	1956	55%
1953	45%		

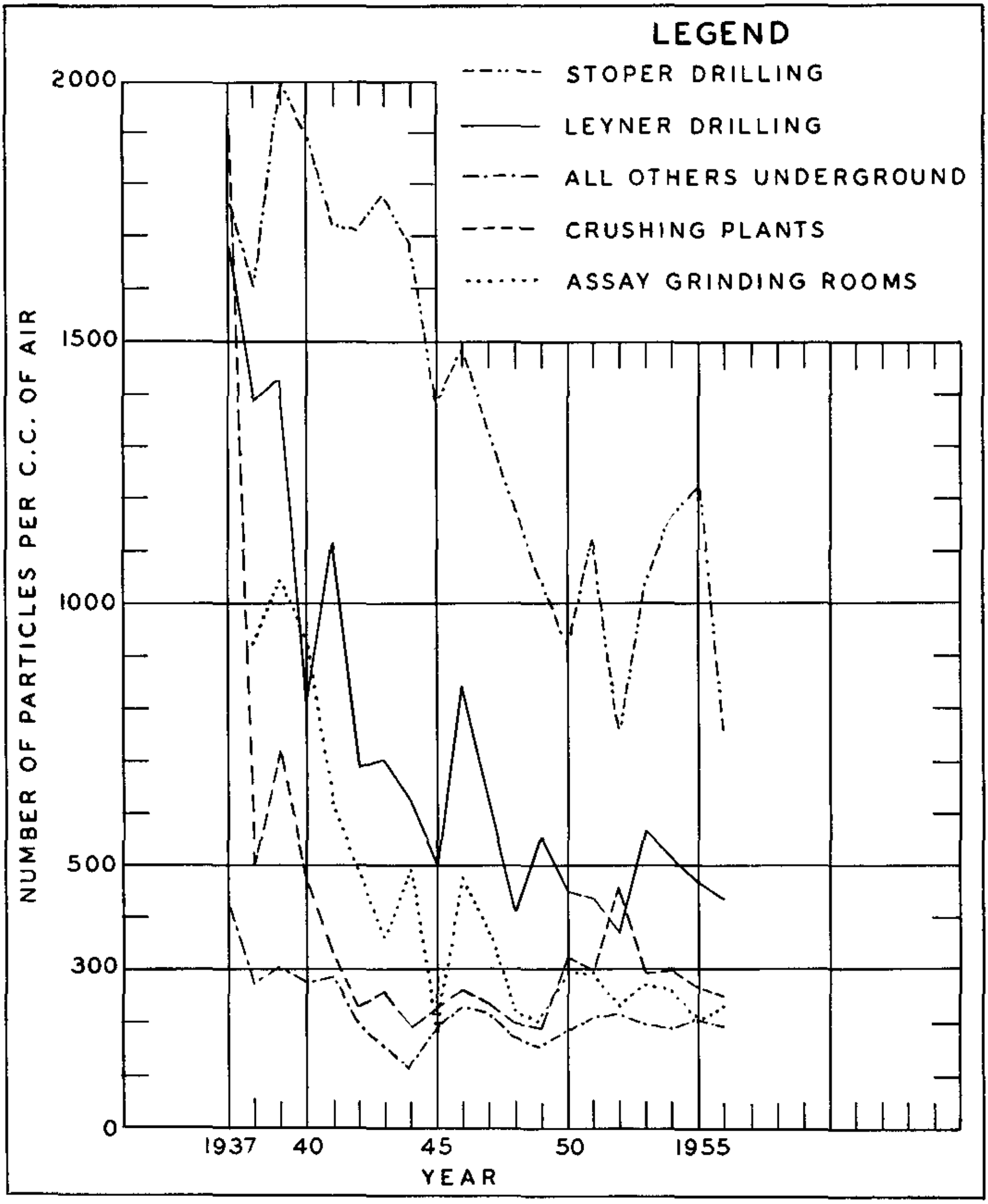


Figure 16. Average dust counts obtained each year since 1937.

"3. *All Other Underground Locations.*—The averages given under this heading are of all the dust counts obtained underground except at drilling operations. They represent the average dust concentration that the greater number of men are subjected to and are taken at the operations of mucking, hoisting, tramming, timbering, nipping, drawing ore from chutes, scraping, slushing, bulldozing, etc., and in drifts, crosscuts, and stopes where the men spend a portion of their time. The greater majority of the seventy-five surveys made during the year gave averages of less than 300 particles per c.c. of air. It is interesting to note how fairly constant this average has remained during the past seven years. These percentages are given below for each of the years.

Year	Percentage of Surveys Giving Less than 300 P.P.C.C. of Air	Year	Percentage of Surveys Giving Less than 300 P.P.C.C. of Air
1950	82%	1954	76%
1951	78%	1955	77%
1952	81%	1956	81%
1953	83%		

"4. *Crushing Plants.*—Forty-eight surveys were made in crushing plants during the year. There was a larger percentage of surveys where averages of less than 300 particles were obtained than for several years past. These percentages for the past seven years are given here for the purpose of comparison.

Year	Percentage of Surveys Giving Less than 300 P.P.C.C. of Air	Year	Percentage of Surveys Giving Less than 300 P.P.C.C. of Air
1950	46%	1954	54%
1951	52%	1955	64%
1952	27%	1956	67%
1953	53%		

"5. *Assay Grinding Rooms.*—Exhaust systems are necessary in assay grinding rooms to keep the dust concentrations at a low figure. The rock that is handled is in a dry condition and dust is very easily dispersed into the room atmosphere. Thirty-one surveys of such rooms were made during the year and 71 per cent of them gave an average dust concentration of less than 300 particles per c.c. of air. The percentages for the past seven years are given below for the purpose of comparison.

Year	Percentage of Surveys Giving Less than 300 P.P.C.C. of Air	Year	Percentage of Surveys Giving Less than 300 P.P.C.C. of Air
1950	54%	1954	61%
1951	63%	1955	82%
1952	53%	1956	71%
1953	61%		

"Certificates of Fitness

"Under the silicosis provisions of the Act, workmen in certain categories of work require an annual medical examination. The certificates of fitness issued to the workmen are to be kept at the office of the employer. In 1954 we were given the responsibility of checking these certificates against the list of workmen at each property to determine if this provision of the Act was being observed. The work was started late in 1954 and has continued since then. On account of the late start in 1954, the number of certificates checked during that year was small. Below is given a summary of the number of workmen who required medical examinations and the percentage of these men for whom the employers held the required certificates of fitness.

Year	Number of Men Who Required Certificates	Percentage of Certificates Held by Employers
1954	1757	85.6%
1955	5617	88.3%
1956	6453	95.8%

"Summary

"1. Seventy-nine inspections were made at metalliferous mines during 1956. Fifty-one mining operations were inspected and twenty-eight of these were inspected the second time.

"2. It is not known what concentration of silica dust is considered safe to breathe without producing silicosis as several other factors besides the dust concentration must be taken into consideration. The main object of this inspection work is to lower the amount of dust breathed by the workmen as much as possible. The figure of 300 particles per c.c. of air has been chosen as an objective to work towards. When this figure is attained, it indicates a very great improvement over conditions existing several years ago.

"3. Blasting operations produce a large amount of dust, but the workmen are generally not subjected to this dust or subjected to it for short periods of time only. Most of the blasting operations can be done at the end of the shifts and allow sufficient time for ventilation to remove the dust from the workings before the following shift goes to work. Some blasting operations, such as in chutes, may be considered necessary so that the production of ore is not interfered with, but this should be reduced to the very minimum.

"4. Stoper drilling operations consistently produce the highest concentrations of dust during the time the men are working. The counts used to be 2,000 or more particles per c.c. of air. Seventy per cent of the surveys made this year gave averages of less than 1,000 particles.

"5. At leyner, jackleg, and plugger drilling operations the dust concentrations are not as high as at stoper drilling operations. Eighty-six per cent of the surveys gave averages of less than 1,000 particles per c.c. of air. Since most of the surveys gave less than 1,000 particles, it is probably better to adopt the figure of 500 particles for the purpose of comparison. Fifty-five per cent of the surveys gave averages of less than 500 particles per c.c. of air.

"6. The averages for 'All Other Underground Locations' are very satisfactory. Eighty-one per cent of the surveys made during the year gave averages of less than 300 particles per c.c. of air. The percentages for the past seven years have remained fairly constant, varying between 76 and 83 per cent. This condition is particularly satisfactory when considering the fact that the great majority of the men work in this lower dust concentration.

"7. In 1952 the dust concentrations in some of the crushing plants were not satisfactory. During 1953 and subsequent years, a special effort was made to get these back in line and satisfactory results have been obtained. Sixty-seven per cent of the surveys made in 1956 gave averages of less than 300 particles per c.c. of air.

"8. Seventy-one per cent of the surveys made in assay grinding rooms gave averages of less than 300 particles per c.c. of air. This is very satisfactory, as it is the second highest percentage that has been obtained during the past seven years.

"9. The main measures for dust prevention and elimination are receiving good attention at the mine. The more important of these are good ventilation, thorough wetting of the rock before it is handled in any manner, not subjecting the workmen to dust and fumes from blasting operations, using good exhaust systems in crushing plants and in assay grinding rooms, etc. Full application of all these measures at all times has not been obtained in all instances, but the results obtained have been quite satisfactory.

"10. The percentage of certificates of fitness held by the employers for their workmen who require a medical examination has steadily increased during the past three years. In 1956, certificates for 95.8 per cent of the workmen who require same were held by the employers. This is a satisfactory performance as there are numerous difficulties to be overcome. One mine was penalized for failure to comply with the requirements.

"11. Aluminium-powder prophylaxis treatments for the prevention of silicosis were given at eight mines during the year. No aluminium-therapy treatments were given at the Rehabilitation Clinic of the Workmen's Compensation Board in Vancouver to men who have silicosis.

" 12. Figure 16 is a graph showing the median of all the averages obtained each year since 1937."

MINE-RESCUE, SAFETY, AND FIRST AID

During 1956 the mine-rescue stations at Cumberland, Princeton, and Fernie were fully maintained with modern equipment, and an instructor, qualified in mine-rescue and first aid, was on duty at each station. Each station is equipped with several sets of McCaa 2-hour self-contained oxygen breathing apparatus, at least one set of Chemox 1-hour self-contained breathing apparatus, all-service gas masks, self-rescuers, methane and carbon monoxide detectors of the latest type, one or more H.H. inhalators, and a complete supply of first-aid equipment. Supplies and facilities for charging and servicing all this equipment are maintained.

Training in the use of mine-rescue equipment is given at all stations to all who apply for it, and fully trained mine-rescue teams are given regular monthly practice-training as a unit, not only to keep them familiar with the use of the machines, but to teach them the value of teamwork in mine-rescue operations.

The mobile mine-rescue unit stationed at Nelson in 1950 continued to be of great assistance in promoting and giving instruction in mine-rescue and first aid at mines tributary to that centre. It is proposed to put a similar unit in the Princeton area in 1957 to serve the mines in central and southern British Columbia.

Classes in first aid were held at the following mines and localities: Princeton, Copper Mountain, Ainsworth, Riondel, Canadian Exploration mine, H.B. mine, Salmo, Giant Mascot, Mineral King, Nelson, Balfour, Procter, and Fernie. At these localities a total of 363 seniors and eighty-five juniors took first-aid courses, and a number of candidates for industrial certificates were given assistance.

Mine-rescue courses were given at Remac, Canadian Exploration, H.B. mine, Yale Lead & Zinc, Giant Mascot mine, Riondel, Fernie, and Princeton.

Two emergency calls for mine-rescue equipment were handled by the Fernie station. On February 16th, smoke and an odour were found issuing from the old working in No. 1 East mine, Elk River Colliery. Apparatus was immediately taken to the mine. After an investigation by the Inspector of Mines and the mine officials, it was decided to seal off the area. The last two stoppings had to be erected by men wearing McCaa apparatus.

On July 20th a gob fire in "A" West, Michel Colliery, necessitated bringing apparatus to that mine. In this case, seals were put up without the use of mine-rescue apparatus, but the apparatus was retained on the site until all work necessary to control the fire was completed.

The Princeton mine-rescue station was made available to the St. John Ambulance Association for lectures and instruction in first aid, and the Similkameen Branch of the Canadian Institute of Mining and Metallurgy made use of the lecture-room for meetings held throughout the year. The building was also used by the Motor-vehicle Branch for the purpose of giving drivers' examinations.

In addition to the mine-rescue equipment maintained at the Government mine-rescue stations, there are several complete sets of McCaa and Chemox apparatus at the Sullivan mine, a set of McCaa at Copper Mountain, and complete sets of Chemox at Wells, the Bridge River camp, Britannia, Riondel, and the Canadian Exploration camp. Minor amounts of mine-rescue equipment are kept at Tulsequah, the Toric mine at Alice Arm, the Giant Mascot mine at Spillimacheen, and the Yale Lead & Zinc mine at Ainsworth. This equipment is periodically checked by one of the instructors.

A certificate of competency in mine-rescue work is granted to each man who takes the full training course and passes the examination set by the Department of Mines. During 1956, in addition to the regular teams in training, seventy-five men took the full course and were granted certificates as follows:—

Certificate No.	Name	Where Trained	Certificate No.	Name	Where Trained
2858	Donald Charles Beddie	Spillimacheen.	2896	John Sigfrid Johnson	Riondel.
2859	Julius L. Bodor	Spillimacheen.	2897	Edward Willis Grove	Riondel.
2860	Thomas Henery Cross	Spillimacheen.	2898	Bela M. Dudas	Riondel.
2861	John Ehlers	Spillimacheen.	2899	Arthur James Hill	Riondel.
2862	James Allan Farrell	Spillimacheen.	2900	Charles Allen	Riondel.
2863	Donald Harold Fatum	Spillimacheen.	2901	Jack L. Cadwallader	Wells.
2864	Stanley T. Fish	Spillimacheen.	2902	George Heldt	Wells.
2865	George Gordon Futcher	Spillimacheen.	2903	Robert Walton	Wells.
2866	Lawrence H. Gilroy	Spillimacheen.	2904	Norman S. Grenfell	Wells.
2867	Orvil Clarence Gilroy	Spillimacheen.	2905	Roland David Dore	Wells.
2868	Raymond A. Hansen	Spillimacheen.	2906	Wilfrid Heppner	Wells.
2869	Walter W. Hansen	Spillimacheen.	2907	Albert Taillefer	Wells.
2870	Anton Hlohovsky	Spillimacheen.	2908	John Gargol	Copper Mountain.
2871	Gordon W. McCool	Spillimacheen.	2909	Gordon Begon	Copper Mountain.
2872	Donald W. Pierce	Spillimacheen.	2910	John Hungle	Copper Mountain.
2873	Howard Duncan Seymour	Spillimacheen.	2911	Willard Kreitz	Copper Mountain.
2874	Donald Stuart	Spillimacheen.	2912	William John Melnechenko	Copper Mountain.
2875	Robert James Willox	Spillimacheen.	2913	Robert E. Miller	Copper Mountain.
2876	William Wymer	Spillimacheen.	2914	Alvin Harold Crittenden	Pioneer Mine.
2877	Victor Albert Marunchuk	Kimberley.	2915	Paul Dase	Pioneer Mine.
2878	William Albert G. Yerbury	Kimberley.	2916	Harold Haggerty	Pioneer Mine.
2879	Thomas Victor Mewson	Kimberley.	2917	Ronald Cracknell Muir	Pioneer Mine.
2880	Charles Manfred Chappell	Kimberley.	2918	Cecil George Obre	Pioneer Mine.
2881	James Gold Paterson	Kimberley.	2919	William John Sawchuk	Pioneer Mine.
2882	George Walter Steacy	Kimberley.	2920	Clifford James Simons	Pioneer Mine.
2883	George James Kalmakav	Kimberley.	2921	Tiitus Somer	Pioneer Mine.
2884	John Kay Walsh	Kimberley.	2922	Philip Lawrence Graham	Remac.
2885	Barry Kells Craig	Kimberley.	2923	Reid Woodrow Gardiner	Remac.
2886	William Betcher	Kimberley.	2924	Alex Wlasiuk	Salmo.
2887	William Miles Fergus	Kimberley.	2925	Arthur Bennett	Kaslo.
2888	John William Rogers	Kimberley.	2926	A. Leo Bourdon	Salmo.
2889	Douglas Irving Morgan	Michel.	2927	Eligio Deno Lozza	Fernie.
2890	Spencer Morgan, Jr.	Natal.	2928	Ronald White	Fernie.
2891	Roland Arthur Desharnais	Natal.	2929	Murray P. Brown	Wells.
2892	Philias George Gauthier	Natal.	2930	Karl Heinke	Wells.
2893	Peter Paul Wiatrowicz	Natal.	2931	Alex McCulloch	Wells.
2894	Louis Maida	Riondel.	2932	Charles H. Scholz	Wells.
2895	Daniel Howard McDonald	Riondel.	2933	John E. White	Wells.

The Mine Safety Associations in the different centres of the Province, sponsored by the Department of Mines and aided by company engineers and officials, safety supervisors, Inspectors of Mines, and mine-rescue instructors, continued to promote mine-rescue, first aid, and safety education in their respective districts.

First-aid and mine-rescue competitions were held at Princeton, Cumberland, Riondel, Chapman Camp, Wells, Britannia, and Bridge River. A Provincial mine-rescue competition, in which winning teams from all the centres competed, was held in Nelson. A special trophy for this Provincial competition was donated by the Department of Mines. The problems for these competitions are set by the Department of Mines, and the judges are chosen from the staff of Inspectors and mine-rescue instructors.

The Similkameen Valley Mine Safety Association held its annual competition at Princeton on June 2nd, 1956. Two teams from Copper Mountain and a visiting team from Tsable River took part in this competition. The Tsable River team, captained by William High, took first place.

The Vancouver Island Mine Safety Association held its annual competition in Cumberland on June 9th, 1956. Three teams competed—two from Tsable River and a visiting team from Copper Mountain. The winning team was from Copper Mountain and was captained by Luke Kirby.

The West Kootenay Mine Safety Association held its annual competition at the Bluebell mine at Riondel. Five teams took part in this competition—two from the Bluebell mine, one from Canadian Exploration Ltd., one from the H.B. mine, and one from the Yale Lead & Zinc mine. The H.B. team, captained by Norman Anderson, took first place.

The East Kootenay Mine Safety Association held its annual competition at Chapman Camp. Six teams took part in this competition—two from Michel, two from Kimberley, one from Coal Creek, and one from Fernie. First place was won by the Kimberley No. 1 team, captained by T. O. Bloomer.

The Central British Columbia Mine Safety Association held its annual competition at Wells on June 30th, 1956. Four teams took part in this competition. They represented Britannia, Bralorne, Cariboo Gold Quartz, and Pioneer mines. The Bralorne team, captained by James Greer, took first place.

Arrangements were made to have a Provincial mine-rescue competition in which the winning teams from the five local associations would have an opportunity to compete. This competition was held at Lakeside Park in Nelson on September 8th, 1956. The five winning teams competed and the event was won by the Kimberley team, captained by T. O. Bloomer.

At all meets, except the Provincial and the Central British Columbia meets, competitions were held in first aid as well as mine-rescue work. In all these competitions, events were held for women and juniors. Representatives from other industries and organizations not necessarily directly connected with mining also participated.

BRITISH COLUMBIA MINING ASSOCIATION SAFETY DIVISION

In 1955 the Mining Association of British Columbia set up a Safety Division with the object of promoting and assisting in establishing and maintaining effective safety programmes at its member mines.

This work was carried on throughout 1956.

Supervisor training courses were given, and visits made to member mines where meetings were held with supervisors and reports made giving recommendations on practices and conditions found at these mines. Monthly accident statistics were compiled and issued to member mines.

The programme proposed for next year includes visits to the member mines, courses on job instruction and safety training, the use of films as visual aids to safety, and the circulation of current accident costs as supplied by the Workmen's Compensation Board.

The Safety Division reports that there was a decrease of 17 per cent in the frequency of all types of accidents for all member mines.

JOHN T. RYAN TROPHY

The John T. Ryan Regional Safety Award for the metal mine with the lowest accident-frequency record for 1955 was won by the Copper Mountain mine of the Granby Consolidated Mining Smelting and Power Company Limited at Copper Mountain. In winning this trophy, the Copper Mountain mine had the lowest accident frequency ever achieved by a Ryan Trophy winner in British Columbia. The award was presented to the officials and crew at the annual mine-rescue and first-aid competition of the Similkameen Valley Mine Safety Association, which was held in Princeton on June 2nd, 1956.

The 1955 regional safety award for coal mines was won by the Tsable River mine of Canadian Collieries (Dunsmuir) Limited, near Cumberland, and was presented to the officials and crew at the annual first-aid and mine-rescue competition of the Vancouver Island Mine Safety Association held in Cumberland on June 9th, 1956.

The regional trophy for metal mines for 1956 was again won by the Copper Mountain mine. The Granby Company is to be congratulated on winning this award two years in succession.

The regional trophy for coal mines for 1956 was again won by Canadian Collieries (Dunsmuir) Limited, the Tsable River mine, near Cumberland. A good safety programme put on by the company two years ago is undoubtedly responsible for this fine showing.

WEST KOOTENAY MINE SAFETY ASSOCIATION TROPHY

Because the West Kootenay District contains many small mines not eligible for the John T. Ryan Safety Awards, and in order to encourage and promote safety in these operations, the West Kootenay Mine Safety Association in 1951 donated a safety trophy for annual competition. In 1955 the area covered by this award was extended to take in all southern British Columbia, and further extended in 1956 to include the whole Province.

The award is made to the mine having the lowest accident rate and working a total of from 2,500 to 3,000 shifts per year, one-third of these having been worked underground. An accident is taken as one which involves more than four days' loss of time.

In 1956 the award was won by the Slocan Van Roi mine near Silverton, and was presented at a joint meeting of the West Kootenay Mine Safety Association and the Nelson Branch of the Canadian Institute of Mining and Metallurgy held in Nelson on February 9th, 1957.

Coal

By Robert B. Bonar, Senior Inspector of Coal Mines

CONTENTS

PRODUCTION

The output of the collieries is given in short tons. The gross output of the coal mines of the Province for the year 1956 was 1,589,398 tons, an increase of 105,332 tons or 7.1 per cent over 1955. A total of 488,964 tons came from strip mines at Michel, Tent Mountain (near Corbin), and Blakeburn.

The Vancouver Island District produced 200,347 tons, a decrease of 9,437 tons or 4.5 per cent from 1955.

The Northern District production was 13,195 tons, a decrease of 21,915 tons or 62.4 per cent from 1955.

The Nicola-Princeton District production was 73,272 tons, a decrease of 1,462 tons or 1.1 per cent from 1955.

The East Kootenay District production was 1,302,584 tons, an increase of 138,146 tons or 11.9 per cent over 1955.

Output and per Capita Production, 1956

Colliery and Mine	Gross Output Mined during Year (Tons)	Days Worked	Total Number of Employees	Daily Output per Employee (Tons)	Yearly Output per Employee (Tons)	Number of Employees Underground	Daily Output per Underground Employee (Tons)	Yearly Output per Underground Employee (Tons)
Tsable River Colliery	195,081	230	230	3.68	848	214	3.96	851
Chambers No. 5 mine	1,562	119	5	2.63	312	4	3.28	390
Loudon No. 6 mine	735	156	3	1.60	245	2	2.35	367
Lewis mine (Timberlands)	897	286	2	1.57	448	2	1.57	448
Carruthers and Wakelam No. 3	480	198	2	1.21	240	2	1.21	240
Stronach No. 2 mine	617	171	4	0.80	154	3	1.20	206
Wellington Blue Flame (Timberlands)	338	81	1	4.17	338	1	4.17	338
Undun mine	547	148	2	1.85	273	2	1.85	273
Big Flame mine	90	80	2	0.56	45	2	0.56	45
Taylor-Burson mine (Blue Flame)	3,078	176	8	2.18	385	7	2.50	439
Coldwater Coal mine	1,170	258	4	1.13	292	3	1.51	390
Mullin's strip mine (Blakeburn)	69,024	258	12	22.29	5,752	—	—	—
Bulkley Valley Collieries	8,553	150	25	2.28	342	20	2.85	428
Reschke mine	3,105	222	10	1.40	310	9	1.55	345
Gething No. 3 mine	1,537	180	8	1.06	192	7	1.11	219
Elk River Colliery	299,182	239	300	4.17	997	225	5.56	1,329
Michel Colliery (underground)	583,462	248	686	3.43	851	464	5.07	1,257
Michel Colliery (strip)	305,490	248	44	28.91	6,943	—	—	—
Coleman Collieries (strip)	114,450	—	18	—	6,353	—	—	—

Collieries of Vancouver Island District

The output of Vancouver Island collieries was 200,347 tons. Of this amount, 28,838 tons or 14.3 per cent was rejected in preparation for market and 389 tons or 0.19 per cent was used by the operating companies as fuel under boilers, etc. The total sales amounted to 172,140 tons, and 1,020 tons was taken from stocks. Of the amount sold in competitive market, 171,751 tons was sold in Canada and 389 tons sold in the United States.

Collieries of the Nicola-Princeton District

The gross total of 73,272 tons produced in the collieries of the Nicola-Princeton District was sold in Canada.

Collieries of the Northern District

The gross total of 13,195 tons produced in the collieries of the Northern District was sold in Canada.

Collieries of the East Kootenay District

The gross output of the collieries in the East Kootenay District was 1,302,584 tons. Of this amount, 142,169 tons or 10.9 per cent was rejected in preparation for market, 19,518 tons or 1.5 per cent was used as fuel under company boilers, etc., and 248,595 tons was used in making coke. Of the amount sold in competitive market, 793,601 tons was sold in Canada and 96,499 tons was sold in the United States.

Output and per Capita Production in the Various Districts, 1956

District	Gross Output Mined during Year (Tons)	Total Number of Employees at Producing Collieries	Yearly Output per Employee (Tons)	Number of Men Employed Underground in Producing Collieries	Yearly Output per Underground Employee (Tons)
Vancouver Island District	200,347	251	798	232	864
Nicola-Princeton District	4,248	12	354	10	424
Northern District	13,195	43	306	37	356
East Kootenay District	882,644	986	895	689	1,281
Whole Province	1,110,434	1,292	860	968	1,147

NOTE.—The above table deals only with coal mined from underground operations. Coal-stripping operations and the men employed at strip mines are not included.

Output per Man-shift, Underground Mines, 1946–56

Year	Man-shifts[1]	Tonnage	Average per Man-shift (Tons)
1946	596,631	1,463,640	2.45
1947	496,727	1,485,476	2.99
1948	434,074	1,281,530	2.95
1949	520,188	1,589,131	3.05
1950	460,159	1,481,813	3.22
1951	442,170	1,434,974	3.24
1952	383,422	1,388,732	3.62
1953	333,922	1,171,932	3.51
1954	280,353	1,064,023	3.79
1955	304,139	1,157,813	3.86
1956	307,821	1,110,434	3.61

[1] Includes both surface and underground workers.

Collieries of British Columbia, 1956—Production and Distribution, by Collieries and by Districts (in Short Tons)

Mine	Gross Output	Washery Refuse	Net Output	Used under Companies' Boilers, etc.	Used in Making Coke	Stocks				Sales				Total Coal Sold and Used[1]
						On Hand First of Year	On Hand Last of Year	Added To	Taken From	In Canada	In U.S.A.	Elsewhere	Total Sales	
Vancouver Island District														
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Canadian Collieries (Dunsmuir) Ltd.—Tsable River Colliery	195,081	28,838	166,243	389	...	13,894	12,874	...	1,020	166,485	389	...	166,874	167,263
Chambers No. 5 mine	1,562	...	1,562	...	...	...	...	...	...	1,562	...	...	1,562	1,562
Loudon No. 6 mine	735	...	735	...	...	...	...	...	...	735	...	...	735	735
Lewis mine (Timberlands)	897	...	897	...	...	...	...	...	...	897	...	...	897	897
Carruthers and Wakelam No. 3	480	...	480	...	...	...	...	...	...	480	...	...	480	480
Stronach No. 2 mine	617	...	617	...	...	...	...	...	...	617	...	...	617	617
Wellington Blue Flame (Timberlands)	338	...	338	...	...	...	...	...	...	338	...	...	338	338
Undun mine	547	...	547	...	...	...	...	...	...	547	...	...	547	547
Big Flame mine	90	...	90	...	...	...	...	...	...	90	...	...	90	90
Totals, Vancouver Island District	200,347	28,838	171,509	389	...	13,894	12,874	...	1,020	171,751	389	...	172,140	172,529
Nicola-Princeton District														
Taylor Burson mine (Blue Flame)	3,078	...	3,078	...	...	...	...	...	...	3,078	...	...	3,078	3,078
Coldwater Coal mine	1,170	...	1,170	...	...	...	...	...	...	1,170	...	...	1,170	1,170
Mullin's strip mine (Blakeburn)	69,024	...	69,024	...	...	...	...	...	...	69,024	...	...	69,024	69,024
Totals, Nicola-Princeton District	73,272	...	73,272	...	...	...	...	...	...	73,272	...	...	73,272	73,272
Northern District														
Bulkley Valley Collieries	8,553	...	8,553	...	...	...	...	...	...	8,553	...	...	8,553	8,553
Reschke mine	3,105	...	3,105	...	...	...	...	...	...	3,105	...	...	3,105	3,105
Gething No. 3 mine	1,537	...	1,537	...	...	...	...	...	...	1,537	...	...	1,537	1,537
Totals, Northern District	13,195	...	13,195	...	...	...	...	...	...	13,195	...	...	13,195	13,195
East Kootenay District														
Crow's Nest Pass Coal Co. Ltd.—Elk River Colliery	299,182	30,718	268,464	4,355	5,548	...	1,149	1,149	...	238,859	18,553	...	257,412	267,315
Michel Colliery (underground and strip)	888,952	94,169	794,783	15,163	243,047	900	1,953	1,053	...	457,574	77,946	...	535,520	793,730
Coleman Collieries (strip)	114,450	17,282[2]	97,168	...	...	...	...	...	...	97,168	...	...	97,168	97,168
Totals, East Kootenay District	1,302,584	142,169	1,160,415	19,518	248,595	900	3,102	2,202	...	793,601	96,499	...	890,100	1,158,213
Coal														
Grand totals for Province	1,589,398	171,007	1,418,391	19,907	248,595	14,794	15,976	2,202	1,020	1,051,819	96,888	...	1,148,707	1,417,209
Coke														
Crow's Nest Pass Coal Co. Ltd.—Michel Colliery	189,212	...	189,212	...	...	15,850	6,387	...	9,463	128,276	70,399	...	198,675	...

[1] Includes coal used in making coke and coal used under company stationary and locomotive boilers, etc. [2] Estimated.

COLLIERIES OF BRITISH COLUMBIA, 1956—MEN EMPLOYED, DISTRIBUTION BY COLLIERIES AND BY DISTRICTS

Mine	Supervision and Clerical			Miners			Helpers			Labourers			Mechanics and Skilled Labour			Boys			Total Men Employed		
	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.
Vancouver Island District																					
Canadian Collieries (Dunsmuir) Ltd.—																					
Tsable River Colliery	13	1	14	119	......	119	......	......	......	64	9	73	18	6	24	......	......	......	214	16	230
Chambers No. 5 mine	......	1	1	4	......	4	......	......	......	......	......	......	......	......	......	......	......	......	4	1	5
Loudon No. 6 mine	......	1	1	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	1	3
Lewis mine (Timberlands)	1	......	1	1	......	1	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Carruthers and Wakelam No. 3	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Stronach No. 2 mine	1	......	1	2	......	2	......	......	......	......	1	1	......	......	......	......	......	......	3	1	4
Wellington Blue Flame (Timberlands)	......	......	......	1	......	1	......	......	......	......	......	......	......	......	......	......	......	......	1	......	1
Undun mine	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Big Flame mine	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Totals, Vancouver Island District	15	3	18	135	......	135	......	......	......	64	10	74	18	6	24	......	......	......	232	19	251
Nicola-Princeton District																					
Taylor Burson mine (Blue Flame)	1	......	1	5	......	5	......	......	......	1	1	2	......	......	......	......	......	......	7	1	8
Coldwater Coal mine	......	1	1	3	......	3	......	......	......	......	......	......	......	......	......	......	......	......	3	1	4
Mullin's strip mine (Blakeburn)	......	2	2	......	......	......	......	......	......	......	......	......	......	10	10	......	......	......	......	12	12
Totals, Nicola-Princeton District	1	3	4	8	......	8	......	......	......	1	1	2	......	10	10	......	......	......	10	14	24
Northern District																					
Bulkley Valley Collieries	2	2	4	8	......	8	9	......	9	......	2	2	1	1	2	......	......	......	20	5	25
Reschke mine	2	......	2	3	......	3	3	......	3	2	......	2	......	......	......	......	......	......	10	......	10
Gething No. 3 mine	......	......	......	3	......	3	3	......	3	1	1	2	......	......	......	......	......	......	7	1	8
Totals, Northern District	4	2	6	14	......	14	15	......	15	3	3	6	1	1	2	......	......	......	37	6	43
East Kootenay District																					
Crow's Nest Pass Coal Co. Ltd.—																					
Elk River Colliery	21	17	38	121	......	121	28	......	28	21	22	43	34	36	70	......	......	......	225	75	300
Michel Colliery (underground)	41	40	81	233	......	233	89	......	89	22	106	128	79	74	153	......	2	2	464	222	686
Michel Colliery (strip)	......	6	6	......	......	......	......	......	......	......	28	28	......	10	10	......	......	......	......	44	44
Coleman Collieries (strip)	......	2	2	......	......	......	......	......	......	......	4	4	......	12	12	......	......	......	......	18	18
Totals, East Kootenay District	62	65	127	354	......	354	117	......	117	43	160	203	113	132	245	......	2	2	689	359	1,048
Grand totals for Province	82	73	155	511	......	511	132	......	132	111	174	285	132	149	281	......	2	2	968	398	1,366

NOTE.—*U.*=*underground; A.*=*above ground; T.*=*totals.*

Coal-preparation Plants

There were no additions or extensive alterations made to existing plants in 1956. For full details of plants *see* 1954 Annual Report.

Coke-making

Coke is made at only one plant in the Province, that of the Michel Colliery, The Crow's Nest Pass Coal Company Limited, Fernie. There were no alterations or extensions made at this plant during the year. For full details *see* 1954 Annual Report.

Briquetting

In the third week of February, 1954, the first successful briquetting plant in the Province was brought into production on a twenty-four-hour basis at the Michel Colliery of The Crow's Nest Pass Coal Company Limited, Fernie. The plant comprises two Comarck-Greaves units and has a capacity of 50 tons per hour. It utilizes slack coal from both the Elk River and Michel Collieries. For further details of this plant *see* 1954 Annual Report.

LABOUR AND EMPLOYMENT

In 1956, 1,366 persons were employed in and about the coal mines of the Province, a decrease of 112 from 1955.

Because of the five-day week in force throughout the Province at the larger mines, and the legal holidays, the maximum number of working-days is 251. In the Vancouver Island District the one large mine, the Tsable River mine, worked 230 days. In the East Kootenay District the Michel and Elk River Collieries worked 248 and 239 days respectively.

COMPETITION FROM COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA

In 1956 the shipment of Alberta coal and briquettes to British Columbia totalled 860,329 and 32,535 tons respectively. The following table shows the amount of Alberta coal brought into British Columbia during the past ten years:—

Year	Short Tons	Year	Short Tons
1947	899,403	1952	1,021,484
1948	945,700	1953	859,385
1949	891,132	1954	891,194
1950	873,558	1955	932,764
1951	898,533	1956	860,329

Of the 1,148,707 tons of British Columbia coal marketed, 374,603 tons was sold for domestic and industrial use in Alberta, Saskatchewan, Manitoba, Ontario, and Yukon Territory; 385,811 tons was sold for railroad use in Canada; 96,888 tons was exported to the United States; and 4,790 tons was sold for ships' bunkers.

The amount sold for domestic and industrial use in the Province was 286,615 tons.

ACCIDENTS IN AND AROUND COAL MINES

In 1956 six fatal accidents occurred, as compared with five in 1955. The number of fatal accidents per 1,000 persons (underground and strip-mine personnel) employed was 4.39, compared with 3.38 in 1955, 0.69 in 1954, 3.22 in 1953, 1.78 in 1952, 3.11 in 1951, 2.21 in 1950, 0.43 in 1949, 2.04 in 1948, and 0.82 in 1947. The average for the ten-year period was 2.06.

The number of fatal accidents per 1,000,000 gross tons of coal (underground and strip-mine coal) produced in 1956 was 3.77, compared with 3.44 in 1955.

The following table shows the collieries at which fatal accidents occurred in 1956, with comparative figures for 1955:—

Name of Company	Name of Colliery	1956	1955
The Crow's Nest Pass Coal Co. Ltd.	Michel Colliery	2	1
The Crow's Nest Pass Coal Co. Ltd.	Elk River Colliery	2	4
Canadian Collieries (Dunsmuir) Ltd.	Tsable River	2	----
Totals		6	5

The following three tables classify the fatal accidents in coal mines as to cause, quantity of coal per accident, and inspection districts:—

Fatal Accidents Classified as to Cause

Cause	1956		1955	
	Number	Per Cent	Number	Per Cent
By falls of roof and coal	1	16.67	2	40.00
Collapse of roof supports	2	33.33	----	----
Asphyxiated by outburst of coal	----	----	2	40.00
Haulage (underground)	1	16.67	1	20.00
Switching railroad cars	2	33.33	----	----
Totals	6	100.00	5	100.00

Fatal Accidents, Underground Mines, Classified as to Quantity of Coal Mined

Cause	1956		1955	
	Number of Fatal Accidents	Coal Mined per Fatal Accident	Number of Fatal Accidents	Coal Mined per Fatal Accident
		Tons		Tons
By falls of roof and coal	1	1,110,434	2	578,906
Collapse of roof supports	2	555,217	----	----
Asphyxiated by outburst of coal	----	----	2	578,906
Haulage (underground)	1	1,110,434	1	1,157,813
Switching railroad cars	2	555,217	----	----
Totals	6	185,072	5	231,562

Note.—There were no fatal accidents in strip-mining operations in the years 1956 and 1955.

Fatal Accidents Classified as to Inspection Districts

District	Number of Deaths from Accidents					Totals	
	Falls of Roof and Coal	Collapse of Roof Supports	Asphyxiated by Outburst of Coal	Haulage (Underground)	Switching Railroad Cars	1956	1955
Vancouver Island	1	1	----	----	----	2	----
Nicola-Princeton	----	----	----	----	----	----	----
East Kootenay	2	1	2	2	2	4	5
Northern	----	----	----	----	----	----	----
Province, 1956	1	2	----	1	2	6	----
Province, 1955	2	----	2	1	----	----	5

RATIO OF FATAL ACCIDENTS, UNDERGROUND MINES

District	Accident Death Rate			
	Per 1,000 Persons Employed		Per 1,000,000 Tons of Coal Mined	
	1956	1955	1956	1955
Vancouver Island	8.03	—	9.98	—
Nicola-Princeton	......	—	......	—
East Kootenay	4.05	4.64	4.53	5.54
Northern	......	—	......	—
Province, 1956	4.65	—	5.43	—
Province, 1955	......	3.55	—	4.32

In 1956 there were six fatal accidents at the mines in the Province, two of which occurred above ground and four underground.

On January 21st, 1956, at about 1.30 a.m., Andrew Paskewitch, Polish, aged 55, married, and employed as a loaderman on the surface at the Michel Colliery, was fatally injured when he was crushed between two railway cars. He died on arrival at the hospital about 2.05 a.m.

Paskewitch was in the act of lowering a loaded gondola of coke on the No. 2 track to three loaded stationary cars about 300 feet below the coke tipple on No. 1 track. He was riding on the forward platform of the moving car in order to operate the brake wheel. When the cars came together the couplings did not engage, thus allowing the ends of the cars to come very close together and crush Paskewitch. He received severe injuries in the region of the pelvis and abdomen.

Investigation of the accident revealed that the last of the three cars, which had been lowered on the No. 3 track on the previous shift, had not cleared the No. 3 track switch, thus allowing a deviation in the alignment of the two cars of about 18 inches, an amount sufficient to allow the couplings to by-pass one another instead of connecting.

On March 14th, 1956, at about 9.25 a.m., Duane Pelletier, Canadian, aged 21 years, single, and employed as a rope-rider at No. 9 mine, Elk River Colliery, was apparently killed instantly when he was run over by a trip of five loaded cars on No. 5 slope.

There was no witness to the actual accident, but investigation immediately following the arrival of the trip at the top of the slope without a rope-rider led to finding Pelletier's body 43 feet above a curve at the lower section of the slope. The body was found partly on the track and appeared to have been run over by some of the cars. There were indications that the cars had been derailed 16 feet above the curve (or 27 feet below where the body was found); the deceased's pocket watch and smashed helmet was found at this point.

Apparently Pelletier was riding on the front bumper of the first car and for some unknown reason, possibly the derailment, fell off and was run over by the trip. The trip was travelling very slowly and the clearances in the area were normal.

On June 21st, 1956, at about 8 p.m., Donald Winters, Canadian, aged 26 years, married, and employed as a box-car handler at the Michel Colliery was apparently killed instantly when he was crushed between two railway cars at the Michel Colliery preparation plant.

From evidence brought out at the investigation, Winters had dropped a car down from No. 6 track and it stuck on the switch leading to No. 5 track. Failing to move the car by the use of pinch-bars, Winters then attempted to move it by bumping it with the next car in line. He rode the front end of the car used for this purpose and was apparently crushed between the brake wheels of the two cars as the cars came into contact. The couplings of the two cars did not engage because the cars were not in alignment.

On July 6th, 1956, at about 7.30 p.m., Henry L. Ellison, aged 59, married, and employed as a miner by Canadian Collieries (Dunsmuir) Limited, was fatally injured when he was struck by a fall of face coal in the Tsable River mine.

Ellison and his partner were engaged in putting up a set of timber at the face of a crosscut. The left-hand leg had been put up and secured and Ellison had just taken a measurement for the right-hand leg. He turned away from the face when a large piece of coal sloughed off the face and struck him on the lower back. He was removed to the Cumberland General Hospital immediately and, on the advice of the doctor, was taken to the Vancouver General Hospital the following morning. He died on July 14th, 1956, at about 1.15 a.m.

Ellison and his partner had tested the face prior to commencing to erect the set of timber and had found it, in their judgment, to be sound. The crosscut was partly surrounded by gob area, and it is thought probable that the ever-present squeeze accompanying pillar extraction had induced a slip in the coal parallel and ahead of the face. This would account for the coal sloughing off.

On November 5th, 1956, at about 10.20 p.m., Herman Hula, German, aged 29 years, married, and employed as a miner in No. 9 mine, Elk River Colliery, was apparently instantly killed by a fall of ground when the supporting timbers collapsed.

Hula and his partner were engaged in extracting a pillar by skipping or slabbing a pillar on the advance. The skip was about 10½ feet wide and had been advanced approximately 50 feet on the low side pillar of No. 16 room, No. 1 slope section, when the last three sets of timber at the face collapsed, resulting in a fall of ground that buried both men. A slip in the roof contributed to the accident.

On December 31st, 1956, at about 8 p.m., Frank E. Dixon, aged 40 years, Canadian, married, and employed as a fireboss at the Tsable River mine by Canadian Collieries (Dunsmuir) Limited, was fatally injured when he was struck by a fall of ground.

The accident occurred at the face of the crosscut off No. 2 Right level, No. 1 slope section, where preparations were being made to drive a counter level to the right and left off the crosscut simultaneously. The last three sets of timber had been underlined by two bridge-sticks, the legs of which were 3½ feet apart at the face of the crosscut and 10½ feet apart at the outer end. This tapering of the bridge-sticks was made in order to allow room for the Joy loader to operate efficiently to the right and left from the crosscut in starting off these places. On the day prior to the accident the right legs of the three supported sets were removed and a round of shots drilled and blasted to form the opening cut of the level to the right. On the day of the accident the three left legs of these sets were removed and a round drilled in the left side. As far as could be determined, the collar bracing was not replaced when any of the legs were removed.

Dixon, the fireboss, with the assistance of three miners was at the face loading the round, when suddenly, and without warning, the three last sets of timber together with their supporting bridge-sticks collapsed. Dixon was buried and fatally injured. Of the other three men, one suffered a broken ankle.

Including the foregoing fatal accidents, 352 accidents involving loss of seven days or more were reported to the Department by the management of the various mines. All those accidents were investigated and reported on by the District Inspectors of Mines.

The following three tables classify the accidents in coal mines in 1956 as to occupation of the men involved, as to cause, and as to injury. The fatal accidents are included in the totals:—

Accidents Classified as to Occupation

Occupation	Number of Accidents	Percentage of Accidents
Underground—		
Miners	166	47.16
Drillers and facemen	----	----
Haulage and conveyormen	78	22.16
Trackmen and mechanics	17	4.83
Supervisors	13	3.69
Timbermen	8	2.27
Coal-cutters	2	0.57
Miscellaneous	9	2.56
Surface—		
Shops	9	2.56
Surface	25	7.10
Preparation and coke-ovens	24	6.82
Miscellaneous	1	0.28
Totals	352	100.00

Accidents Classified as to Cause

Cause	Number of Accidents	Percentage of Accidents
Fall of ground	51	14.49
Fall of material and flying material	54	15.34
Lifting and handling equipment and material	95	26.99
Machinery and tools	52	14.77
Slipped and tripped	66	18.75
Falling off staging and platforms	12	3.41
Miscellaneous	22	6.25
Totals	352	100.00

Accidents Classified as to Injury

Injury	Number of Accidents	Percentage of Accidents
Head and neck	22	6.25
Eyes	8	2.28
Trunk	61	17.33
Back	47	13.35
Arms	20	5.68
Hands and fingers	74	21.02
Legs	84	23.86
Feet	29	8.24
Toes	7	1.99
Totals	352	100.00

EXPLOSIVES

The following table shows the quantity of explosives used in underground coal mines in 1956, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average number of pounds of explosive per shot fired (these quantities include all the explosives used for breaking coal and rock work in coal mines):—

Vancouver Island District

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Tsable River Colliery	91,675	195,081	122,900	2.13	0.75
Chambers No. 5 mine	1,250	1,562	1,900	1.25	0.66
Loudon No. 6 mine	1,300	735	1,400	0.56	0.93
Lewis mine (Timberlands)	1,400	897	1,000	0.64	1.40
Carruthers and Wakelam No. 3	500	480	650	0.96	0.77
Stronach No. 2 mine	450	617	500	1.37	0.90
Wellington Blue Flame mine	300	338	500	1.13	0.60
Undun mine	400	547	850	1.36	0.47
Big Flame mine	120	90	100	0.75	1.20
Totals for district	97,395	200,347	129,800	2.05	0.75

Nicola-Princeton District

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Taylor Burson mine (Blue Flame)	1,500	3,078	1,400	2.05	1.07
Coldwater Coal mine	1,100	1,170	660	1.06	1.67
Totals for district	2,600	4,248	2,060	1.63	1.26

Northern District

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Bulkley Valley Collieries	7,000	8,553	6,200	1.22	1.12
Reschke mine	1,550	3,105	1,500	2.00	1.03
Gething No. 3 mine	1,500	1,537	3,000	1.02	0.50
Totals for district	10,050	13,195	10,700	1.31	0.94

East Kootenay District

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Elk River Colliery	3,567	299,182	4,855	83.88	0.74
Michel Colliery (underground)	110,200	583,462	100,820	5.29	1.08
Totals for district	113,767	882,644	105,675	7.75	1.07

Province

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Totals for Province	223,812	1,100,434	248,235	4.91	0.90

Quantity of Different Explosives Used

	Lb.
Monobel of different grades	116,929
Permissible rock powder	6,883
Total	123,812

MACHINE-MINED COAL

In 1956, mining-machines produced approximately 31,553 tons or 20 per cent of the total output from underground mining. A total of 488,964 tons of strip-mined coal was removed by mechanical means.

District	Machines Driven by—		Type of Machine Used	
	Electricity	Compressed Air	Chain Undercutting	Rotary
Vancouver Island	—	—	—	—
Nicola-Princeton	—	—	—	—
Northern District	2	—	2	—
East Kootenay	1	1	1	1
Totals	3	1	3	1

In addition to the above, 211 air picks were used in the mines of The Crow's Nest Pass Coal Company Limited.

SAFETY LAMPS

There were 1,331 safety lamps in use in the mines of the Province. Of this number, 120 were flame safety and 1,211 were approved electric lamps, mostly of the Edison type.

Approved Safety Lamps—Electric and Flame

The following is a list of approved safety lamps, electric and flame:—

- The Wolf lamp, flame type.
- The Koehler lamp, flame type.
- The Edison electric lamp (cap) as Approval No. 18 of the United States Bureau of Mines, and all Edison lamps up to and including Model P, carrying the Approval Certificate No. 26 of the United States Bureau of Mines; Model R-4, Approval No. 29.
- The Wheat electric lamp and having Approval No. 20, as issued by the United States Bureau of Mines.
- The Wolf electric lamp, No. 830c.
- The electric lamp manufactured by the Portable Lamp and Equipment Company, under Approval No. 27 of the United States Bureau of Mines.
- M.S.A. single-cell trip lamp, carrying United States Bureau of Mines Approval No. 1009, approved for use on haulage trips in mines.
- The Davis M.L. model pneumatic electric lamp.

ELECTRICITY

Electricity is used for various purposes on the surface and underground at six collieries. A total of 15,887 horsepower was used in and about these mines. Detailed information as to how and where this power is used is given in the report of the Electrical Inspector of Mines.

VENTILATION

Information regarding the quantity of air passing in the main airways and working-places in the various mines is given in the reports of the District Inspectors. Blasting operations are not allowed in working-places where methane can be detected by the use of a flame safety lamp. The ventilation in general, as found during inspection visits, was adequate to meet requirements.

METHANE DETECTION

The principal methods used to detect small percentages of methane in the mines are by the use of the M.S.A. detector and by gas analysis.

Regular tests are made on every shift in the working-places and the roadways by the firebosses and other certified mine officials, principally by means of the flame safety lamp. Every candidate for a miner's certificate must show, over and above the other necessary qualifications, that he has a thorough knowledge of the flame safety lamp, of handling it safely, and of the method of testing for methane before he is given a certificate.

AIR-SAMPLING

In addition to regular tests made by use of the flame safety lamp and methane detectors, the Inspector of Mines in each district takes mine-air samples regularly in main return airways and return airways of the various splits, so that a complete record may be kept of the condition of the air passing through the mine. Air samples are also taken by the Inspector and mine officials when there is an abnormal issuance of gas in working-places, and to ascertain the condition of the atmosphere in gob areas and old workings.

INSPECTION COMMITTEES

The provisions of the "Coal-mines Regulation Act," section 65, General Rule 19, require that an inspection committee of workmen shall inspect the mine regularly on behalf of the workmen and make a true report of the conditions found. In all the larger mines of the Province this rule is fully observed, and copies of the report are sent to the Inspector for the district. The work of these committees is valuable and assists in furthering the interests of safety at the various mines.

COAL DUST

The danger of accumulations of coal dust on the roadways and in the working-places is fully realized, and as a rule the regulations regarding the control of coal dust are adequately carried out. Large quantities of limestone dust are used continually in the larger mines to combat this hazard. It is used in the roadways, working-places, and for the tamping of shots.

Dust samples are taken regularly from roof, sides, and floor of mine roadways and analysed. The reports of the analyses are forwarded to the District Inspector each month.

DIESEL LOCOMOTIVES

Early in August, 1950, the first diesel underground locomotive to be used in any mine in British Columbia made its trial runs in No. 9 mine, Elk River Colliery, The Crow's Nest Pass Coal Company Limited.

The locomotive is a 15-ton 100-horsepower North British type and is fully permissible for use in coal mines. This locomotive is still in use at the Elk River Colliery. Two 75-horsepower diesel locomotives were purchased in 1956 for use in hauling the output from the "A" North mine to the tipple at the Michel Colliery.

MILLISECOND DELAY DETONATORS

In February, 1951, an amendment to the "Coal-mines Regulation Act" was passed to allow, with the permission of the Chief Inspector of Mines, more than one shot to be fired at a time in any coal mine or district of a mine. For further details *see* 1954 Annual Report.

DANGEROUS OCCURRENCES

On January 3rd, 1956, at 10.30 p.m., a trip of seven loaded cars was being lowered on the surface incline at No. 1 East mine, Elk River Colliery, when the link of a coupling broke and six cars ran out of control. A derailment switch near the bottom of the incline failed to stop the cars, and they crashed into a trip standing on the parting at the bottom of the incline. One workman was seriously injured on the parting and eleven cars were severely damaged. Fifty feet of snowshed was demolished.

On February 13th, 1956, traces of smoke and carbon monoxide were noticed issuing from a caved gob area in the No. 3 Room west section, No. 1 East mine, Elk River Colliery. Efforts to find the seat of the heating failed, and it was decided to seal off the area as soon as possible. This was successfully accomplished two days later, the final sealing having been carried out by a mine-rescue team equipped with self-contained breathing apparatus.

On February 28th, 1956, a large snowslide at Elk River Colliery caused extensive damage and disrupted operations at No. 1 East mine and a portion of No. 9 mine for several days. No one was injured. The slide originated at a high altitude on the mountainside across a ravine from No. 9 mine, and in its travel completely buried and damaged the fan used for ventilating the No. 1 slope section of No. 9 mine. The slide then travelled down the ravine for 1,500 feet, demolishing a locomotive-shed and part of a bridge on No. 4 landing. A steam locomotive which was in the shed was swept down the ravine for 100 feet and extensively damaged, and a 20,000-gallon-capacity water-tank below the bridge was demolished.

On June 9th, 1956, a trip of nine empty cars was being lowered on the diagonal slope, Tsable River mine, when the leading three cars became uncoupled and ran out of control. At the point of derailment the runaway cars knocked out five sets of timber and caused a cave of about fifty cars of rock.

On July 20th, 1956, a gob fire was discovered in the No. 3 Left belt-road section of "A" West mine, Michel Colliery. The fire was in a caved gob area on No. 7 Raise. Due to the steep pitch of the seam and the caved condition in the area, it was considered too dangerous to attempt to load out the fire. Immediate steps were taken to seal off the fire area, and this was accomplished in three days.

On October 5th, 1956, at Michel Colliery, thirty-five cars of coal ran out of control from "A" West mine gathering parting and travelled the length of the main rock tunnel to near the portal, where they collided with a standing trip. Two of the cars were extensively damaged, and the armour of an electric cable suspended alongside the tunnel was slightly damaged. No one was injured.

BUMPS AND OUTBURSTS

On March 7th, 1956, at 3 a.m. a severe bump occurred on the No. 3 Raise in "B" South mine, Michel Colliery, and caused considerable damage to the roadway. The floor of the roadway was heaved nearly to the roof for a length of over 100 feet, trapping two men inside the area for about two hours. One of the men was slightly injured. The bump is attributed to excessive pressures building up on the roadway pillars following large-scale pillar extraction.

PROSECUTIONS

John Yarovich, carpenter, Michel Colliery, was prosecuted on April 3rd, 1956, under Rule 112 of the Crow's Nest Pass Coal Company's "Special Rules" for subjecting himself and a fellow-workman to a danger that was not necessary in the course of his occupation. He was found guilty and fined $20 and $30.50 costs.

Charles Koska, Jr., miner, Michel Colliery, was prosecuted on May 17th, 1956, under Rule 7 of the Crow's Nest Pass Coal Company's "Special Rules" for not complying with the instructions of an official. He was found guilty and fined $10 and $5 costs.

SUPERVISION OF COAL MINES

During 1956 seventeen companies operated twenty-six mines, employing 968 men underground. In the supervision of underground employees there were 4 managers, 15 overmen, 2 shiftbosses, and 65 firebosses, or approximately 1 official for every 11 men.

"COAL SALES ACT"

LIST OF REGISTERED NAMES OF BRITISH COLUMBIA COALS, APPROVED BY THE CHIEF INSPECTOR OF MINES, IN ACCORDANCE WITH THE PROVISIONS OF THE "COAL SALES ACT."

Registered Name of Coal	Colliery and Location	Producing Company
Comox	Tsable River mine, Comox Colliery (Cumberland)	Canadian Collieries (D.) Ltd.
Hi-Carbon	Mixture of Canadian Collieries coal and B.C. Electric coke	Canadian Collieries (D.) Ltd.
Old Wellington	No. 9 mine (Wellington)	Canadian Collieries (D.) Ltd.
Chambers-Extension	Chambers-Extension	R. H. Chambers.
Cassidy-Wellington	Cassidy mine (Cassidy)	A. H. Carroll.
Taylor Burson	Blue Flame No. 2 mine (Princeton)	Taylor Burson Coal Co. Ltd.
Hat Creek	Hat Creek (Lillooet)	Canada Coal and Development Co. Ltd.
Bulkley Valley	Bulkley Valley (Telkwa)	Bulkley Valley Collieries.
Crow's Nest, Elk River	Elk River (Coal Creek)	Crow's Nest Pass Coal Co. Ltd.
Crow's Nest, Michel	Michel (Michel)	Crow's Nest Pass Coal Co. Ltd.
Coldwater	Coldwater No. 3 mine (Merritt)	S. Gerrard.
Black Prince	Black mine (Princeton)	R. B. Savage.
Bowron River Coal	Bowron River mine (Prince George)	Central Industries Ltd.
Comac	Tsable River Colliery (Cumberland) and McLeod River Colliery (Alberta)	Canadian Collieries (D.) Ltd.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE SURVEYORS' CERTIFICATES

The Board of Examiners, formed on July 10th, 1919, consists at present of H. C. Hughes, Chief Inspector of Mines, chairman; Edward R. Hughes, Inspector of Mines, member; and Robert B. Bonar, Senior Inspector of Mines, secretary and member.

The meetings of the Board are held in the office of the Department of Mines in Victoria. The examinations are held in accordance with the amended rules of the Board of Examiners and approved by the Minister. The examinations are held at least once a year, and more often if necessary. Regular examinations were held in 1956 on the following dates: May 9th, 10th, and 11th at the Fernie centre.

The total number of candidates at these examinations was as follows: For third-class certificates, 3 (3 passed); for mine surveyors' certificates, 1 (failed).

The following were the successful candidates: Third class—Silvio Maio, Hugh Quintilio, and Simon Vanderjagt.

In addition to the above, an interchange certificate was granted without full examination to the following candidate who held coal-mine official certificates of equal rating from other Provinces or from Great Britain: Third class—Henry A. France.

All officials, before engaging in multiple blasting with millisecond delay detonators, are required to obtain a permit to do so from the Board of Examiners (Coal-mine Officials). This permit is issued only after the applicant has successfully passed oral and practical examinations in such work.

EXAMINATIONS FOR CERTIFICATES OF COMPETENCY AS COAL-MINERS

In addition to the examinations and certificates already specified as coming under the Board of Examiners, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. Examinations are held regularly in coal-mining districts, and no certificate is granted where the candidate has failed to satisfy the Board as to his fitness, experience in a coal mine, and a general working knowledge of the English language.

During 1956 there were 103 candidates for coal-miners' certificates, six of whom were unsuccessful.

In addition to the certificates granted above, substitute certificates were issued to those who had lost their original certificates.

Permits to act as coal-miners, as provided by the Act, have been granted to younger men by Inspectors in their respective districts. This method allows promising men with less than one year's experience underground to work at the coal face as miners under the guidance of an experienced miner.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises for holding examinations where necessary.

NOTES ON COAL MINES

VANCOUVER ISLAND INSPECTION DISTRICT

By R. B. Bonar

The gross output of coal from the Vancouver Island Inspection District was 200,347 tons, a decrease of 9,437 tons or 4.49 per cent from the 1955 output. Only one large coal mine, the Tsable River mine, is now in production on the Island. Operations in the once important Nanaimo coalfield are now restricted to seven very small mines, providing employment for no more than twenty-one men. These mines operate in outcrop, pillars, and barriers left during earlier working.

The Island coal-mining industry has suffered a rapid decline in the past few years. Production has declined by as much as 60 per cent since 1951. This condition has resulted from loss of markets due to competition from other fuels, high costs of production, and from the depletion of reserves in the Nanaimo coalfield. However, indications are that the bottom of the decline has been reached, and that a levelling-off of production will take place in the next few years.

In 1956 there were six accidents classified as serious, five of which occurred underground at the Tsable River mine and one on the surface at Union Bay. Two of the five accidents that occurred underground were fatal.

In addition to these, forty-three minor accidents were reported and investigated. There were no dangerous occurrences in the coal mines of the Island.

The annual mine-rescue and first-aid meet organized by the Vancouver Island Branch of the British Columbia Mine Safety Association was held at Cumberland on Saturday, June 9th. Two teams from Tsable River mine and a visiting team from Copper Mountain mine participated in the mine-rescue competition, and a very high standard of performance was maintained. The winning team was the Copper Mountain team, captained by Luke Kirby.

Nanaimo (49° 123° S.W.)

Chambers No. 5 Mine, Extension

R. H. Chambers and associates, operators; R. H. Chambers, manager. This mine is in Section 14, Range 7, in the Douglas district, near Extension. The area was first opened up as a stripping operation in the latter part of 1952 and comprised a small section of the Wellington seam lying close to the surface in the vicinity of the old Vancouver slope workings. By the end of 1954 all available surface coal was depleted, and early in January, 1955, the present slope was started to test the continuity of the seam underground. At the end of 1955 the slope had reached a point about 400 feet from the portal in coal which varied in thickness from 6 to 8 feet. Rooms started to the left off the slope were cut off by a fault which was found to converge on the slope. To offset this convergence, the slope was turned to the right to parallel the fault. Several rooms were started to the right off the slope in 1955 and 1956, but were driven only a short distance, as most of the work has been concentrated on driving the slope to its limit with the object of extracting the coal on the retreating system. At the end of the year the slope had reached a distance of 626 feet from the portal and had 7 to 8 feet of coal at the face.

The coal is mined by picking out the middle band of carbonaceous shale with hand-picks. It is then blasted and hand-loaded into cars which are hauled to the tipple by a gasoline-driven hoist. A small shaker screen sorts the coal into over 2-inch, 1- to 2-inch, and under 1-inch sizes.

Total production in 1956 was 1,562 tons over a working period of 119 days, with a crew of five men. Working conditions were found to be satisfactory in the course of inspections. One accident was reported and investigated.

Lewis Mine (Timberlands)

Glyn Lewis, operator and fireboss. This property comprises two small mines operating in the Wellington seam in a small area of outcrop coal that was left when No. 8 mine was abandoned by Canadian Collieries (Dunsmuir) Limited. The seam outcrops on the side of a ridge parallel to and immediately south of the Nanaimo River valley at an elevation of 540 feet above sea-level. The coal measures dip southward at 8 degrees. The two mines are one-third of a mile apart.

The new mine, which commenced production in May, 1951, is in Range 1, Section 2, of the Cranberry district. It is operated in the Wellington seam in an area of coal outcrop about 1 acre in extent, which is bounded on the west by a thrust fault that also formed the western boundary of the old No. 8 mine. The seam is 6 feet thick, including two thin rock bands.

The coal is blasted off the solid and hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. A shaker screen sorts the coal into lump, nut, and pea sizes. Total production in 1956 was 897 tons over a working period of 286 days, with a crew of two men. Working conditions were found to be satisfactory, and no accidents were reported.

Blue Flame Mine, Wellington (Timberlands)

F. Vlasich, operator and fireboss. This mine is on Lot 194 in the Bright district, about 600 feet west of the Timberlands road and 16 miles by road from Nanaimo. It operates in the western outcrop of the Wellington seam about half a mile south of the Nanaimo River. The coal averages from 2 to 3 feet thick and is overlain by a bed of mudstone ranging from 10 inches to 2½ feet thick.

Total production in 1956 was 338 tons over a working period of eighty-one days with a crew of two men. Conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

Due to depletion of reserves this mine was permanently abandoned in November, 1956.

Undun Mine

J. Unsworth and A. Dunn, operators; A. Dunn, fireboss. This mine, which was brought into production in August, 1954, is three-quarters of a mile northwest of the village of Extension. It operates in the Wellington seam, and the output comes from the mining of pillars and small areas of coal left near the outcrop in the workings of the old Extension No. 6 mine. The Wellington seam is variable in thickness, but the coal is of excellent quality. The measures dip about 10 degrees southwest. The roof is a strong conglomerate.

The coal is blasted off the solid and hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. Production in 1956 amounted to 547 tons over a working period of 148 days, with a crew of two men. Working conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

Big Flame Mine

Albert Addison, operator. This mine is in Range 5, Section 13, of the Cranberry district. Reopening of this mine, formerly known as the Clifford mine, was commenced early in 1955. It operated about eighty days during 1956 with a working crew of two men. Ninety tons of coal was produced. At the end of the year the mine was inoperative. No accidents were reported.

NORTH WELLINGTON (49° 124° S.E.)

Loudon No. 6 Mine

W. Loudon and associates, operators; W. Loudon, fireboss. This mine is about 1 mile southeast of Wellington and has been opened up by a slope driven in a small area of outcrop coal in the No. 2 Upper Wellington seam adjacent to the old No. 9 mine workings.

The coal is blasted off the solid and hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. Production in 1956 amounted to 735 tons over a working period of 156 days with a crew of three men. Working conditions were found to be satisfactory during the course of inspections, and no accidents were reported.

Carruthers and Wakelam No. 3 Mine

R. B. Carruthers and W. Wakelam, operators; R. B. Carruthers, fireboss. This mine, near the Loudon mine, is also in the No. 2 or Upper Wellington seam adjacent to the abandoned workings of the old No. 9 mine. Production in 1956 amounted to 480 tons over a working period of 198 days with a crew of two men. Working conditions were found to be satisfactory in the course of inspections. No accidents were reported.

Stronach No. 2 Mine

Charles Stronach, operator; H. Gilmour, fireboss. This mine is in a section of the No. 2 or Upper Wellington seam adjacent to the old No. 9 mine. All of the output comes from the mining of pillars and small areas of coal left in the early workings. Production in 1956 amounted to 617 tons over a period of 171 days with a crew of four men. Working conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

Comox (49° 124° N.W.)

Canadian Collieries (Dunsmuir) Limited.—Head office, 355 Burrard Street, Vancouver. F. Ronald Graham, chairman of the board; R. Whittall, president; E. O. T. Simpson, vice-president, mining; W. W. Johnstone, district superintendent. In 1956 this company operated one mine on Vancouver Island, the Tsable River mine.

Tsable River Mine.—S. J. Lawrence, manager; T. Ecclestone, overman; L. Cooper, A. Cullen, and A. Somerville, shiftbosses; W. Bennie, J. Cochrane, F. Dixon, M. Frobisher, W. High, L. Hutchinson, C. Lewis, G. Nicholas, and J. Thomson, firebosses.

The layout and method of operating this mine are fully described in the 1954 Annual Report. In 1956 production came from the extraction of pillars formed by earlier development in the seam and from development work in the northeast section beyond the second fault system. This latter section, which was penetrated by an inclined rock tunnel near the end of 1955, has been rapidly expanded in spite of the difficulties encountered when penetrating a downthrow fault of varying displacement that was met by the two levels driven from the top of the rock tunnel.

Two slopes are being driven in the seam—one on either side of the downthrow fault. The seam at the face of the slopes is of normal height and clean, but the roof, probably due to the near presence of the fault, has numerous slips and joints and requires closer timbering than is usually required.

All the coal, both in development and pillar-extraction workings, is blasted off the solid. Electrical multiple blasting with millisecond delay detonators is used throughout the mine. Totals of 91,550 pounds of Monobel No. 4 explosive and 122,900 detonators were used during the year.

Total production in 1956 amounted to 195,081 tons over a working period of 230 days, with a crew averaging 214 men underground and sixteen on the surface.

Conditions at the mine have usually been found to be satisfactory in the course of inspections.

First-aid arrangements have been maintained at a satisfactory standard. A suitably equipped first-aid room is provided on the surface, and an ambulance car is held in readiness for emergencies. Five employees hold industrial first-aid certificates, and twenty-four employees hold other first-aid certificates. Two mine-rescue teams of six men each are maintained, and these attend periodic practices at the Cumberland mine-rescue station.

Forty-eight accidents were reported and investigated, six of which were classed as serious, including two fatal accidents. This represents a decrease of 23.8 per cent in the number of lost-time accidents compared with 1955, and is due to the maintaining of the intensified safety programme put into effect by the management. The management is ably assisted and advised in this work by the director of the Safety Division of the British Columbia Mining Association.

Regular inspections of the mine were made each month by the inspection committee appointed by the workmen, and copies of its reports were forwarded to the office by the District Inspector through the courtesy of this committee.

NICOLA-PRINCETON INSPECTION DISTRICT

By E. R. Hughes

Three mines were operated in this district in 1956, and the output of coal totalled 72,567 tons. This was a slight decrease from the amount produced in 1955. As before, the chief producer was the Mullin strip mine at Blakeburn, and the coal from this property was almost entirely used at The Granby Consolidated Mining Smelting and Power Company Limited steam-electric power plant at Princeton. Taylor Burson Coal Company Limited discontinued operating the Blue Flame mine in May, and the property was later operated by some of the former employees. The Coldwater Coal mine at Merritt continued to be operated on a small scale and produced coal chiefly for local domestic use. Continued search for a commercial coal seam was reported to have been made without success on Lot 377, which is held by B. Vittori and N. F. Robb, in the vicinity of Blakeburn. The lease held by the late C. H. Jackson, covering the south half of Lot 88 and the southeast quarter of Lot 86, 4½ miles southwest of Princeton, was surrendered, and in its stead Coal Licence No. 124, covering only the south half of Lot 88, was, on November 26th, issued to his son, Charles Jackson. No development work was reported from Cliffview Colliery Limited at Enderby, nor from the White Lake coalfield on which Coal Licences Nos. 67 and 68, covering 2 square miles, are held by John Lutin. Wilson Mining Corporation Limited did not renew title to eight coal leases containing a total of 4,336 acres in the southern part of the Princeton coalfield, but continues to hold Lease No. 38 covering 630 acres, in which is the Blue Flame mine. No work was reported to have been done in the Hat Creek coal area, where Inland Resources Company Limited hold Coal Licence No. 12, comprising 640 acres, as well as additional coal lands that have been Crown granted.

No compensable accidents were reported, nor were there any prosecutions under the "Coal-mines Regulation Act" during the year. One dangerous occurrence took place when a fire completely destroyed the tipple at the portal of the Blue Flame No. 2 mine on September 3rd.

The Similkameen Valley Mine Safety Association held its twenty-sixth annual field-day competitions at Princeton on Saturday, June 2nd. The mine-rescue competition was held in the forenoon at the Princeton Memorial Park, and the first-aid events were held in the auditorium at the Princeton school. The mine-rescue event was won by the Cumberland team, captained by W. High. A Copper Mountain team, captained by Luke Kirby, won the mine-rescue competition at Cumberland on June 9th. This team placed second at the interprovincial mine-rescue competition at Nelson on September 8th.

PRINCETON (49° 120° S.W.)

Taylor Burson Coal Company Limited

Blue Flame No. 2 mine.—James Fairley, overman; Thomas Bryden, fireboss. This mine is about 10 miles by road south of Princeton and about half a mile west of the Hope–Princeton Highway. It was decided to discontinue development, and activities were confined to the extraction of pillars in the No. 2 level workings. Due to the loss of the contract with the Granby Company, coal sales diminished to such an extent that the Taylor Burson Company discontinued production on May 20th. The property was then taken over by former employees operating under the name of Blue Flame Colliery Limited. The extraction of pillar coal was continued on a smaller scale, and the output was sold in the Princeton area. A fire, believed to be of spontaneous origin, totally destroyed the mine tipple on September 3rd. This was replaced with a small bar-screen tipple, which was adequate for the reduced output. Eighteen men were employed at the beginning of the year, but the number was later reduced to four.

Coalmont (49° 120° S.W.)

Blakeburn Strip Mine

Mullin's Strip Mine Ltd.—Edward Mullin, manager, Princeton. This company holds three coal licences covering 2½ square miles, which includes most of the area underlain by the abandoned workings of the former Coalmont Collieries Limited Nos. 3, 4, and 5 mines at Blakeburn. They are about 5 miles by road from the railway at Coalmont. The stripping of overburden and removal of coal continues to be confined to Lot 298, which overlies the old Blakeburn No. 3 mine. Overburden is shallow in this area, and the coal removed is that remaining between the outcrop and the old workings. A D-8 bulldozer is used to remove the overburden and the coal, and a TD-14 2-yard loader is used to load the coal, which is transported to the near-by tipple, where it is crushed and screened. The entire production is trucked to the Granby Company's steam-electric power plant near Princeton and the steam heating plants at Allenby and Copper Mountain. Fifteen men were employed, including nine truck-drivers. Operations were continuous throughout the year, and 68,531 tons of coal was produced. The largest monthly output was in November, when 7,613 tons was shipped.

Merritt (50° 120° S.W.)

Coldwater Coal Mines

This property, 1 mile south of Merritt, is operated by the owners, S. Gerrard and partners. Fireboss (on permit), S. Gerrard. Activities were again confined to the Coldwater No. 5 mine and consisted of splitting pillars and extracting remnants of coal left between the abandoned Middlesboro No. 5 mine and the surface, in the area adjacent to and west of the old water-tank and about 250 feet west of the portal of the old Middlesboro No. 4 mine. The seam is from 4 to 5 feet thick and includes two partings consisting of 3 inches of bone and 1 inch of hard shale. This is a coking coal. The coal is blasted from the solid and is hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. Ventilation is natural and is sufficient for this small operation. No methane has been detected in the mine workings. The total production in 1956 was 1,170 tons. In December 137 tons was produced and three men were employed.

EAST KOOTENAY INSPECTION DISTRICT

By D. R. Morgan

The net production of coal from the East Kootenay District during 1956 was 1,160,415 tons, an increase of 110,526 tons over the corresponding figure obtained in 1955. There were two companies in operation, and their activities were confined to the Crowsnest Pass area. The Crow's Nest Pass Coal Company, with mines at Michel and Coal Creek, produced 1,063,247 net tons, and Coleman Collieries Limited, operating a large strip mine on the interprovincial boundary on Tent Mountain, produced 97,168 net tons. Most of the mines were in operation throughout the year, but the production of both companies was curtailed early in the year by the loss of a number of working-days owing to the state of the coal market.

The accident record for the district in 1956 showed a slight improvement in the severity rate, but there was an increase in the frequency rate or total number of accidents. Sixteen serious accidents were reported under section 59 of the "Coal-mines Regulation Act," four of which resulted in the deaths of four men. There was one fatality less than in 1955, but there were four more serious accidents. Two of the fatal accidents occurred at the surface operations at Michel Colliery, and the other two occurred underground at the Elk River Colliery. Minor accidents which resulted in the loss of one or more days totalled 331, of which 272 occurred in the underground workings and fifty-nine on the surface. This was twenty-eight more than in 1955. All the accidents were investigated, and the serious accidents were classified as follows: Seven caused by falls of rock and coal (including one fatal); seven involving haulage and machinery (including one fatal); and two while lowering railway cars on surface sidings (both fatal). Seven dangerous occurrences were reported from the various mines and were investigated, and are described more fully under "Dangerous Occurrences." No accidents or dangeerous occurrences were reported from the stripping operation on Tent Mountain.

The East Kootenay Mine Safety Association held a successful mine-rescue and first-aid competition at Chapman Camp, near Kimberley, on June 23rd, and it was well attended. Six teams from Fernie, Michel, and Kimberley entered the mine-rescue competitions, and the British Columbia Department of Mines shield was won by the Kimberley No. 1 team, captained by T. O. Bloomer. In the first-aid competitions there were 110 entries, and the men's first-aid cup and shield were won by the Sullivan Mine No. 1 team from Kimberley, captained by A. Streich.

The Crow's Nest Pass Coal Company Limited

T. G. Ewart, president, Fernie; Thomas Balmer, vice-president, 305 Great Northern Railway Building, Seattle, Wash.; H. H. Gardner, general manager, Fernie; James Littler, general superintendent, Fernie; W. R. Prentice, secretary, Fernie; R. A. Colleaux, treasurer, Fernie. The Crow's Nest Pass Coal Company Limited has conducted large-scale coal-mining operations in the East Kootenay District since 1897, and present operations include the Michel Colliery at Michel and the Elk River Colliery at Coal Creek. The operations include both underground and open-cast mining and are directed from a head office at Fernie. Most of the production is sold on the industrial market and a large amount is utilized for briquetting and coke-making. A short description of the operations follows.

Michel Colliery.—(49° 114° N.W.) William Chapman, manager; Irving Morgan, senior overman; Walter McKay, safety inspector. This colliery is situated on the Crowsnest branch of the Canadian Pacific Railway, 24 miles east of Fernie. It is the largest operation in the district and comprises extensive underground workings at Michel and a large stripping operation on Baldy Mountain, near Michel. It also includes a modern briquette and by-product plant, which is located on the colliery-site. Five mines were in operation during 1956, in addition to the strip mines, and most of the production was obtained from those located in the "A" and "B" seams. Four of the mines have been developed from a pair of cross-measure rock tunnels driven into the synclinal structure of the seams on the south side of Michel valley, and the other, "A" North mine, is being developed on the north side of the valley. Each mine is ventilated by a separate fan. The method of working, in general, is by the room-and-pillar system, and the pillars are extracted on the retreat. The chief motive power in use underground is compressed air, which is supplied by three electric and two steam-driven compressors on the surface. Two other compressors also supply high-pressure air for operating compressed-air locomotives on the main haulage roadways in some of the mines. Both battery and diesel locomotives are in use at the "A" North mine. Electricity is used in parts of some of the mines for operating conveyors and pumps on the main and secondary roadways and is used on a larger scale in the "A" North mine. The production of coal from all the mines is cleaned and treated for market at a modern preparation plant, a description of which is given in another part of this report.

The underground operations of the colliery are under the direct supervision of six overmen and twenty-nine firebosses.

"A" East Mine.—William Gregory, overman; Frank McVeigh, Harry Saunders, David Thewlis, Sr., Frederick Nash, Gordon Murdoch, Robert Woods, and Andrew Davey, firebosses. This mine is operated in the "A" seam, and has been developed on the eastern limb of the Michel syncline, to the left side of the rock tunnels. The seam varies from 10 to 12 feet thick and dips at an average of 20 degrees in a southwesterly direction. The coal is of good quality and is friable and gassy; the roof is weak and requires careful attention for its support. The mine is worked on the room-and-pillar system, and the pillars are extracted on the retreat.

Usually the coal in the rooms is mined by compressed-air picks, shortwall coal-cutters, or is blasted off the solid by the use of millisecond delay detonators and loaded by duckbill conveyors or direct by hand on to conveyors. The pillars are extracted by the shortwall method, and, as the coal is friable, pneumatic picks are used and only occasional shots are necessary. The coal from the pillars is loaded by hand on to shaker-conveyors and transferred to loading points in the rooms or levels by shaker, chain, and belt conveyors. From these loading points the coal is hauled in trips of cars by compressed-air hoists to the main east level, and from there to the surface by compressed-air locomotives via the main rock tunnels.

Most of the production in 1956 was obtained from two sections of workings known as No. 1 and No. 3 slope districts and the remainder from a small section of pillar workings above the main levels. The average daily production was 580 tons with 115 men employed. No. 3 slope district has been in operation for many years, and the present activities in the area are confined to the extraction of pillars. These are rapidly nearing completion, and only the pillars left for supporting the main slopes and a small section of workings below the No. 7 room that was developed to prolong the operations remain to be worked. The No. 1 slope district is located outby the No. 3 slope district and is being developed preparatory to completion of the latter district. The main slope has been driven to the base of the syncline, and rooms and pillars are being developed on both limbs of the syncline. The extent of the workings on the inner or Sparwood limb of the syncline will be restricted, owing to the presence of the old "A" South workings to the rise. The conditions in general were found to be satisfactory in the mine during the course of inspections, but considerable difficulties have been experienced from excessive roof pressures causing breakage to timber supports at some of the lower workings in the No. 1 slope district. Minor difficulties were also experienced early in the year in coursing the ventilation to the faces of the pillar-extraction working-places on No. 7 room in the No. 3 slope district owing to the extensive gob areas which were open.

The mine is ventilated by an electrically driven aerodyne fan which delivers 95,000 cubic feet of air per minute to the workings at a 5.9-inch water-gauge. This quantity was found to be sufficient for the requirements of the mine.

"A" West Mine.—Harry Corrigan, overman; Reginald Taylor, Robert Taylor, James Walsh, John McInnis, Thomas Krall, Richard Hughes, William Cytko, Mario Pettoello, Stanley Menduk, and Joseph Serek, firebosses. This mine is in the "A" seam on the eastern limb of the Michel syncline. It is entered on the right side of the rock tunnels, and all the present workings are toward the outcrop. The seam is of good quality, ranging in thickness from 10 to 28 feet and dipping at an angle ranging from 20 to 35 degrees in a westerly direction. It is worked by the room-and-pillar system, with all the pillars being extracted on the retreat, and its layout is so arranged that most of the production is obtained along the strike of the seam.

The mine is the largest producer at the colliery, and most of the present workings are in the upper section of the mine, where the coal is 28 feet thick, and the pillars are extracted by the caving system. All the roadways in this area are driven on the footwall of the seam and the top coal is supported by timber sets. The rooms are driven along the strike of the seam at 45-foot centres, and during advancement the coal at the faces of the rooms is mined by shortwall coal-cutters and then blasted. The coal at the faces of the working-places advancing on the pitch is blasted off the solid by the use of millisecond delay detonators. During extraction of pillars the timber sets of the roadways are withdrawn and the top coal is allowed to fall or is blasted into the roadways. All loading operations in the rooms during extraction of pillars are carried out by duckbill conveyors, and extension pans are provided to avoid exposure of the workmen under the caved areas. The coal from the faces is transferred by a series of shaker, chain, and belt conveyors to a central loading point on the main west level. All the production of the mine is loaded into cars at this point, and large trips are formed and taken out through the main rock tunnel by compressed-air locomotives. The equipment at the mine is driven by both compressed air and electricity, the use of electricity being confined to the conveyors on the main incline and secondary levels. The average daily production of the mine in 1956 was 680 tons with a crew of 135 men.

The mine is ventilated by an electrically driven axivane fan which produces 65,000 cubic feet of air per minute at a 3-inch water-gauge. This fan was formerly used for ventilating the old No. 3 mine in No. 3 seam, but since the abandonment of those workings in 1955 it has been utilized to ventilate the "A" West mine. This quantity has been found to be sufficient for the requirements of the present workings, and no trace of gas was found during the course of inspections. Other conditions were also found to be satisfactory in general, with the exception of a gob fire in the No. 3 left belt-road section of the mine on July 20th, which is reported more fully under the heading of "Dangerous Occurrences." The main inclines were driven to the surface during 1956, and these roadways now serve as second intake airways to the workings at the upper section of the mine.

Upper "A" South Mine.—Vans H. Hulbert, overman; Roger Pasiaud, Joseph Fortunasso, and Herbert Parsons, firebosses. This operation was commenced in October, 1955, and it is intended to develop a mine in a large area of "A" seam between the abandoned "A" South mine workings and the outcrop of the seam. Entry to this area is to be made by means of two inclines which are being driven up the pitch in the underlying No. 1 seam and which will later be connected to the "A" seam by rock tunnels on reaching a point above the elevation of the old workings. The operation is on the west or Sparwood limb of the Michel syncline, and the seams pitch 35 to 40 degrees with an interval of 175 feet between the two seams.

Considerable progress was made in 1956, and after driving a rock tunnel for 250 feet to meet the seam, the inclines were driven 850 feet. The coal in No. 1 seam is 12 to 15 feet thick, and the roof is fairly strong. The roadways are supported by timber sets, and those on the main incline are being reinforced with roof bolts. All the coal at the faces is blasted off the solid with millisecond delay detonators and is transported by chutes and chain-conveyors to a central loading point at the bottom of one of the inclines. The present production is 90 tons of coal per day with a crew of eighteen men.

It is expected the mine will develop into a large operation, and preparations are being made for the excavation of an underground bin at the bottom of the No. 1 incline that will hold 650 tons of coal. The production of the mine will be conveyed to this point and loaded into cars on the main tunnel below.

Electricity was brought into the mine in 1956 to operate the conveyors and small hoists, and performance to date has been satisfactory. The mine is ventilated by the No. 3 seam fan.

"A" North Mine. — John Whittaker, overman; Sidney Hughes, Henry Eberts, Thomas Slee, and Ronald Saad, firebosses. This mine is in a development stage and is operated in the "A" seam on the north side of Michel valley, approximately half a mile east of the preparation plant.

The mine is being developed on a modified room-and-pillar system, and it is intended to extract pillars on both the advance and retreat. Present operations are confined to development work, and four companion levels are being driven along the strike of the seam. Off these main levels two inclines are being driven toward the outcrop and rooms are being developed from the inclines. The seam is 12 feet thick where normal, and the dip varies from 15 to 20 degrees. The coal at all the faces in general is mined with pneumatic picks or is blasted off the solid by means of millisecond delay action detonators. It is loaded by hand on to shaker and chain conveyors and transferred to loading points on the main level, where it is loaded into 10-ton bottom-dumping cars and taken out of the mine by battery or diesel locomotives. Most of the equipment in the mine is operated by electricity and is of the permissible type. Compressed air, which is chiefly used for operating the pneumatic picks, is supplied by a portable compressor located inside the mine in the main intake airway.

The production of the mine in 1956 averaged 200 tons of coal per day with a crew of forty men. Progress was again hampered by the thinning of the seam and the presence of small faults at various points on the main levels and the inclines. These entailed a great deal of rock work in maintaining sufficient height and width on the roadways for the haulage. Two of the main levels were driven 1,500 feet during the year, and the faces are now 4,000 feet from the portal of the mine. The other two levels are not so far advanced, one having only been started early in the year to provide access to the mine from the steel bridge that was built across the valley in 1955. This level will eventually be used as the main haulage roadway, and all production from the mine will be hauled to the preparation plant by locomotive. The entrance to the portal has been concreted, and the level is supported by steel sets and roof bolts.

During the latter part of 1956 considerable interest was taken in a new type of continuous miner that is being tested at the face of the above-mentioned level. The machine is driven by a 75-horsepower electric motor and is designed to cut and load the coal by means of a rotating barrel mounted on caterpillar tracks, with a trailer conveyor attached.

The mine is ventilated by an electric axivane fan which delivers 38,000 cubic feet of air per minute with a 0.5-inch water-gauge. This was found to be sufficient for the present needs of the workings, and conditions in general were found to be satisfactory during the course of inspections.

" B " South Mine.—William Davey, overman; Henry Batchelor, Robert Doratty, Thomas Taylor, John Krall, and Paul Kusnir, firebosses. This mine is operated in the " B " seam on the western limb of the Michel syncline. The seam is 5½ feet thick, is of excellent quality, and is overlain by a strong shale roof. The seam dips at an angle of 30 degrees and is worked by the room-and-pillar system, with the pillars being extracted on the retreat.

The mine has been one of the major operations for many years and comprises two districts, one being known as the " B " South Level district, which includes all the workings to the rise side of the main levels, and " B " South Slope district, which is located on the dip side of the levels. A description of the layout and method of working the districts is included in past Annual Reports.

Extraction of the pillars in the No. 3 raise panel of the " B " South Level district was completed in October, 1956, and the activities in this district are now confined to the extraction of pillars left from former workings. These are scattered and comprise a few remaining pillars left in the No. 3 incline section and some pillars above the old west level. Considerable work has been done in reopening the old No. 3 incline roadway, and it is intended to bring the production from that area by rope haulage.

In the "B" South Slope district, activities were confined to the No. 3 slope section and a small area of coal that was extracted near the abandoned face of the main south level. The No. 3 slope was extended to its ultimate distance, and an area of coal has been developed below the No. 5 room. Extraction of pillars above the No. 5 room was completed early in 1956.

The conditions in general were found to be fairly good during the course of inspections, with the exception of one period when difficulties were experienced by the increased issue of gas from the coal near a large fault, on the return side of the workings below the No. 5 room in the slope district. These difficulties were overcome by enlarging a section of the return airway to increase the quantity of ventilation. Difficulties were also experienced in maintaining sufficient height on the roadways in the No. 3 raise section of the "B" South Level district following extensive pillar extraction before operations in that area were completed.

Closure of the No. 3 raise section has reduced the size of the operation considerably, but the mine continued to be one of the major producers at the colliery at an average daily output of 450 tons of coal in 1956 with a crew of ninety men.

The mine is ventilated by an axivane fan which delivers 72,000 cubic feet of air per minute at a 3.2-inch water-gauge; at present 43,000 cubic feet is directed to the slope workings and the remainder to the incline workings.

In 1956, 104,250 pounds of Monobel No. 4, 5,950 tons of CXL-ite, and 100,820 electric detonators were used at the colliery for coal and rock blasting. Fifteen misfired shots were reported.

Three hundred and eighty-four tons of limestone dust were used for application to the roadways at the various mines to minimize the coal-dust hazard and for tamping shots. Monthly mine-dust samples were taken at all the mines and analysed. All the samples were above the minimum requirements of incombustible content.

Monthly examinations were made by the miners' inspection committees at all the mines, and a regular meeting was held at the colliery office each month by the pit safety committee. All the report books kept at the various mines in accordance with the "Coal-mines Regulation Act" were examined periodically and found to be in order.

Baldy Mountain Strip Mines.—William Chapman, manager; C. M. Matson, foreman. The coal-stripping operations of The Crow's Nest Pass Coal Company Limited are on Baldy Mountain, where some very thick seams outcrop on the mountainside. Two open pits were in operation during 1956, and activities were carried out by Mannix Ltd., of Calgary, on a contract basis. The pits are known as the No. 4A and No. 3 pits.

Operations in the No. 4A pit were completed early in the year, and a description of the pit is included in the 1955 Annual Report. Since completion of the pit, activities have been confined to the No. 3 pit, which is at a lower elevation and to the south of the No. 4A pit. Operations were commenced in this pit in 1955. The coal is 45 feet thick and is of fairly good quality, although some sections of the seam have inferior coking qualities. The overburden is removed to the ratio of 2 to 1 and has been taken back to a predetermined cut line which provides a slope ranging from 45 to 50 degrees on the wall above the pit. Extraction of coal is along the strike of the seam, and the coal is loaded by power-shovels into 15-ton trucks which haul it to the preparation plant. The production is governed by the output of the underground mines and requirements of the market, and is usually more than 1,000 tons per day.

Conditions were found to be satisfactory during the course of inspections.

By-product Plant.—This plant is operated on the colliery-site at Michel, and a description of the plant is included in the 1954 Annual Report. The Curran Knowles ovens were in operation throughout the year and produced 163,686 tons of coke. More than seventy of the bee-hive ovens, the use of which was discontinued in 1952, were put back into operation for a few months and produced 8,948 tons of coke.

Periodic inspections were made, and the conditions were found to be satisfactory.

Briquette Plant.—This plant is adjacent to the preparation plant at Michel Colliery, and was first in production in 1954. The operation of the plant is governed by the number of days worked by the mines. The production of briquettes in 1956 was 188,355 tons, an increase of 21,527 tons from the 1955 production. A description of the plant is included in the 1954 Annual Report.

Elk River Colliery.—(49° 114° S.W.) James E. Morris, manager. This colliery is operated in Coal Creek valley, 4 miles east of Fernie. It comprises five mines operating in four seams, the mines being driven from the outcrops of the respective seams on the south side of the valley. The mines are entered at various elevations on the mountainside, but all production is brought to the same surface landing and is treated at a modern preparation plant on the colliery-site. The colliery is connected to the Crowsnest branch of the Canadian Pacific Railway at Fernie by a branch line operated by the Michel, Fernie and Morrisey Railway, a subsidiary company of The Crow's Nest Pass Coal Company Limited. No alterations were made on the surface plants and buildings during 1956, and a description of the preparation plant is included in the 1954 Annual Report.

The underground operations are under the supervision of three overmen and fifteen firebosses, and a description of the operations follows.

No. 1 East Mine.—Arnold Webster, overman; Leonard Brett, Eric Singleton, and Ronald White, firebosses. This mine is operated in the No. 10 seam, which is the uppermost seam now being worked. It is the oldest operation at the colliery and once formed part of the old Coal Creek Colliery before that operation closed down in 1943. Most of the older workings have now been abandoned, and present activities are confined to the extraction of a small area of coal left between the old No. 1 East workings and a barrier pillar in the old No. 1 South workings.

The mine is operated by the room-and-pillar system and produces an average output of 375 tons per day with a crew of seventy-five men. The thickness of the coal ranges from 12 to 25 feet, of which the top 12 feet is worked under the roof of strong shale. The coal is of good quality and friable, and is worked by pneumatic picks, no shot-firing being necessary. Both development and extraction of pillars are in progress, and the coal at the faces is loaded directly on to cars which are hauled by horses to the partings near the main slope. From the partings the cars are hauled in six-car trips to the new portal by a 100-horsepower electric hoist on the surface and lowered to the No. 4 landing, from where they are taken in large trips to the preparation plant by steam locomotive.

The conditions in general were found to be fairly good during the course of inspections, but considerable difficulties are experienced on some sections of roadways through breakage of timber supports; this is usually due to heaving of the floor as a result of roof pressures on the adjacent pillars. Indications of gob heating were found in the No. 3 room west section of the mine on February 13th, and is reported in more detail under "Dangerous Occurrences." This necessitated sealing from the remainder of the mine a small area of the workings which is not likely to be reopened.

The mine is ventilated by an electrically driven Sirocco double-inlet fan which delivers 45,000 cubic feet of air per minute at a 2-inch water-gauge. This quantity was found to be sufficient for the present requirements of the workings.

No. 9 Mine.—Daniel Chester, overman; Albert Littler, Ralph Larner, William Waller, Harry Miller, Henry O'Neil, and Louis Sclippa, firebosses.

This mine is operated in the No. 9 seam and is entered by means of four levels and a slope, driven from the outcrop, at a high elevation on the mountainside. It is a large mine, worked on the room-and-pillar system, and the workings have been developed on both the rise and dip side of the main levels. The coal is of excellent quality and is normally 9 feet thick; the seam pitches at 15 degrees and is overlain by a hard sandstone roof. During development considerable irregularities of the seam have been encountered over the past few years and have restricted further development. The present activities are confined to the extraction of pillars formed in past workings.

Despite difficulties the mine continues to be one of the larger producers at the colliery, and at the end of 1956 averaged 475 tons of coal per day with 100 men employed. Most of the production was obtained from pillar extraction in the No. 1 and No. 5 slope sections, where the slopes have been advanced into a portion of the old No. 2 mine workings to prolong the life of the present mine. Extraction of the pillars in that area from the No. 5 slope is rapidly nearing completion, and only the pillars left to support the slope remain to be worked. In the No. 1 slope, however, development is continuing with a view to extracting two large pillars left in the old workings. The coal throughout the mine is cut by pneumatic picks and occasionally blasted off the solid. It is hand-loaded on to conveyors and transferred to loading points on the levels or rooms by chain, belt, or shaker conveyor, where it is loaded into trips of cars. From the loading points it is hauled by compressed-air hoists to the main level and taken out of the mine by diesel locomotive. On No. 1 slope, which has been driven from the surface as a separate entry, the coal is loaded from the conveyors into 10-ton bottom-dumping cars which are hauled up the slope by a 300-horsepower electric hoist on the surface. The cars are unloaded on a ramp outside the mine, and the coal is conveyed by a short belt-conveyor to a retarding conveyor, which transports the entire production of the mine down the mountainside to the preparation plant.

The mine is ventilated by two separate ventilation systems. In the No. 1 slope section the present ventilation is by means of a Sheldon centrifugal fan which produces 26,000 cubic feet of air per minute at a 0.6-inch water-gauge to that section of workings. This fan was installed in February to replace the axivane fan that was damaged by a snowslide. The other part of the mine is ventilated by an axivane fan which delivers 56,000 cubic feet of air per minute at a 5.2-inch water-gauge. These quantities were found to be sufficient for the requirements of the mine, and conditions were found to be satisfactory during the course of inspections. Small quantities of gas were found on a few occasions at some of the working-places but were usually due to defective bratticing, and remedial steps were taken on each occasion.

No. 4 Mine.—James Brown, assistant overman. This is a small operation that is being worked in the No. 4 seam. A description of the method of working it is included in the 1955 Annual Report. During 1956 it was idle for the greater part of the year because the coal was unsuitable for the existing market, but the roadways are being kept under repair and the mine will be ready for production when required.

The workings are ventilated by an electrically driven Sirocco fan which delivers 35,000 cubic feet of air per minute at a 0.3-inch water-gauge.

No. 3 Mine.—James Anderson, overman; Roger Girou, Kenneth Kniert, and James Brown, firebosses. This mine is operated in No. 3 seam, which is the lowest being worked at the present time. The seam is 17 feet thick where normal and is considerably thicker at the inner end of the main levels. The average pitch of the seam is 20 degrees, and only the top 10 feet is worked. The coal is friable and is mined by pneumatic picks, only occasional shots being necessary. It is very gassy, and a large volume of air is required to dilute the gases effectively.

The mine is operated by the room-and-pillar system, and the workings have been developed to both the dip and rise side of the main levels. Further development, however, has been stopped due to the quality of the coal and the presence of faults, and present activities are now confined to the extraction of pillars on the retreat. This has reduced the size of the operation considerably and will continue to do so until pillar extraction is completed. During 1956 the average daily output was 250 tons with a crew of forty-five men, and most of the production was obtained from the No. 5 slope section, where pillars were being extracted from the No. 5 and No. 6 rooms on the right side of the slope. Extraction from this area was completed in September, and since that time activities have been confined to the No. 4 and No. 5 incline sections. The coal is mined by pneumatic picks and loaded on to conveyors which carry it to loading points on the main level, from which it is taken from the mine in cars by battery locomotive.

The conditions in general were found to be satisfactory during the course of inspections. In the incline sections considerable difficulties are experienced from the presence of faults, and great care must be taken in supporting the roof. Mining conditions in the No. 5 slope sections were found to be more favourable during 1956, and no difficulties were experienced by outbursts of gas as in the past few years.

The mine is ventilated by an electrically driven aerodyne fan which normally delivered 80,000 cubic feet of air per minute at a 2.5-inch water-gauge. Following the completion of the No. 5 slope district, the capacity of the fan was decreased, and it now delivers 45,000 cubic feet of air per minute at a 0.7-inch water-gauge. These quantities were found to be sufficient for the requirements of the mine, although minor difficulties were experienced on a few occasions in the slope district in directing sufficient ventilation to some of the working-places where extensive gob areas were open.

No. 1 Mine.—James Anderson, overman; Michael Tymchuk, Brindley Morris, and William Verkerk, firebosses. This is a new operation commenced in August, 1956, to develop a mine in the No. 10 seam adjacent to the old No. 1 East mine workings. It is expected to become a fairly large operation, and present activities are centred on driving a main slope on the pitch of the seam from outside. The slope was driven 500 feet, and conditions appear to be favourable, although at present an influx of surface water at the face of the slope creates some difficulties. The heading is ventilated by a small auxiliary fan equipped with metal tubing for conducting the air to the face, but later a connection will be made to the surface for a return airway. Haulage of the coal from the face is by a compressed-air hoist on the surface, and the cars are lowered to a parting on the elevation of the No. 4 level.

During 1956, 3,309 pounds of Monobel No. 4, 258 pounds of CXL-ite, and 4,855 electric detonators were used at all the mines of the colliery in coal and rock blasting. No misfired shots were reported.

To neutralize the coal dust, 209 tons of limestone dust was applied to the underground roadways of the mine and used in shot-firing. Monthly mine-dust samples were collected from the mines and analysed. All the samples were above the minimum requirements of incombustible dust.

Monthly inspections were made at all the mines by the miners' inspection committee, and a copy of each inspection report was forwarded to the office of the District Inspector through the courtesy of the committee members. Meetings were held at the colliery office each month by the safety committees. All report books kept at the various mines in accordance with the "Coal-mines Regulation Act" were examined regularly and were found in order.

Coleman Collieries Limited

(49° 114° N.W.) D. B. Young, general manager, Coleman, Alta.; J. C. Shearer, strip-mine manager. This company directs a large stripping operation on the interprovincial boundary on Tent Mountain, near Corbin, and access to the property is made by means of a private road leading from the No. 3 highway near the Crowsnest lakes, in Alberta. Most of the operation is in Alberta, but a large quantity of coal has been produced in British Columbia where the seams extend over the border.

Activities in 1956 were confined to the No. 2 pit, where a large deposit of coal is in the form of a synclinal basin. The thickness of the seam varies, but information obtained by several diamond-drill holes indicates that in some places it is over 100 feet thick.

The overburden has been removed during the past two years, and present operations are confined to the loading of coal. This is done with power-shovels, and the coal is transported by 15-ton-capacity trucks to the company's preparation plant at Coleman. Conditions during the course of inspections were found to be satisfactory.

Fording River Area

(50° 114° S.W.) Utah Co. of the Americas carried out an exploration programme in the Fording River area in 1956 following the grant of coal licences covering Lots 6728 to 6742, inclusive, 6745, and 6748 to 6758, inclusive. A camp was set up in the vicinity of Ewin Creek in June to accommodate a party of men, and a geological survey was made of the whole area. Various points on the outcrops of nine seams were exposed on Todhunter Ridge, and seven seams on the northwest side of Bear Mountain. Roadways were cleared by bulldozer to obtain access to both places, and prospect tunnels were being driven in six of the seams on Todhunter Ridge when the camp was closed due to snow at the end of October.

This area was prospected to a large extent nearly fifty years ago by the Imperial Coal Company, and a report of the various seams is included in the 1909 Minister of Mines Annual Report.

NORTHERN INSPECTION DISTRICT

By A. R. C. James

The coal mines of the Northern District produced a total of 13,195 tons of coal in 1956, a very substantial reduction from the 1955 output. This may be attributed entirely to the loss of the important Columbia Cellulose contract by Bulkley Valley Collieries Limited in August, 1955. Since the loss of this contract, due to a change-over to oil, the market for Telkwa coal has been restricted mainly to domestic heating in communities along the line of the Canadian National Railway between Burns Lake and Terrace.

The two operating mines in the Hudson Hope area of the Peace River district show a small increase in output over 1955. Local demand for coal was reported to be quite strong toward the end of the year. The principal markets in this area are the army camp at Fort Nelson, which consumes up to 2,000 tons of stoker coal a year, and the Department of Transport installations at Fort St. John airport, which use 500 tons or more of coal a year. Outlying schools and farms also use a small amount of coal, and the drill rigs in the Fort St. John gasfield are at present large consumers of coal for heating purposes in winter drilling operations.

No accidents or dangerous occurrences were reported from the coal mines of this district during 1956.

Telkwa (54° 127° N.E.)

Bulkley Valley Collieries Limited

Company office, Telkwa. F. M. Dockrill, president; A. H. Dockrill, superintendent; F. Bond and L. Gething, firebosses. This is a private company mining coal on a royalty basis on property comprising six Crown-granted lots, Nos. 388 to 392 and No. 401. The property is on Goat Creek, a tributary of the Telkwa River about 7 miles southeast of Telkwa. The mine is connected by a good road with the Canadian National Railway and Highway No. 16 at Telkwa.

The total production in 1956 was 8,553 tons, only one-third of the 1955 production. As mentioned above, the reduction is attributable to the loss by the company of the important Columbia Cellulose contract in August, 1955. Previous to that date the Columbia Cellulose Company took the whole annual output of Bulkley Valley Collieries Limited, amounting to 36,000 to 42,000 tons per year. Since the loss of the contract the company has been largely restricted to supplying the domestic market in those communities along the line of the Canadian National Railway between (and including)

Burns Lake and Terrace. Average daily production in the winter months has been about 60 tons with a crew of sixteen men underground and five on the surface. The No. 4 mine was in operation 155½ days in 1956, and was closed from March 31st to August 5th.

The No. 4 mine, which is the present operating mine, is on Lot 401, on the west bank of Goat Creek. The seam being worked is from 6 feet to 6 feet 8 inches thick and, except for irregular thin lenses of pyritic material, the seam section consists of clean coal. It is overlain by a thick bed of strong grey shale. The coal measures strike in a northerly direction and dip eastward at 5 degrees. As developed up to the present time, the mine broadly comprises two parallel main entries driven up dip on the seam in a westerly direction for 850 feet. At a point 500 feet from the portal, two levels, set off from the right main entry at 50-foot centres, have been driven 1,250 feet in a north-westerly direction. A series of rooms has been driven at 50-foot centres for a distance of 250 feet up dip from the levels, the coal between the rooms being extracted on the retreat. Several small faults were encountered at the inby end of the levels, and these were accompanied by "slabby" and difficult roof conditions. Consequently, when the mine resumed production at the end of August, it was decided to abandon the inner 500-foot length of the levels and withdraw all conveyors and machinery. This was done, and in December a pair of semi-longwall faces were opened up 200 feet down dip from the left-hand level, and these are now being mined on the retreat toward the level. One face is 50 and the other 100 feet long. The coal is undercut by coal-cutting machine and is blasted with the aid of short-period delay detonators. It is then hand-loaded on to scraper chain-conveyors. Transportation of the coal from face to tipple is done entirely by conveyors, the main conveyors being of the troughed-belt type.

The coal is screened with a Tyler Tyrock three-deck vibrating screen. Four sizes of coal are produced for sale—namely, lump, egg, nut, and stoker. The bunker capacity is 230 tons and comprises five bins.

Conditions in the mine were usually found to be satisfactory in the course of inspections. No accidents were reported. No methane was detected during inspections. The mine is ventilated by a 30-inch Sirocco axial-flow fan which circulates approximately 10,000 cubic feet of air per minute.

Peace River (56° 122° S.E.)

King Gething Mines

Quentin F. (King) Gething, operator and fireboss. This property is on Lot 1039, on the southeastern slope of Portage Mountain; it is 12 miles by road from Hudson Hope and 72 miles from Fort St. John. The mine was described in detail in the 1954 Annual Report. In 1956 it operated in the six fall and winter months as in previous years. Mining has been confined to the upper level, which has now been driven 700 feet from the portal. Two rooms are being driven updip from the upper level at 50-foot centres. One of the rooms, 330 feet back from the face of the upper level, is being driven through to surface to provide additional ventilation. The total amount of development work completed in 1956 amounted to about 270 feet. Total production was 1,537 tons. In December a crew of four men was employed and daily production was about 15 tons. Conditions were usually found to be satisfactory in the course of inspections. No methane was detected. No accidents were reported.

Reschke Coal Ltd.

Company office, Fort St. John. E. B. Summer, operator and fireboss. This property is at about 2,600 feet elevation on the steep southern end of a spur of Butler Ridge, 1 mile north of the Peace River. It is 23 miles by road from Hudson Hope and 83 miles from Fort St. John. The seam at present being worked is 4 feet thick and dips at 46 degrees due west. Both roof and floor of the seam are a silty shale.

The mine has been developed from two parallel adit levels driven due north along the strike of the seam from the outcrop. The lower level is the main haulage level, and the upper level, until it was abandoned in March, 1956, provided a return airway and second exit. The latter was 330 feet updip from the lower level. The lower level was driven 127 feet during the year, and the face of the level is now 1,257 feet from the portal.

The coal is mined from a series of 30-foot-wide rooms set off from the lower level at 50-foot centres and driven up the full dip of the seam to connect with the upper level. Pillars of coal 15 feet wide are left between the rooms to support the roof. Twenty-two rooms have been worked out to the upper level, and Nos. 23 and 24 rooms are now being worked. The No. 20 room was continued updip to the surface and broke through on March 13th 825 feet updip from the bottom level. This room has now been fitted up as a manway and ventilation raise, and the upper level has been abandoned. The coal seam was found to be of uniform thickness and quality throughout the whole length of the raise, and a considerable reserve of coal has thus been blocked out.

The coal is blasted off the solid, using millisecond delay detonators, and is transported by gravity chutes into cars on the main level. The mine was in production six months in 1956, and some development work was done during the summer months. Production was 3,105 tons. In November a crew of six men was employed, and the average daily production was about 25 tons. Conditions were usually found to be satisfactory in the course of inspections, and no methane was detected. No accidents were reported.

Inspection of Electrical Equipment and Installations at Mines, Quarries, and Oil and Gas Wells

By L. Wardman, Electrical Inspector of Mines

CONTENTS

ELECTRIC POWER

In 1956 electric power was used by forty-five mining companies in operations at thirty mills, thirty-seven lode mines, two placer mines, two non-metallic mineral mines, six collieries, which includes three coal-cleaning plants, and one coking plant. Electric power was also used at seven quarries for loading, crushing, separating, and conveying materials. Twenty-five drilling rigs using electric power for lighting and driving motors were used in drilling operations on seventy-nine wells. Sixty of these wells were completed.

Lode Mines

The kva. generating capacity of privately owned power plants at those mines which were operating in 1956 was as follows:—

Prime Mover	Generator Kva. Capacity
Steam turbines	17,500
Diesel engines	14,830
Water-wheels	13,550
Total	45,880

The electric power produced by these plants was approximately 139,876,402 kilowatt-hours during 1955. These figures are approximate because many of the small power plants are not equipped with recording meters and, therefore, the power generated at these plants was estimated. Power purchased from public utilities amounted to 103,533,996 kilowatt-hours. The power which was obtained by The Consolidated Mining and Smelting Company of Canada, Limited, from its generating division amounted to 92,335,892 kilowatt-hours. The total amount of power used in the Province for mining purposes was 335,746,290 kilowatt-hours.

Power produced for direct mechanical application amounted to 7,720 horsepower and was produced as follows:—

Prime Mover	Horsepower
Diesel engines	5,225
Water-wheels	1,560
Gasoline engines	935
Total	7,720

The connected load for 1956 at operating lode mines and mills has increased by 4,178 horsepower over that for 1955. This increase is due to the building of three new mills and the addition of equipment at other properties. The connected load for 1956 at those properties which were in operation was approximately as follows:—

Equipment	Horsepower
Hoists	7,107
Scraper hoists	5,814
Ventilating fans	4,426
Pumps	4,349
Rectifiers and M.G. sets	8,975
Air compressors	18,553
Crushing equipment	10,409
Sink float	1,048
Milling and concentrating equipment	43,971
Conveyor systems	945
Workshop equipment	2,771
Miscellaneous equipment	10,070
Total	118,438

For surface and underground haulage there were in use 138 battery locomotives, 102 trolley locomotives, and 8 diesel locomotives.

Placer Mines

Electric power was used at three placer mines. The generating capacity was as follows:—

	Kva.
Diesel-engine-driven generators	147
Hydro-electric	600
Total	747

The connected load was as follows:—

	Horsepower
Shaft hoists	40
Ventilating fans	8
Mine pumps	10
Air compressors	75
Trommel screens	10
Miscellaneous	5
Total	148

Non-metallic Mines and Quarries

Electric power was used at seven quarries for loading, crushing, separating, and conveying materials.

Coal Mines

There was no change in the number of collieries using electric power in 1956. The distribution of electric power was as follows:—

Surface

	Horsepower	
Compressed air	5,775	
Ventilation	1,105	
Hoisting	1,100	
Haulage	318	
Coal washing and screening	3,089	
Pumping	515	
Briquetting	642	
Coke production	1,222	
Miscellaneous	709	
Total		14,475

Underground

Ventilation	24	
Hoisting	76	
Haulage	123	
Pumping	310	
Coal-cutters	100	
Conveyors	565	
Compressors	200	
Miscellaneous	14	
Total		1,412
Total for surface and underground		15,887

Five permissible battery locomotives and three permissible diesel locomotives were in use underground.

Well Drilling Rigs

Twenty-five drilling rigs were operated in 1956. Seventy-nine wells were operated during the year. Sixty-one wells were completed; of these, thirty-five were gas wells, eight were oil wells, three were suspended, fifteen were abandoned, and eighteen were drilling at the end of the year.

An outline of the electrical equipment normally used on the drilling rigs is given in the 1955 Annual Report.

The rugged use to which this equipment is subjected and the frequent assembly, disassembly, and moving of the equipment cause considerable damage to the lighting fixtures and cables. However, there has been a general improvement in maintenance during the past two years, and less damaged equipment was found on the rigs during recent inspections.

MINE ELECTRICAL INSTALLATIONS

Notes on electrical installations at mines are printed for separate distribution and are not included in this Report.

BRITISH COLUMBIA DEPARTMENT OF MINES LIST OF PUBLICATIONS

The publications listed are available for distribution except as noted. Recent publications for which no charge is made may be obtained from the Department's offices at Victoria and Nelson, and from the office of the Geological Survey of Canada, 739 West Hastings Street, Vancouver.

PAYMENT FOR PUBLICATIONS

If payment is required, application for a publication should be made to the Department of Mines, Victoria, B.C., and should be accompanied by the proper sum. Sales tax of 5 per cent is payable on charge items sent to British Columbia addresses. This sales tax is not applied on items sent outside British Columbia, but a mailing charge of 10 cents is made.

Annual Reports and Bulletins

Bulletins and Annual Reports are distributed free of charge, with a limit of one copy to an applicant until the free stock has been exhausted. Thereafter distribution is from reserve stock on payment of the charge listed. Under special circumstances duplicate copies may be supplied from the free stock. If so a charge of $1.25 per copy will be made for a bulletin or paper-bound Annual Report, and the charge for a cloth-bound Annual Report will be increased by $1.25.

If more than two nominally free publications are requested, the applicant should remit 50 cents for each publication in excess of two.

Indexes

No. 1.—Index to Annual Reports of the Minister of Mines of British Columbia for the years 1874 to 1936, inclusive. (By H. T. Nation.) Cloth bound, $2.

No. 2.—Index to Annual Reports of the Minister of Mines, 1937–43, and Bulletins Nos. 1–17. (By H. T. Nation.) Cloth-bound copies, $1 each.

No. 3.—Index to Publications of the British Columbia Department of Mines, Annual Reports of the Minister of Mines, 1937 to 1953, and Bulletins Nos. 1 to 35. (Tables listing the recorded production of lode-metal mines and the occurrences of metals in lode deposits are appended.) Paper bound, $2; cloth bound, $4.50; tables separately, 50 cents.

Index No. 3 incorporates corrections to the 1874–1936 index and replaces the 1937–1943 index.

NOTICES *RE* PUBLICATIONS

Applications are invited from those who wish to receive notices when new publications become available.

ANNUAL REPORTS

If neither an asterisk nor a price is entered, the report for that year is not available for distribution.

Year	Paper Bound	Cloth Bound	Year	Paper Bound	Cloth Bound	Year	Paper Bound	Cloth Bound
1874–1917	——	——	1930	——	——	1943	*	——
1918	75¢	——	1931	——	——	1944	*	$1.00
1919	——	——	1932	——	——	1945	*	1.00
1920	——	——	1933	*	$1.00	1946	*	1.00
1921	75¢	——	1934	75¢	1.75	1947	*	1.00
1922	——	——	1935	*		1948	*	1.00
1923	75¢	——	1936	(1)	1.00	1949	*	1.00
1924	——	——	1937	(1)	——	1950	*	1.00
1925	——	——	1938	(1)	1.00	1951	*	1.00
1926	——	——	1939	*	1.00	1952	——	3.50
1927	*	——	1940	*	1.00	1953	1.00	3.50
1928	*	——	1941	*	1.00	1954	*	2.50
1929	*	——	1942	*	1.00	1955	1.00	3.50
						1956	*	2.50

[1] Parts A to F, bound separately in paper, are available (free) for the years 1936, 1937, and 1938. Part G, "Inspection of Mines," is not available for these years.

NOTE.—Since 1952 the Lode Metals section and the Statistical and Introductory section have been published as separate reprints of the Annual Report. For 1956 the Notes on Electrical Installations at Mines are printed as a separate pamphlet and are not included in the Annual Report. These separate publications are free of charge.

BULLETINS, OLD SERIES

Bulletin No. 2, 1918: Bumps and Outbursts of Gas. (By George S. Rice.)

Bulletin No. 2, 1919: The Commercial Feasibility of Electric Smelting of Iron Ores in British Columbia. (By Alfred Stansfield.)

Bulletin No. 2, 1932: Report on McConnell Creek Placer Area. (By Douglas Lay.)

MISCELLANEOUS

Special Reports on Coal-mine Explosions. (By George Wilkinson, Thomas Graham, and James Ashworth.) 1918. Out of print.

Report on Snowflake and Waverley-Tangier Mineral Properties. (By J. D. Galloway.) 1928.

Report on Mineral Properties of the Goldside Mining Company. (By B. T. O'Grady.) 1935. Out of print.

Elementary Geology Applied to Prospecting. (By John F. Walker.) Revised, 1955. 65 cents; outside British Columbia, 75 cents.

Possibilities for Manufacture of Mineral Wool in British Columbia. (By J. M. Cummings.) 1937.

Lode-gold Deposits of the Zeballos Area. (By J. S. Stevenson.) 1938. Out of print.

Preliminary Investigations into Possibilities for Producing Silica Sand from British Columbia Sand Deposits. (By J. M. Cummings.) 1941.

Iron Ores of Canada: Vol. 1, British Columbia and Yukon. (By G. A. Young and W. L. Uglow, Geological Survey, Canada, Department of Mines.) 1926.

Synopses of Mining Laws.

*** Only two reports or bulletins for which no charge is shown may be supplied free; a charge of 50 cents is made for each publication in excess of two.**

BULLETINS, SERIES STARTING IN 1940

Bulletin No. 11: Fraser River Tertiary Drainage-history in Relation to Placer-gold Deposits. II. (By Douglas Lay.)*

Bulletin No. 12: Reconnaissance in the Area of Turnagain and Upper Kechika Rivers. (By M. S. Hedley and Stuart S. Holland.) 75 cents.

Bulletin No. 13: Supplementary Report on Bedwell River Area. (By H. Sargent.) 75 cents.

Bulletin No. 14: Coal Analyses of British Columbia. (By James Dickson.)*

Bulletin No. 18: Specimens and Samples—Their Treatment and Use. (By Officers of the Department.)*

Bulletin No. 19: The Tuya-Teslin Area, Northern British Columbia. (By K. DeP. Watson and W. H. Mathews.)*

Bulletin No. 20: Lode-gold Deposits—

Part II: South-eastern British Columbia. (By W. H. Mathews.) Revised, 1948.*

Part IV: South-western British Columbia—exclusive of Vancouver Island. (By J. S. Stevenson.) Revised, 1946.*

Part V: Vancouver Island. (By J. S. Stevenson.) Revised, 1946.*

Part VI: North-eastern British Columbia and Cariboo and Hobson Creek Areas. (By S. S. Holland.) Revised, 1946.*

Bulletin No. 21: Notes on Placer-mining in British Columbia. (By Officers of the Department.)*

Bulletin No. 22: Geology of the Whitewater and Lucky Jim Mine Areas. (By M. S. Hedley.)*

Bulletin No. 24: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map-area. (By W. H. Mathews.)*

Bulletin No. 25: The Squaw Creek-Rainy Hollow Area. (By K. DeP. Watson.)*

Bulletin No. 26: Report on the Stanley Area, Cariboo Mining Division. (By Stuart S. Holland.)*

Bulletin No. 27: Geology and Mineral Deposits of the Zeballos Mining Camp, British Columbia. (By John S. Stevenson.)*

Bulletin No. 28: Placer Gold Production of British Columbia. (By S. S. Holland.)*

Bulletin No. 29: Geology and Ore Deposits of the Sandon Area, Slocan Camp, British Columbia. (By M. S. Hedley.)*

Bulletin No. 30: Clay and Shale Deposits in British Columbia. (By J. W. McCammon and J. M. Cummings.)*

Bulletin No. 31: Geology of the Sheep Creek Camp. (By W. H. Mathews.)*

Bulletin No. 32: Geology and Mineral Deposits of the Shulaps Range, Southwestern British Columbia. (By G. B. Leech.)*

Bulletin No. 33: Geology of the Crowsnest Coal Basin with Special Reference to the Fernie Area. (By C. B. Newmarch.)*

Bulletin No. 34: Geology of the Yanks Peak-Roundtop Mountain Area, Cariboo District, British Columbia. (By Stuart S. Holland.)*

Bulletin No. 35: Geology of the Stanford Range of the Rocky Mountains, East Kootenay District, British Columbia. (By G. G. L. Henderson.)*

Bulletin No. 36: Coal Reserves of the Hasler Creek-Pine River Area, British Columbia. (By N. D. McKechnie.)*

Bulletin No. 37: Geology of the Cowichan Lake Area, Vancouver Island, British Columbia. (By James T. Fyles.)*

Bulletin No. 38: Geology of the Antler Creek Area, British Columbia. (By A. Sutherland Brown.)*

*** Only two reports or bulletins for which no charge is shown may be supplied free; a charge of 50 cents is made for each publication in excess of two.**

Bulletin No. 39: Geology of Lower Jervis Inlet, British Columbia. (By W. R. Bacon.)*
Bulletin No. 40: Calcareous Deposits of Southwestern British Columbia. (By W. H. Mathews and J. W. McCammon.)*

The following bulletins are out of print and no longer available; copies may be consulted at various public libraries:—

Bulletin No. 1: Aiken Lake Area, North-Central B.C. (By Douglas Lay.) Out of print.
Bulletin No. 2: Placer-gold Deposits, Wheaton (Boulder) Creek, Cassiar District. (By Stuart S. Holland.) Out of print.
Bulletin No. 3: Fraser River Tertiary Drainage-history in Relation to Placer-gold Deposits. I. (By Douglas Lay.) Out of print.
Bulletin No. 4: Saline and Hydromagnesite Deposits of British Columbia. (By J. M. Cummings.) Out of print.
Bulletin No. 5: Mercury Deposits of British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 6: Geology of Camp McKinney and the Cariboo Amelia Mine. (By M. S. Hedley.) Out of print.
Bulletin No. 7: Lode-gold Deposits of the Upper Lemon Creek Area and Lyle Creek-Whitewater Creek Area, Kootenay District. (By R. J. Maconachie.) Out of print.
Bulletin No. 8: Preliminary Report on the Bedwell River Area. (By H. Sargent). Out of print.
Bulletin No. 9: Molybdenite in British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 10: Tungsten Deposits of British Columbia. (By John S. Stevenson and staff of the Department of Mines.) Revised. Out of print.
Bulletin No. 15: Hydraulic Mining Methods. (By Stuart S. Holland.) Out of print.
Bulletin No. 16: Dragline Dredging Methods. (By Stuart S. Holland.) Out of print.
Bulletin No. 17: An Introduction to Metal-mining in British Columbia. (By Officers of the Department.) Out of print.
Bulletin No. 20: Lode-gold Deposits—
Part III: Central Southern British Columbia. (By M. S. Hedley and K. DeP. Watson.) Out of print.
Bulletin No. 23: Calcareous Deposits of the Georgia Strait Area. (By W. H. Mathews.) Out of print.

PRELIMINARY MAPS

Preliminary Map of the Granduc Area, by W. R. Bacon.

WELL SCHEDULES

Schedule of Wells Drilled for Oil and Natural Gas in British Columbia to January 1st, 1956. $1.25.

MAPS SHOWING MINERAL CLAIMS AND PLACER LEASES

Maps showing the approximate locations of placer-mining leases and mineral claims held by record may be seen at the Central Records Offices at Victoria and at Room 104, 739 West Hastings Street, Vancouver. Prints are obtainable on request made to the Chief Gold Commissioner at Victoria, and accompanied by the proper sum. The charges† are: Full sheet, $1; half-sheet, 50 cents; quarter-sheet, 25 cents. The maps conform to the reference and mineral-reference maps issued by the Legal Surveys Branch, Department of Lands and Forests, in size and geographical detail and correspond as to numbers.

*** Only two reports or bulletins for which no charge is shown may be supplied free; a charge of 50 cents is made for each publication in excess of two.**

† Charges for sales within British Columbia are subject to the 5-per-cent sales tax, which must accompany the remittance.

PERMITS AND LEASES UNDER "PETROLEUM AND NATURAL GAS ACT, 1954"

Maps showing the locations of permits and leases under the "Petroleum and Natural Gas Act, 1954," may be obtained upon application to the office of the Chief Commissioner, Petroleum and Natural Gas, Department of Mines, Victoria, B.C., accompanied by payment of $3* per sheet.

Monthly reports giving information on changes in permits and leases held, changes in title to permits and leases, additions and revisions to permit-location maps, and related matters are available from the office of the Chief Commissioner, Petroleum and Natural Gas, upon application and payment of a fee of $1 per annum.

ROCK AND MINERAL SPECIMENS

Identified specimens, about an inch square, of rocks and minerals may be purchased by prospectors and by schools in British Columbia.

A collection of rock specimens including twenty items is sold for $1. A collection of economic minerals including twenty-five items is sold for $3.50. For schools in British Columbia a combined collection of rock and mineral specimens is available at $3.50, on official application from the school. Specimens of scheelite, wolframite, cinnabar, stibnite, and tetrahedrite are sold at 25 cents each. All sales in British Columbia are subject to the Provincial 5-per-cent sales tax. If specimens are to be mailed to an address outside British Columbia, the applicant should remit 25 cents for mailing charges on either collection provided the package is to go by surface mail to an address in North America. Otherwise the applicant should remit the actual carrying charge, which may be calculated on 1½ pounds of weight for either collection.

A request for specimens should be addressed to the Chief of the Mineralogical Branch, Department of Mines, Victoria, B.C., and should be accompanied by the proper sum, including 5-per-cent tax for deliveries within British Columbia, or the proper mailing allowance to an address outside British Columbia.

* Charges for sales within British Columbia are subject to the 5-per-cent sales tax, which must accompany the remittance.

MINING LAWS AND LAWS RELATED TO THE MINERAL INDUSTRY

Synopses of mining laws and of laws related to mining are available on application. The titles of the various Acts and the price charged for each are listed below. Upon payment of the price, plus 5 per cent tax, a copy of any Act may be obtained from the office of the Queen's Printer, Victoria.

	Price
Department of Mines Act	$0.15
Mineral Act	.25
Placer-mining Act	.25
Metalliferous Mines Regulation Act	.50
Coal-mines Regulation Act	.70
Mines Right-of-way Act	.15
Iron Bounty Act	.15
Mineral Property Taxation Act	.15
Iron and Steel Bounties Act	.15
Indian Reserves Mineral Resources Act	.15
Prospectors' Grub-stake Act	.15
Taxation Act	.75
Forest Act	.80
Greater Vancouver Water District Act	.80
Security Frauds Prevention Act	.30
Coal Sales Act	.15
Coal Act	.15
Petroleum and Natural Gas Act	.25
[1]Drilling and Production Regulations under Petroleum and Natural Gas Act, 1954 (including tax)	.40
[1]Geophysical Regulations, Petroleum and Natural Gas Act, 1954 (including tax)	.25
[1]Permit and Lease Grid System, Petroleum and Natural Gas Act, 1954 (including tax)	1.00
[1]Schedule of Wells Drilled for Oil and Natural Gas (including tax)	1.25

[1] Obtained from Chief Commissioner, Petroleum and Natural Gas, Victoria.

LIST OF LIBRARIES

Department publications are being sent to the following Government departments and legislative, university, and public libraries:—

CANADA

Government departments—

- Ottawa: Departments of Mines and Technical Surveys, and Resources and Development.
- St. John's, Newfoundland: Department of Mines and Resources.
- Halifax, Nova Scotia: Department of Mines.
- Fredericton, New Brunswick: Department of Lands and Mines.
- Quebec, Quebec: Department of Mines.
- Toronto, Ontario: Department of Mines.
- Winnipeg, Manitoba: Department of Mines and Natural Resources.
- Regina, Saskatchewan: Department of Natural Resources and Industrial Development.
- Edmonton, Alberta: Department of Mines and Minerals.

Legislative libraries—

- St. John's, Newfoundland.
- Halifax, Nova Scotia.
- Fredericton, New Brunswick.
- Quebec, Quebec.
- Library of Parliament, Ottawa.
- Toronto, Ontario.
- Winnipeg, Manitoba.
- Regina, Saskatchewan.
- Edmonton, Alberta.
- Provincial Library, Victoria, British Columbia.

University libraries and museums—

- Dalhousie University, Halifax, Nova Scotia.
- Acadia University, Wolfville, Nova Scotia.
- Laval University, Quebec, Quebec.
- McGill University, Montreal, Quebec.
- Queen's University, Kingston, Ontario.
- Royal Ontario Museum of Geology and Mineralogy, Toronto, Ontario.
- University of Toronto, Toronto, Ontario.
- University of Manitoba, Winnipeg, Manitoba.
- University of Montreal, Montreal, Quebec.
- University of Saskatchewan, Saskatoon, Saskatchewan.
- University of Alberta, Edmonton, Alberta.
- University of British Columbia, Vancouver, British Columbia.

Public libraries—

- Halifax, Nova Scotia.
- Montreal, Quebec.
- Toronto, Ontario (Reference Division).
- Edmonton, Alberta.
- Calgary, Alberta.
- Nelson Municipal Library, British Columbia.
- New Westminster, British Columbia.
- Prince Rupert, British Columbia.
- Prince George, British Columbia.
- Vancouver, British Columbia (Acquisitions Division).
- Victoria, British Columbia.

ENGLAND

British Columbia House, Regent Street, London, England.
Canada House, London, England.
Institution of Mining and Metallurgy, 44 Portland Place, London, England.

SOUTH AFRICA

Public Library, Johannesburg, South Africa.

AUSTRALIA

Public Library, Sydney, Australia.

UNITED STATES

Government departments and legislative libraries—
- Library of Congress, Washington 25, D.C.
- The Interior Department Library, Washington 25, D.C.
- United States Geological Survey—Washington 25, D.C.; and Denver Federal Centre, Denver, Colorado.
- California State Division of Mines, Ferry Building, San Francisco, California.
- Oregon State Department of Geology and Mineral Industries, 702 Woodlark Building, Portland, Oregon.
- Washington State Division of Mines and Geology, Olympia, Washington.
- Idaho State Bureau of Mines, Boise, Idaho.

University and society libraries—
- Columbia University, New York 27, New York (Document Division).
- Cornell University Library, Ithaca, New York.
- Engineering Societies Library, 29 West Thirty-ninth Street, New York, New York.
- State University of Iowa, Iowa City, Iowa.
- Montana School of Mines, Butte, Montana.
- Oregon State College, Corvallis, Oregon.
- University of Washington, Seattle, Washington.
- University of Nevada, Reno, Nevada.
- University of California, Berkeley, California (Document Division).

Public libraries—
- New York, New York.
- Boston, Massachusetts.
- Denver, Colorado.
- St. Louis, Missouri.
- Free Library, Philadelphia Zone 3, Pennsylvania.
- Library Association of Portland, Portland, Oregon.
- Los Angeles, California.
- San Francisco, California.
- Seattle, Washington.
- Spokane, Washington.

Lode-metal Deposits Referred to in the 1956 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 1956:—

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	Mercury	Tin	Nickel	Molybdenum	Cobalt	Page
Northern British Columbia																		
Big Bull	Atlin	58° 133° N.W.	2	1	1	1	1		2									12
BUY	Liard	57° 131° S.W.			3													14
Callison Copper	Liard	58° 131° S.W.			3													14
Contact	Liard	59° 129° S.W.		1	2	1												A47
HAB	Liard	57° 131° S.W.			3													14
Maid of Erin	Atlin	59° 136° N.W.	2	1	1													11
Northwestern Explorations	Liard	59° 129° S.E.				3	3											11
Reed	Liard	59° 129° S.E.				3	3											11
Tulsequah Chief	Atlin	58° 133° N.W.	2	1	1	1	1		2									12
Windy	Liard	57° 129° N.W.			3													14
Central British Columbia																		
Abe	Omineca	53° 124° N.W.										3						28
Aurum	Cariboo	53° 121° S.W.	1	2														31
Babs	Omineca	53° 124° N.W.										3						28
Boss Mountain	Cariboo	52° 120° S.W.														3		34
Cariboo Gold Quartz	Cariboo	53° 121° S.W.	1	2														31
Copper Nos. 1 to 4	Clinton	51° 122° S.W.			3													35
Cronin Babine	Omineca	54° 126° N.W.	2	1		1	1		2									27
D.A.	Omineca	54° 124° S.E.											3					29
Duthie	Omineca	54° 127° N.E.		3		3	3											26
Erie	Omineca	55° 127° S.W.		3		3	3											26
Ferguson	Omineca	56° 125° N.E.				3	3											30
Ike	Omineca	53° 124° N.W.										3						28
Iron Mountain	Cariboo	52° 122° S.E.			3													33
Jim	Cariboo	52° 121° N.E.	3															33
McDonald Island	Omineca	54° 126° N.E.			3													29
Mohawk	Clinton	51° 123° S.E.			3													35
Mouse Mountain	Cariboo	53° 122° S.E.	2	2	1													33
Ni	Cariboo	52° 122° S.E.													3			34
Pat	Omineca	53° 124° N.W.										3						28
Rio Canadian, French Peak	Omineca	55° 126° S.W.		3		3												29
Rio Canadian, Hansard	Cariboo	54° 121° S.W.			3													30
Rio Canadian, Hutton	Cariboo	53° 121° N.W.			3													31
Silver Standard	Omineca	55° 127° S.W.																23
Spokane	Clinton	51° 123° S.E.			3													35
Swannell	Omineca	56° 125° N.E.				3	3											30
Three Hills	Omineca	55° 127° S.W.			3													25
Topley Richfield	Omineca	54° 126° N.E.	3	3														28
Wow	Omineca	53° 124° N.W.										3						28
Zeke	Omineca	53° 124° N.W.										3						28

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 gross value of the shipment. Production for 1956 is listed in Table XV.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

Lode-metal Deposits Referred to in the 1956 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Mercury	Tin	Nickel	Molybdenum	Cobalt	Page
Coast and Islands																		
A.M.	New Westminster	49° 121° S.E.			3													114
Anyox	Skeena	55° 129° S.W.			3													21
Argentine	Skeena	56° 129° S.W.			3													18
Argus	Nanaimo	50° 125° S.E.		2	1													A47
Avallin	Victoria	48° 124° N.W.			3													124
Blue Grouse, Cowichan Lake	Victoria	48° 124° N.E.		2	1													120
Blue Grouse, Reginald Lake	Nanaimo	49° 125° N.W.		2	1	2												A48
Boulder, Kitsault River	Skeena	55° 129° N.W.			3													21
Britannia	Vancouver	49° 123° N.E.	2	2	1	2	1		2									115
Copper Road	Nanaimo	50° 125° S.E.		2	1													A48
Domineer	Nanaimo	49° 125° N.E.			3													119
Double Ed	Skeena	55° 129° S.W.			3													22
Douglas	New Westminster	49° 121° S.W.		2	1	2												A48
E.B.V.	Victoria	48° 123° N.W.								3								136
Fraser	Victoria	48° 124° N.E.			3													122
Gabbro	Victoria	48° 124° S.E.			3													124
Glengarry	Alberni	49° 126° N.W.								3								131
Granduc	Skeena	56° 130° S.E.			3													15
Indian Chief	Alberni	49° 126° S.E.			3					3								119
Iron Crown	Nanaimo	50° 126° S.W.								3								134
Iron Hill	Nanaimo	49° 125° N.W.								1								119
Iron River	Nanaimo	49° 125° N.E.								3								131
Kingfisher	Nanaimo	50° 127° S.E.								3								117
Kinskuch	Skeena	55° 129° N.W.			3													21
Klaanch	Nanaimo	50° 126° S.W.								3								133
Lady A	Victoria	48° 123° N.W.								3								135
Lorry	Victoria	48° 124° N.E.			3													122
Lucky Four	New Westminster	49° 121° S.W.			3													115
McMillin	Skeena	52° 131° S.E.			3					3								22
Maple Bay	Skeena	55° 130° S.E.			3													18
Merry Widow No. 5	Nanaimo	50° 127° S.E.								3								117
Nadira Mines Limited	Alberni	48° 124° N.W.			3													123
Old Sport	Nanaimo	50° 127° S.E.			3													117
Paxton	Nanaimo	49° 124° N.W.								1								116
Prescott	Nanaimo	49° 124° N.W.								1								116
Reina Blanca	Skeena	55° 129° N.W.			3													21
Rhoda	Nanaimo	50° 126° S.W.								3								134
Silbak Premier	Skeena	56° 130° S.E.	2	2		1	1											17
Silver Tip	Skeena	56° 130° S.E.		3		3	3											18
South Leduc	Skeena	56° 130° S.E.			3													17
Star, Porcher Island	Skeena	54° 130° S.E.								3								23
Star of the West	Alberni	49° 126° N.W.			3													119
Stormont	Alberni	49° 126° N.W.								3								131
Sunloch	Victoria	48° 124° S.E.			3													124
Swede	Skeena	52° 131° N.W.			3													22
Tanitin	Alberni	48° 124° N.W.			3													124
Tassoo	Skeena	52° 132° N.E.								3								125
Torger Copper	Skeena	52° 126° N.W.			3													22
Toric	Skeena	55° 129° N.W.		1		1												19
Yellow Jacket	Nanaimo	49° 124° N.W.								1								116
Yellow Kid	Nanaimo	49° 124° N.W.								1								116
Yreka	Nanaimo	50° 127° S.W.			3													117
South Central British Columbia																		
Ajax	Kamloops	50° 120° N.E.			3													63
Ash	Kamloops	51° 119° N.W.		3		3	3											69
Beaver	Kamloops	50° 121° N.E.			3													44
Bethlehem Copper	Kamloops	50° 120° S.W.			3													45
Bethsaida Copper	Kamloops	50° 121° S.E.			3													45
Bralorne	Lillooet	50° 122° N.W.	1	2														37
Cam	Kamloops	51° 119° N.W.		3		3	3											69
Commercial Minerals Limited	Kamloops	50° 120° N.E.			3													67
Copper King	Lillooet	50° 121° N.W.			3													41
Copper Mountain	Similkameen	49° 120° S.W.	2	2	1													72
Copper Queen	Greenwood	49° 118° S.W.			3													75
Copperado	Nicola	50° 120° S.W.		2	1													47
D.W.	Kamloops	50° 121° N.E.			3													44
Dry Gulch	Lillooet	50° 122° N.W.	3															41
Dunmore Mines Limited	Kamloops	50° 120° S.W.			3													46
East Lemhi	Kamloops	51° 119° S.W.	2	1		1	1											A49

Lode-metal Deposits Referred to in the 1956 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Mercury	Tin	Nickel	Molybdenum	Cobalt	Page
South Central British Columbia—Continued																		
Elizabeth	Lillooet	51° 122° S.W.	3															37
Evening Star	Kamloops	50° 120° N.E.			3													57
Fairview	Osoyoos	49° 119° S.W.	3															74
French	Osoyoos	49° 120° S.E.	3															73
Graham Bousquet	Kamloops	50° 121° S.E.			3													45
Greyhound	Greenwood	49° 118° S.W.			3													75
Highland-Bell	Greenwood	49° 119° S.E.	2	1		2	1		2									74
Inland Copper	Kamloops	50° 120° N.E.			3													58
Iron Mask	Kamloops	50° 120° N.E.			3													58
Jericho Mines Limited	Kamloops	50° 120° S.W.			3													46
Krain Copper	Kamloops	50° 121° N.E.			3													43
Laco Mines Limited	Kamloops	50° 121° S.E.			3													45
Little Gem	Lillooet	50° 122° N.W.	3									3					3	40
Little Joe	Osoyoos	49° 119° S.W.	2	1														A49
Lodestone Mountain	Similkameen	49° 120° S.W.								3								136
Monte Carlo	Kamloops	50° 120° N.E.			3													63
Mother Lode	Greenwood	49° 118° S.W.			3													75
Nickel Plate	Osoyoos	49° 120° S.E.	1	2	2													A49
Noranda, Eholt	Greenwood	49° 118° S.W.			3													75
Northlodge	Kamloops	50° 120° N.W.			3													44
Northwestern Explorations, Guichon Creek	Nicola	50° 120° S.W.			3													46
Olalla	Osoyoos	49° 119° S.W.									1							73
Outrider	Kamloops	50° 121° N.E.			3													44
Phoenix	Greenwood	49° 118° S.W.	3	3	3													75
Pioneer	Lillooet	50° 122° N.W.	1	2														39
Providence	Greenwood	49° 118° S.W.	2	1		2	2											A48
Python	Kamloops	50° 120° N.E.			3													54
Red Star	Similkameen	49° 120° S.W.	3	3	3		3											71
Rexspar	Kamloops	51° 119° N.W.										3						70
Ruby	Greenwood	49° 118° S.W.		2	1													A49
Salmo Prince	Kamloops	50° 120° N.W.			3													43
Silver Hill	Similkameen	49° 121° S.E.		3		3	3											71
Transvaal	Kamloops	50° 121° N.E.			3													44
Tri-Side	Kamloops	50° 120° N.W.			3													44
Trojan	Kamloops	50° 120° N.W.			3													43
Victor	Kamloops	50° 121° S.E.			3													46
Southeastern British Columbia																		
A.U.	Slocan	49° 117° N.E.		1		1	1											98
Amazon	Slocan	49° 116° N.W.		3		3	3											92
Archer	Nelson	49° 117° S.E.	3		3													77
Aurea	Nelson	49° 116° S.W.		3		3												107
Austin	Slocan	49° 117° N.E.		1		1	1											98
Beatrice	Revelstoke	50° 117° N.W.	3	3		3	3											105
Bil Mecky	Nelson	49° 117° S.E.	3		3													77
Bluebell	Slocan	49° 116° N.W.		2	2	1	1		2									89
Bob	Nelson	49° 116° S.W.			3													106
Boomerang	Slocan	49° 117° N.E.		1		1	1											99
Bosun	Slocan	49° 117° N.E.		3		3	3											96
Boy Scout	Fort Steele	49° 116° N.E.		3		3	3											108
Buffalo	Slocan	49° 117° N.E.	2	1		1	1		2									A51
Caledonia	Slocan	50° 117° S.E.	2	1		1	1		2									93
Campsall	Fort Steele	49° 115° N.W.				3		3										108
Copper Queen	Nelson	49° 116° S.W.			3													85
Cork	Slocan	50° 117° S.E.		3		3	3											93
Crawford	Nelson	49° 116° S.E.		2		1												A50
Creston Hill	Nelson	49° 116° S.E.			3													107
Cu	Golden	50° 115° N.W.			3													111
Deer Horn	Nelson	49° 117° S.E.		3		3	3											79
Discovery Fraction	Slocan	49° 117° N.E.		1		1	1											96
Dixie	Slocan	49° 116° N.W.				3	3											89
Dodger	Nelson	49° 117° S.E.						1										80
Eclipse	Revelstoke	50° 117° N.W.	2	1	2	1	1		2									99
Emerald	Nelson	49° 117° S.E.						1										80
Enterprise	Slocan	49° 117° N.E.	2	1		1	1		2									96
Eureka	Nelson	49° 117° S.E.	2	1	1													78
Feeney	Nelson	49° 117° S.E.						1										80

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 gross value of the shipment. Production for 1956 is listed in Table XV.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

LODE-METAL DEPOSITS REFERRED TO IN THE 1956 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Mercury	Tin	Nickel	Molybdenum	Cobalt	Page
Southeastern British Columbia—Continued																		
Fisher Maiden	Slocan	49° 117° N.E.		1		1	1		2									98
Galena Farm	Slocan	49° 117° N.E.		1	1		1		2									98
Go Lucky	Nelson	49° 117° S.E.	3	3		3												80
H.B.	Nelson	49° 117° S.E.		2		1	1		1									83
Hard Luck	Nelson	49° 117° S.E.	3	3		3												80
Hecla	Slocan	49° 117° N.E.	2	1		1	1		2									96
Hercules	Slocan	49° 116° N.W.		3		3	3											92
Hewitt	Slocan	49° 117° N.E.	2	2		1	1		2									97
Highland	Slocan	49° 116° N.W.		3		3	3											91
Highlander	Slocan	49° 116° N.W.	2	1		1	1											91
Hinckley	Slocan	49° 117° N.E.	2	1		1	1		2									95
Hope	Nelson	49° 116° S.W.		3		3	3											87
Hungry Man	Nelson	49° 117° S.E.	3		3													79
I.X.L.	Trail Creek	49° 117° S.W.	3															77
J.G.	Slocan	50° 116° S.W.		3		3	3											106
Jersey	Nelson	49° 117° S.E.		2		1	1		2									80
King, Cranbrook	Fort Steele	49° 115° N.W.			3													108
King, Creston	Nelson	49° 116° S.W.		3	3	3												106
King Fissure	Revelstoke	51° 118° S.E.		3		3	3											114
Kootenay Florence	Slocan	49° 116° N.W.		1		1	2											91
Kootenay Selkirk	Fort Steele	49° 115° N.W.				3												109
Lakeview	Nelson	49° 116° S.W.		3		3	3											86
Laura M.	Slocan	49° 116° N.W.		1		1	2											92
Lead Mountain	Golden	50° 116° N.E.				3	3											112
Lone Bachelor	Slocan	49° 117° N.E.		3		3	3											95
Lucky Boy, Crescent Valley	Nelson	49° 117° S.W.										3						77
Lucky Boy, Salmo	Nelson	49° 117° S.E.		3		3	3											80
M.B.	Nelson	49° 116° S.E.				3												107
Mammoth	Slocan	49° 117° N.E.	2	1		1	1		2									96
May-Bee	Nelson	49° 116° S.E.			3													107
Midnight	Trail Creek	49° 117° S.W.	3															77
Min	Slocan	50° 117° S.E.		3		3	3											93
Mineral King	Golden	50° 116° S.E.		2	2	1	1		2									110
Monarch	Slocan	49° 117° N.E.		3		3	3											96
Moonshine	Slocan	50° 116° S.W.		3		3	3											106
Mystery	Fort Steele	49° 116° N.E.			3													108
Noble Five	Slocan	49° 117° N.E.		1		1	1											94
Noonday	Slocan	49° 117° N.E.		1		1	1											98
Nugget	Nelson	49° 117° S.E.	1	2														80
O.K.	Trail Creek	49° 117° S.W.	3															77
Ottawa	Slocan	49° 117° N.E.		1		2	2											99
Promistora	Slocan	49° 117° N.W.	1	2		2	2											99
Ptarmigan	Golden	50° 116° N.E.		3	3													111
Queen	Nelson	49° 117° S.E.	1	2														80
Queen Victoria	Nelson	49° 117° S.E.	2	1	1													78
Red Ledge	Golden	50° 116° S.E.				3	3											110
Reeves MacDonald	Nelson	49° 117° S.E.		2		1	1		2									85
Right Bower	Slocan	50° 116° S.W.		3		3	3											106
Ruth-Vermont	Golden	50° 116° N.W.		3		3	3											112
Santa Fe	Slocan	49° 116° N.W.		3		3												88
Silver Giant	Golden	50° 116° N.E.		2	2	1	2		2									111
Silver Glance	Slocan	49° 116° N.W.		3		3	3											92
Silver King	Nelson	49° 117° S.E.	2	1	1	2												79
Silversmith	Slocan	49° 117° N.E.	2	1		1	1		2									94
Snowdrop	Trail Creek	49° 117° S.W.	3		3													76
Spider	Revelstoke	50° 117° N.W.	2	1	2	1	1		2									99
Spokane	Nelson	49° 116° S.W.	1	2		1	1											86
Standard	Slocan	49° 117° N.E.	2	1		1	1		2									96
Star	Slocan	49° 116° N.W.	2	1		1	2											A51
Star No. 1	Nelson	49° 116° S.E.		2		1	2											A50
Sullivan	Fort Steele	49° 115° N.W.	2	1	2	1	1							2				108
Tam O'Shanter	Slocan	49° 116° N.W.		3		3	3											90
Tariff	Slocan	49° 116° N.W.		1		1	1											92
United Copper	Slocan	49° 116° N.W.			3													87
Utica	Slocan	49° 117° N.E.		1		1	1											93
Van Roi	Slocan	49° 117° N.E.	2	2		1	1		2									97
Velvet	Trail Creek	49° 117° S.W.	1	2	1													76
Victor	Slocan	49° 117° N.E.	2	1		1	1		2									95
Warhorse	Fort Steele	49° 116° N.E.		3		3	3											108
Westmont	Slocan	49° 117° N.E.		1		1	1											98
Whitewater	Slocan	50° 117° S.E.		1		1	1											93
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