# Minister of Mines and Petroleum Resources

PROVINCE OF BRITISH COLUMBIA

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# ANNUAL REPORT

for the Year Ended December 31

1967

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1968

**BRITISH COLUMBIA DEPARTMENT OF MINES AND PETROLEUM RESOURCES**
VICTORIA, B.C.

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*Major-General the Honourable* GEORGE RANDOLPH PEARKES,
V.C., P.C., C.C., C.B., D.S.O., M.C., C.D.,
*Lieutenant-Governor of British Columbia.*

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mineral Industry of the Province for the year 1967 is herewith respectfully submitted.

DONALD L. BROTHERS,
*Minister of Mines and Petroleum Resources.*

*Minister of Mines and Petroleum Resources Office,*
*March 31, 1968.*

Robert James Craig, Senior Inspector, Environmental Control, died in Vancouver on December 12, 1967, after a short illness. He was born in Vancouver on July 1, 1913, and it was here he received his engineering education, graduating from the University of British Columbia with a B.A. and a B.A.Sc. in mining engineering. He served on the engineering staff of the Britannia mine from 1936 to 1945, when he joined the Workmen's Compensation Board as an Inspector, silicosis branch. He was transferred to the Department in 1962 as a Senior Inspector with office in Vancouver. "Bob" Craig was hghly respected throughout the mining industry for his knowledge of ventilation and dust control. He was intimately aware of the problems of environmental control which had to be solved to improve working conditions, and his advice was widely sought. He was a member of the Association of Professional Engineers of British Columbia and the Canadian Institute of Mining and Metallurgy. He is survived by his wife Alice, two daughters, and a son.

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# ANNUAL REPORT OF THE MINISTER OF MINES AND PETROLEUM RESOURCES, 1967

## Introduction

An annual report of the mineral industry of the Province has been published each year since 1874. From 1874 to 1959 it was the Annual Report of the Minister of Mines, and since 1960 it has been the Annual Report of the Minister of Mines and Petroleum Resources. It is the official document in which each year is recorded the salient facts of activity of the industry.

The Annual Report of the Minister of Mines and Petroleum Resources contains sections dealing with Statistics; Departmental Work; Lode Metals; Placer; Structural Materials and Industrial Minerals; Petroleum and Natural Gas; Inspection of Mines; and Coal.

There is a general introductory review of the mineral industry as a whole, as well as somewhat more detailed reviews of mining and exploration and of petroleum and natural gas.

The section on Statistics records the mineral production of the Province in all its phases and in considerable detail. Current and past practice in arriving at quantities and in calculating the value of the various products is outlined.

The organization of the Department and the work of its various branches are outlined briefly in the section on Departmental Work.

The Lode Metals section records details of individual mining operations, as well as the exploration and development of mineral deposits. Information is provided on every metal-producing mine in the Province, and an attempt is made to record the progress of exploration and development work on most of the important, newly discovered and recently explored mineral deposits. In some instances a mining property is described in considerable detail, with special attention given to the history of past work, to a description of the workings, the geological setting, and to the mineral deposit itself. Some geological reports are of areas where one or more mineral deposits occur. These geological reports provide the basic information about the mineral resources of the Province that is essential to intelligent resource planning.

The declining phase of the once important placer-mining industry continues to be recorded in the Placer section.

Information on occurrences and production of Structural Materials and Industrial Minerals is recorded in a separate section.

The Petroleum and Natural Gas section records in considerable detail the development and production statistics of that expanding industry.

Information concerning mine safety, fatal accidents, dangerous occurrences, etc., and the activities of the Inspection Branch of the Department is contained in the section on Inspection of Mines.

The section on Coal contains information on operating coal mines and on exploration activities.

# Review of the Mineral Industry

By M. S. Hedley

The year 1967 was a good one for British Columbia's mineral industry. For the sixth successive time a new record was set for the value of annual production. The total of $386,796,807 was 14 per cent above the previous record set in 1966, and brought the all-time total value to $6,297 million.

A record value was set in each of the four categories of metals, industrial minerals, structural materials, and fuels. The comparison with 1966 follows:—

| | 1966 | 1967 | Gain (Per Cent) |
|---|---|---|---|
| Metals | $209,036,531 | $235,932,026 | 12.9 |
| Industrial minerals | 22,865,324 | 29,364,065 | 28.4 |
| Structural materials | 46,821,264 | 47,359,089 | 1.1 |
| Fuels | 60,470,406 | 74,141,627 | 22.6 |
| Totals | $339,193,525 | $386,796,807 | 14.0 |

The most valuable single commodity was copper, and the second was crude oil; the value and quantity of each were at unprecedented high levels.

The increase in the metals category was due to a greatly increased output of copper, resulting from new mines and increased milling rates. Production was 63.2 per cent above that for 1966, but, because of a lower average price, the value was up only 57.1 per cent. The quantities and values of molybdenum, nickel, and silver were up, but lead and zinc were both down in quantity and value. The by-products of lead-zinc mining—antimony, bismuth, cadmium, indium, and tin—were down an aggregate three-quarters of a million dollars.

The value of industrial minerals was up due to increase in production and, to a greater extent, the value of asbestos, which exceeded $18 million. Although the output of sulphur was down, the total value increased substantially. This was the result of revaluing the Cominco sulphur output, which is a by-product in the form of sulphuric acid. The nominal value assigned to this sulphur equivalent was raised to be in line with world prices. The sulphur recovered at the gas plant at Taylor was valued at the average price received.

Structural materials showed little change. The value of cement production was up about 6 per cent, and that of sand and gravel was down by a like amount. A new 2-million-barrels-per-year kiln was installed in the plant of Lafarge Cement of North America Ltd. Other commodities showed no significant change.

Fuels as a whole showed a 22.6-per-cent increase in value. Coal production was up 6.8 per cent, and this increase coupled with a rise in the price put the value up 13.7 per cent. Crude oil was up 18 per cent in quantity and 24 per cent in value, while natural gas delivered to pipe-lines for distribution increased 24 per cent in quantity and 25 per cent in value.

The price for gold was 5 cents per ounce higher than in 1966. The price for silver rose to more than $2 late in 1967 and averaged an unprecedented $1.67. The average price for lead was down a little more than 1 cent, and that of zinc was down three-quarters of a cent. The price for copper dropped to 50 cents per pound from its all-time high in 1966.

The Trail custom smelter treated 13,650 tons of British Columbia crude ore, 6,403 tons of lead concentrates, and 5,562 tons of zinc concentrates, in addition to the product of its own mines and various out-of-Province sources. American smelters received the remainder of the lead concentrates and most of the zinc concentrates, as well as 11,667 tons of copper concentrates. To Japanese smelters went 96 per cent of the production of copper concentrates, all the iron concentrates, all the nickel-copper concentrates, and a small percentage of the zinc concentrates. In summary, concentrates representing 7.4 per cent of the total value of 1967 metal production were treated at United States smelters and concentrates representing 47.5 per cent of the total were treated in Japan.

DESTINATION OF BRITISH COLUMBIA CONCENTRATES

| Smelters | Gold-Silver | Lead | Zinc | Copper | Nickel-Copper | Iron |
|---|---|---|---|---|---|---|
| | Tons | Tons | Tons | Tons | Tons | Tons |
| Trail | 1,530 | 135,165 | 159,572 | ...... | ...... | ...... |
| United States | ...... | 13,552 | 65,154 | 11,667 | ...... | ...... |
| Japan | ...... | ...... | 14,010 | 283,020 | 22,777 | 1,982,030 |

Six mines closed. The Aurum gold mine at Wells was a victim of fixed price and rising costs, after 34 years' production. Iron mines closed at Benson Lake and Kennedy Lake on Vancouver Island, as well as a copper mine on Quatsino Sound and lead-zinc mines on Toby Creek and east of Kimberley. Not all closures were due to exhaustion of reserves, but there is little likelihood of these mines reopening unless conditions change considerably.

The loss in gold production from the closing of the Aurum mine was more than made up by the output of gold as a by-product of copper-mining. Silver production was up 11.4 per cent.

Three mines came into production—the Tasu iron-copper mine of Wesfrob Mines Limited, the Alice mine of British Columbia Molybdenum Limited, and the Horn Silver mine of Utica Mines Ltd. The first two are open-pit mines with a combined capacity of 14,000 tons per day.

Copper production increased by 63.2 per cent to 172.7 million pounds, largely as the result of the first full year's operation at the Granisle and Western (Lynx) mines and of increased capacity at Bethlehem. At the end of 1967, 10 mines were producing major amounts of copper at an aggregate milling rate of more than 30,000 tons of ore per day. The Bethlehem mill achieved a capacity of 14,000 tons per day, or four times its initial capacity in 1963.

Prospects for further increases in the production of copper are bright indeed. The Granduc and Brenda mines are slated for production in 1969, and exploration is at an advanced stage on a number of properties.

Molybdenum is in better position than is indicated by the small increase in production from 1966. The Alice mine will have a full year's production in 1968, and the Brenda mine will contribute a major amount in 1969. The full effect of the increased capacity at Endako will be felt in 1968.

The production of lead and zinc was down for the third successive year, due in large part to the fact that most of the output of Cominco's Pine Point mine in the Northwest Territories has since 1965 been treated in the Trail smelter, thus effectively reducing the output of the Sullivan mine. In 1967 a considerable tonnage of high-grade ore from Pine Point was concentrated at the Kimberley plant.

The exploration for metals continued through 1967 at a high rate, the measurement of which is something of a problem. The Department has at all times endeavoured to report annually on as much current activity as possible, and this has become increasingly difficult in the last few years, with more ground to cover and without increase in staff. The Inspectors of Mines and the Mineralogical Branch geologists have found it increasingly difficult to obtain the information and have instituted a short work questionnaire that forms part of the central permanent record. At the same time a questionnaire was devised to obtain statistics on all forms of exploration expenditures, with the aid of the Bureau of Economics and Statistics. In 1967 the Dominion Bureau of Statistics (D.B.S.) initiated a form to collect all data on expenditures in the field of exploration and development, extending from the broad field of prospecting to detailed investigation of ore zones, and including all such work in and adjacent to operating mines. The response to the D.B.S. form has been good, and it is hoped that further refinement of the form will result in better coverage. For the first time it has been possible to measure with reasonable accuracy the moneys expended by the mining industry for its own perpetuation.

Ten staff geologists of the Mineralogical Branch did geological field work ranging from property examinations to an areal mapping project in the Unuk River region. Results of part of this work is to be found in the Lode Metals section of this Report, and the remainder will appear in the bulletin series.

The Geological Survey of Canada reported 28 projects involving field work in British Columbia. These ranged from geological mapping at 4 miles to 1 inch and 1 mile to 1 inch to palæontological and mineralogical studies. Some of this work extended into Alberta.

Airborne magnetometer surveying under a cost-sharing arrangement with the Geological Survey of Canada was continued in the north-central plateau region. Sheets at a scale of 1 mile to 1 inch are issued about one year after flying is completed. Compilations on a 4-miles-to-1-inch scale are available for some earlier work. Following release of maps, the basic data are filed with the Geological Survey in Ottawa.

EXPLORATION AND DEVELOPMENT EXPENDITURES, 1967

| | Physical Work | Land Costs | Head Office, Administration, Etc. |
|---|---|---|---|
| Exploration—prospecting and undeclared mines—293 companies | $22,861,000 | $1,098,000 | $4,067,000 |
| Exploration—on or near declared mines— | | | |
| Two development companies | $139,000 | | |
| Fourteen operating companies | 2,724,000 | | |
| | $2,863,000 | 5,000 | 227,000 |
| Development—on declared or operating mines— | | | |
| Three development companies | $20,791,000 | | |
| Twenty operating companies | 6,052,000 | | |
| | $26,843,000 | 29,000 | 2,201,000 |
| Totals | $52,567,000 | $1,132,000 | $6,495,000 |
| Grand total, $60,194,000. | | | |

The foregoing table represents minimum figures. The total shown for head office, overhead, and administration is certainly low because only those companies which performed physical work made returns. Land costs, such as leases, purchases, etc., are also certainly low. Exploration devoted to finding and investigating new ore zones is close to being correct, as there are relatively few omissions of major undertakings. Exploration and development expenditures related to declared or operating mines are the most accurate. The definition of exploration and development by operating companies may vary, but, as a rule, work on a declared or recognized orebody is " development " and work performed in search of or to prove up new ore is " exploration."

About one-half the total expenditure on exploration work was made under contract and of that on development work a little more than half. This refers to all physical and technical work, including diamond drilling, stripping, tunnelling, and geological, geochemical, geophysical, and other surveys. The expenditure on work done by contractors amounted to some $11 million for exploration and some $15 million for development. The contractors' work force was approximately equal to the companies' work force. At the middle of the summer season the total combined work force approximated 3,000 men.

Employment figures in exploration and development are none too certain because of the short summer season, but the Department has record of 6,000 man-months worked by contractors' employees and a like figure for company employees in the conduct of general exploration for new ore deposits. The figure for company employment is somewhat at variance with that in Table 10, which shows the total as reported in the D.B.S. forms.

Over-all expenditures in the metal-mining industry in 1967 were as follows:—

| | |
|---|---|
| Mining and quarrying operations— | |
| Salaries and wages | $94,523,495 |
| Compensation, silicosis, unemployment | 3,486,232 |
| Fuel and electricity | 13,590,759 |
| Process supplies | 34,368,856 |
| Capital expenditures | 33,800,000 |
| Repairs | 12,412,172 |
| Exploration and development | 60,194,000 |
| Total | $252,375,514 |

This compilation is not directly comparable with the total given in the 1966 Review because expenditures of capital and repairs and of exploration and development are on a somewhat different basis.

The total gross dividends reported amounted to $48,145,202 from companies other than those producing or processing petroleum or natural gas. This figure compares with $42,385,263 for 1966. Dividend tables are no longer carried in the statistical section, and the 1965 Report is the last to list them in detail. Some history is thus lost sight of, but because of much diversification of industry the sources of profits and hence of dividends are not always clear. Dividends in the petroleum industry would be particularly difficult to assign to British Columbia operations within the scope of this Report.

In 1967 crude oil became the second most valuable product of the mineral industry, being surpassed only by copper. The production of oil and natural gas has expanded at a relatively steady rate for some years, as have prices. Fewer wells were completed than in 1966, but the fact of deeper drilling was shown by the fact that total footage remained almost unchanged at more than 1 million feet.

Drilling began on the continental shelf. The Sedco 135-F semi-submersible drilling-vessel abandoned two holes west of Vancouver Island and was drilling a third at the end of 1967.

Exploration activity increased as seismograph studies were extended into the Province from the important petroleum pools recently discovered in the Rainbow area of northwestern Alberta.

The gas-gathering system was extended to the Yoyo, Kotcho, and Sierra fields, where there are large reserves.

The major development in the marketing of petroleum products was the completion of an oil refinery at Prince George, the seventh in the Province. A total of about 103,300 barrels per day was delivered to the several refineries at the end of 1967, about half of which was produced in British Columbia.

The net cash expenditures for the petroleum industry follow:—

| | |
|---|---|
| Exploration, including land acquisition and drilling | $57,095,000 |
| Development drilling | 13,584,000 |
| Capital expenditures | 11,177,000 |
| Operations of natural-gas plants | 18,575,000 |
| Operations of wells | 8,684,000 |
| General (excluding income tax) | 12,699,000 |
| Total | $121,814,000 |

Direct revenue to the Government from the entire mineral industry is listed below:—

| | |
|---|---|
| Free miners' certificates, recording fees, lease rentals, assessment payments, etc. | $1,117,354 |
| Royalties on iron concentrates | 138,172 |
| Payments on industrial minerals and structural materials | 207,754 |
| Ten-per-cent mineral tax (received during 1967) | 2,367,986 |
| Coal licences | 23,518 |
| Petroleum and natural-gas rentals, fees, etc. | 10,356,731 |
| Sale of Crown reserves | 14,297,816 |
| Royalties on oil, gas, and processed products | 9,607,437 |
| Miscellaneous | 17,917 |
| Total | $38,134,685 |

# Statistics

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

## CO-OPERATION WITH DOMINION BUREAU OF STATISTICS

In the interests of uniformity and to avoid duplication of effort, beginning with the statistics for 1925, the Dominion Bureau of Statistics and the various Provincial departments have co-operated in the collection and processing of mineral statistics.

Producers of metals, industrial minerals, structural materials, coal, and petroleum and natural gas are requested to submit returns in duplicate on forms prepared for use by the Province and by the Dominion Bureau of Statistics.

So far as possible both organizations follow the same practice in processing the data. The final compilation by the Dominion Bureau is usually published considerably later than the Report of the Minister of Mines and Petroleum Resources for British Columbia. Differences between the figures published by the two organizations arise mainly from the facts that the Dominion Bureau bases its quantities of metals on returns made by smelter operators, whereas the British Columbia mining statistician uses the returns covering shipments from individual mines in the same period; the Dominion Bureau uses average prices for metals considered applicable to the total Canadian production, whereas the British Columbia mining statistician uses prices considered applicable to British Columbia production.

Peat, included under the classification of fuel by the Dominion Bureau, is not regarded as mineral or fuel, and accordingly is not included in the British Columbia statistics of mineral production.

## METHOD OF COMPUTING PRODUCTION

The tabulated statistics are arranged so as to facilitate comparison of the production records for the various mining divisions, and from year to year. From time to time, revisions have been made to figures in earlier reports as additional data became available or errors came to light.

Data are obtained from the certified returns made by producers of metals, industrial minerals and structural materials, and coal, and are augmented by data obtained from customs smelters. For placer gold, returns from operators are augmented by data obtained from the Royal Canadian Mint, from Gold Commissioners, and other sources. For petroleum, natural gas, and liquid by-products, production figures supplied by the Petroleum and Natural Gas Branch of the Department of Mines and Petroleum Resources are compiled from the monthly disposition reports and the Crown royalty statement filed with the Department by the producers.

Values are in Canadian funds. Weights are avoirdupois pounds and short tons (2,000 lb.), and troy ounces. Barrels are 35 imperial gallons.

### METALS

#### *Gross and Net Content*

The gross contents for any metal are the sum of its total assay content in ore, concentrates, or bullion shipped to the smelter or refinery. The net contents are the gross contents less smelter and refinery losses.

In past years there have been different methods used in calculating net contents, particularly in the case of one metal contained in the concentrate of another. The present method was established in 1963 and is outlined in the following table. For example, the net content of silver in copper concentrates is 98 per cent of the gross content, of cadmium in zinc concentrates is 70 per cent of the gross content, etc.

| | Lead Concentrates | Zinc Concentrates | Copper Concentrates | Copper-Nickel Concentrates | Copper Matte |
|---|---|---|---|---|---|
| | Per Cent | Per Cent | Per Cent | Per Cent | Per Cent |
| Silver | 98 | 98 | 98 | — | 98 |
| Copper | Less 26 lb./ton | — | Less 10 lb./ton | 85 | Less 10 lb./ton |
| Lead | 98 | 50 | 50 | — | 50 |
| Zinc | 50 | 90 | — | — | — |
| Cadmium | — | 70 | 70 | — | — |
| Nickel | — | — | — | 88 | — |

## *Calculated Value*

Prior to 1925 the value of metals produced was calculated by using the true average prices for gold and copper, and the smelter loss of copper was taken into account. The value of other metals was calculated from the gross metal content of ores or concentrates by using a metal price which was an arbitrary percentage of the average price, as follows: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent. These percentages of the average price are listed in the table on page A 24.

For 1925 and subsequent years the value has been calculated by using the true average price (*see* p. A 24) and the net metal contents, in accordance with the procedures adopted by the Dominion Bureau of Statistics and the Department of Mines and Petroleum Resources.

In the statistical tables, for gold the values are calculated by multiplying the gross contents of gold by the average price for the year; for the other principal metals, by multiplying the net contents of metals as determined by means of the above table by the average price for the year.

Iron concentrate exported to Japan is valued at the price received by the shippers. The value of the iron ore used in making pig iron at Kimberley is an arbitrary figure, being the average value per ton of ore of comparable grade at its point of export from British Columbia.

The value of molybdenum is the amount received by the shippers.

The by-product metals, bismuth, tin, and indium, are valued on the basis of the price received by the shippers, and the value of antimony is the net content multiplied by the average price for the year.

## *Average Prices*

The prices used in valuation of metal production are shown in the table on page A 24.

In 1967 the price of gold, $37.76, is the average Canadian Mint buying price.

Originally when fine gold was $20.67 per ounce the price used for valuing placer gold was established arbitrarily at $17 per ounce; between 1931 and 1962 the price was proportionately increased with the continuously changing price of fine gold. Since 1962 Canadian Mint reports giving the fine-gold content have been available for all but a very small part of the placer gold produced, and the average price listed is derived by dividing ounces of placer gold into total amount received.

Prices of the other principal metals are the average United States prices converted into Canadian funds. Average monthly prices are supplied by the Dominion Bureau of Statistics from figures published in the Metal Markets section of the Engineering and Mining Journal. Specifically, for silver it is the New York price; for lead it is the New York price; for zinc it is the price at East St. Louis of Prime Western; for copper it is the United States export refinery price; and for cadmium the New York producer's price to consumer.

For nickel the price used is the Canadian price as set by the International Nickel Company of Canada Ltd.

### Industrial Minerals and Structural Materials

The prices for industrial minerals and structural materials approximate the prices received at the point of origin.

### Fuel

The price per ton used in valuing coal (*see* p. A 24) is the weighted average of the f.o.b. prices for the coal sold.

The values for natural gas, natural-gas liquid by-products, and for petroleum including condensate/pentanes plus are the aggregates of amounts received for the products at the well-head.

## NOTES ON PRODUCTS LISTED IN THE TABLES

*Antimony.*—Antimony was produced as early as 1907 from Slocan ore exported to foreign smelters, and since 1939 it has been produced as a by-product at the Trail smelter. Currently Trail is the only source of the metal. In Table 7C the antimony assigned to individual mining divisions is the reported content of concentrates exported to foreign smelters; the antimony " not assigned " is the antimony recovered at the Trail smelter from the various ores received there. *See* Tables 1, 3, and 7C.

*Arsenious Oxide.*—Arsenious oxide was recovered at foreign smelters from arsenical gold ores, chiefly from Hedley between 1917 and 1931, again in 1942, and from the Victoria property on Rocher Déboulé Mountain in 1928. There has been no production since 1942. *See* Tables 1 and 7D.

*Asbestos.*—Production of asbestos began in 1952 with the opening of the Cassiar mine, from which all Provincial production continues to be derived. From 1953 to 1961 asbestos was valued at the shipping point in North Vancouver, but beginning in 1962 it has been valued at the mine, and the values for the preceding years have been recalculated on that basis. *See* Tables 1, 3, and 7D.

*Barite.*—Production of barite began in 1940, and since then it has been produced continuously at several operations in the valley of the upper Columbia River, where it is mined from veins and recovered from an old lead-zinc mill tailings pond. *See* Tables 1, 3, and 7D.

*Bentonite.*—Small amounts of bentonite were produced between 1926 and 1944 from deposits in the coal measures near Princeton. There has been no production since 1944. *See* Tables 1 and 7D.

*Bismuth.*—Production of bismuth began in 1929 at the Trail smelter. It is a by-product of refining lead, and consequently it cannot be assigned to any specific property or mining division. *See* Tables 1, 3, and 7C.

*Butane.*—Butane is recovered as a by-product at the gas-processing plant at Taylor and at oil refineries. *See* Tables 1, 3, and 7A.

*Cadmium.*—Cadmium is recovered as a by-product at zinc refineries. It was first produced at the Trail zinc refinery in 1928. Cadmium occurs in variable amounts in sphalerite and is recovered from most British Columbia silver-lead-zinc ores. Cadmium assigned to individual mining divisions is the reported content of custom shipments to the Trail smelter and to foreign smelters. The " not assigned " cadmium in Table 7C is the remainder of the reported estimated recovery at the Trail smelter from British Columbia concentrates. *See* Tables 1, 3, and 7C.

*Cement.*—Cement is manufactured from a controlled mixture of limestone, rock, and gypsum. It has been produced in British Columbia since 1905. The total production each year fluctuates to meet current building demands. *See* Tables 1, 3, and 7E.

*Clay and Shale Products.*—Include brick, tile, sewer pipe, pottery, light-weight aggregate, and pozzolan. Local surface clays or shale and fireclay are used. Common clays and shales are abundant in the Province, but fireclay and other high-grade clays are scarce. *See* Tables 1, 3, and 7E.

*Chromite.*—Only two shipments of chromite are recorded, one of 670 tons from Cascade in 1918 and one of 126 tons from Scottie Creek in 1929. *See* Tables 1 and 7C.

*Coal.*—Coal was discovered at Suquash on Vancouver Island in 1835 and at Nanaimo in 1850. First production: Cariboo Mining Division, 1942; Fort Steele Mining Division, 1898; Kamloops Mining Division, 1893; Liard Mining Division, 1923; Nanaimo Mining Division, 1836; Nicola Mining Division, 1907; Omineca Mining Division, 1918; Osoyoos Mining Division, 1926; Similkameen Mining Division, 1909; and Skeena Mining Division, 1912. The Nanaimo and Comox fields produced virtually all the coal until production started from the Crowsnest area in 1898. The Nanaimo field was exhausted in 1953, when the large mines closed.

All the coal produced, including that used in making coke, is shown as primary mine production. Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. From 1910 the quantity is the amount sold and used, which includes sales to retail and wholesale dealers, industrial users, and company employees; coal used under company boilers, including steam locomotives; and coal used in making coke. *See* Tables 1, 3, 7A, 8A, and 8B.

*Cobalt.*—Cobalt was recovered in 1928 from a 22-ton shipment of arsenical gold ore made in 1926 from the Victoria property on Rocher Déboulé Mountain. *See* Tables 1 and 7C.

*Coke.*—Coke is manufactured from certain special types of coal and has been produced since 1895. Being a manufactured product, its value does not contribute to the total mineral production as shown in Table 1. Up to 1966, coke statistics have been included in the Annual Report as Table 9, but this table is being discontinued. The coal used in making coke is still recorded in Table 8B. Coke statistics may be obtained on request to the Bureau of Economics and Statistics, Department of Industrial Development, Trade, and Commerce, Victoria.

*Copper.*—Most of the copper production has come from the southern part of the Province, from Britannia, Copper Mountain, Greenwood, Highland Valley, Merritt, Nelson, Rossland, Texada Island, and Vancouver Island. Some came from Anyox and a lesser amount from Tulsequah. Production in 1966 from Granisle in the central interior is the first from an important new region. Copper production started in 1894. Ore was smelted in British Columbia first at Nelson (from the Silver King mine) and at Trail (from the Rossland mines) in 1896, and four and five years later at Grand Forks (from the Phoenix mine) and Greenwood (from the Motherlode mine). Other smaller smelters were built in the Boundary district and on Vancouver Island. In 1914 the Anyox smelter was blown in.

Copper-smelting ceased in the Boundary district in 1919, at Trail in 1929, and at Anyox in 1935. British Columbia copper ore was then smelted mainly at Tacoma, and since 1961 mainly in Japan. *See* Tables 1, 3, 6, and 7B.

*Crude Oil.*—Production of crude oil in British Columbia began in 1955 from the Fort St. John field but was not significant until late in 1961 (*see* Fig. 38), when the 12-inch oil pipe-line was built to connect the old-gathering terminal at Taylor to the Trans Mountain Oil Pipe Line Company pipe-line near Kamloops. Oil is now being produced from 19 separate fields, of which the Boundary Lake, Peejay, and Milligan Creek fields are currently the most productive, accounting for 78.5 per cent of the annual total.

In Tables 1, 3, and 7A, quantities given prior to 1962 under "petroleum, crude" are total sales, and from 1962 to 1965 include field and plant condensates. Beginning in 1966, total production of crude oil is given and field and plant condensates are listed separately. Full details are given in tables in the Petroleum and Natural Gas section of this report.

*Diatomite.*—Small amounts of diatomite have been quarried near Quesnel periodically since 1928. *See* Tables 1, 3, and 7D.

*Field Condensate.*—Field condensate is the liquid produced in the field from gas wells. It is listed as condensate/pentanes plus in the Petroleum and Natural Gas section of this Report. *See* Tables 1, 3, and 7A.

*Fluorite (Fluorspar).*—Between 1918 and 1929, fluorite was mined at the Rock Candy mine north of Grand Forks for use in the Trail lead refinery. In the last several years it has been produced as a by-product of the silica quarry at Oliver. *See* Tables 1, 3, and 7D.

*Flux.*—Silica and limestone are added to smelter furnaces as flux to combine with impurities in the ore and form a slag which separates from the valuable metal. The quantities of flux have been continuously recorded since 1911. *See* Tables 1, 3, and 7D.

*Gold, Lode.*—Gold has played an important part in mining in the Province. The first discovery of lode gold was made on Moresby Island in 1852, and the first stamp mill, to treat gold-bearing quartz, was built in the Cariboo in 1876.

The principal gold camps have been Bridge River, Hedley, Portland Canal, Rossland, Sheep Creek, and Wells. At the present time the only major producing gold mine is the Bralorne mine in the Bridge River area. Currently more than half the gold is produced as a by-product from copper, copper-zinc-silver, and other base-metal mining. *See* Tables 1, 3, 6, and 7B.

*Gold, Placer.*—The early explorations and settlement of the Province followed rapidly on the discovery of gold-bearing placer creeks throughout the country. The first placer miners came in 1858 to mine the lower Fraser River bars upstream from Yale.

Important placers were found in the Cariboo, Cassiar, Omineca, and Princeton areas, and at Atlin, Cedar Creek, Fort Steele, Goldstream, Rock Creek, Squaw Creek, and many other places.

Since World War II, placer-mining has been declining steadily.

A substantial part of the production, including much of the gold recovered from the Fraser River upstream from Yale (in the present New Westminster, Kamloops, and Lillooet Mining Divisions) and much of the early Cariboo production, was mined before the original organization of the Department of Mines in 1874. Consequently the amounts recorded are based on early estimates and cannot be accurately assigned to individual mining divisions.

The first year of production for major placer-producing divisions was: Atlin, 1898; Cariboo, 1858; Liard, 1873; Lillooet, 1874; Omineca, 1869.

In 1965, changes were made in the allocation of placer gold to the New Westminster and Similkameen Mining Divisions and "not assigned," to reconcile those figures with data incorporated in Bulletin No. 28, "Placer Gold Production of British Columbia." *See* Tables 1, 3, 6, and 7A.

*Granules.*—Rock chips used for exposed aggregate, roofing, stucco dash, terrazzo, etc., have been produced in constantly increasing amounts since 1930. *See* Tables 1, 3, and 7D.

*Gypsum and Gypsite.*—Gypsum and gypsite have been produced since 1911. Between 1925 and 1956 more than 1,000,000 tons was produced from quarries at Falkland; latterly production has come from large deposits near Windermere. *See* Tables 1, 3, and 7D.

*Hydromagnesite.*—Hydromagnesite has been produced from deposits at Atlin and Clinton, but no production has been recorded since 1921. *See* Tables 1 and 7D.

*Indium.*—Production of indium as a by-product of zinc-refining at the Trail smelter began in 1942. Production figures have not been disclosed since 1958.

*Iron Concentrates.*—Iron ore was produced in small quantities as early as 1885. Sustained production began in 1951 with shipments of concentrated magnetite ore to Japan. The ore has been mined mainly from magnetite and copper-bearing magnetite deposits on Vancouver Island, Texada Island, and Moresby Island.

Since 1961, calcined iron sulphide from the tailings of the Sullivan mine has been used for making pig iron at Kimberley. The entire production, credited to the Fort Steele Mining Division in Table 7C, is of calcine. *See* Tables 1, 3, 6, and 7C.

*Iron Oxide.*—Iron oxide, ochre, and bog iron were mined as early as 1918 from several occurrences, but mainly from limonite deposits north of Squamish. None has been produced since 1950. *See* Tables 1 and 7D.

*Jade (Nephrite).*—Production of jade (nephrite) has been recorded only since 1959 despite there being several years of significant production prior to that date. The jade is recovered as alluvial boulders from the Fraser River, the Bridge River and its tributaries Marshall and Cadwallader Creeks, Kwanika and Wheaton Creeks, and Dease Lake. *See* Tables 1, 3, and 7D.

*Lead.*—Lead was first produced in British Columbia in 1887. Almost all has come from the southeastern part of the Province, where the Sullivan mine has produced 83 per cent of the Provincial total. Other important mines are at Salmo, Pend d'Oreille River, and North Kootenay Lake.

In 1958, revisions were made in some yearly totals for lead to adjust them for recovery of lead from slag treated at the Trail smelter. *See* Tables 1, 3, 6, and 7B.

*Limestone.*—Limestone, besides being used for flux and granules (where it is recorded separately), is used in cement manufacture, in the pulp and paper industry, in agriculture, and in making builders' lime. It has been produced since 1886, and currently most production is from quarries on northern Texada Island. *See* Tables 1, 3, and 7E.

*Magnesium.*—Magnesium was produced in 1941 and 1942 by Cominco Ltd. from a large deposit of magnesite at Marysville. *See* Tables 1 and 7C.

*Magnesium Sulphate.* — Magnesium sulphate has been recovered in small amounts at various times since 1915 from alkali lakes near Clinton, Basque, and Osoyoos. There has been no production since 1942.

Principal productive periods: Clinton, 1918–20, 1,923 tons, $39,085; Kamloops, 1918–42, 8,742 tons, $193,967; Osoyoos, 1915–19, 3,229 tons, $21,300. *See* Tables 1 and 7D.

*Manganese*.—The only manganese ore produced was shipped in 1918–20 from a bog deposit near Kaslo and from Hill 60 near Cowichan Lake, and in 1956 a test shipment was made by Olalla Mines Ltd. *See* Tables 1 and 7C.

*Mercury*.—Mercury was first produced near Savona in 1895, and since then small amounts have been recovered from the same source and from the Bridge River area. The main production was in 1940–44 from the Pinchi Lake mine and Takla mercury mine near Fort St. James. *See* Tables 1 and 7C.

*Mica*.—Sheet mica has not been produced commercially in British Columbia, but since 1932 small amounts of mica for grinding has been produced from deposits at Albreda, Armstrong, and Oliver. *See* Tables 1, 3, and 7D.

*Molybdenum*.—Molybdenum ore in small amounts was produced from high-grade deposits between 1914 and 1918. Beginning in 1964, first as a by-product of the Bethlehem copper mine, the production of molybdenum ore has increased tremendously from several low-grade mines. Now it is the fourth most valuable metal product of the Province, and a molybdenum mine (Endako) is currently the largest open-pit mine in the Province. *See* Tables 1, 3, 6, and 7C.

*Natro-alunite*.—In 1912 and 1913, 400 tons of natro-alunite was mined from a small low-grade deposit at Kyuquot Sound. There has been no subsequent production. *See* Tables 1 and 7D.

*Natural Gas*.—Commercial production of natural gas began in 1954 to supply the community of Fort St. John. Since the completion in 1957 of the gas plant at Taylor and the 30-inch pipe-line to serve British Columbia and the northwestern United States, the daily average volume of production has increased to more than 500,000,000 cubic feet per day (*see* Fig. 39). In 1967 there were 29 separately producing gasfields.

The production shown in Tables 1, 3, and 7A is the total amount sold of residual gas from processing plants plus dry and associated gas from the gas-gathering system; that is, the quantity delivered to the main transmission-line. The quantity is net after deducting gas used on leases, metering difference, and gas used or lost in the cleaning plant. The quantity is reported as thousands of cubic feet at standard conditions (14.4 pounds per square inch pressure, 60° F. temperature, up to and including the year 1960, and thereafter 14.65 pounds per square inch pressure, 60° F. temperature).

Gross well output, other production, delivery, and sales data are tabulated in the Petroleum and Natural Gas section of this report.

*Nickel*.—Nickel was produced in 1936 and 1937 and continuously since 1958, all being derived from one mine, the Pride of Emory near Hope. Since 1960, bulk nickel-copper concentrates have been shipped to Japan for smelting. *See* Tables 1, 3, and 7C.

*Palladium*.—Palladium was recovered in 1928, 1929, and 1930 as a by-product of the Trail refinery and is presumed to have originated in copper concentrates shipped to the smelter from the Copper Mountain mine. *See* Tables 1 and 7C.

*Perlite*.—In 1953 a test shipment of 1,112 tons was made from a quarry on Francois Lake. There has been no further production. *See* Tables 1 and 7D.

*Petroleum, Crude*.—*See* Crude Oil.

*Phosphate Rock*.—Between 1927 and 1933 Cominco produced 3,842 tons of phosphate rock for test purposes, but the grade proved to be too low for commercial use. There has been no further production. *See* Tables 1 and 7D.

*Plant Condensate*.—Plant condensate is liquid produced from natural gas at field plants or at the Taylor gas-processing plant. *See* Tables 1, 3, and 7A.

It is listed as condensate/pentanes plus in the Petroleum and Natural Gas section of this report.

*Platinum.*—Platinum has been produced intermittently from placer streams in small amounts since 1887, mostly from the Tulameen and Similkameen Rivers. Some platinum recovered between 1928 and 1930 as a by-product of the Trail refinery is presumed to have originated in copper concentrates shipped to the smelter from the Copper Mountain mine. *See* Tables 1, 3, and 7C.

*Propane.*—Propane is recovered from gas-processing plants at Taylor and Boundary Lake, and at oil refineries. *See* Tables 1, 3, and 7A.

*Rock.*—Production of rubble, riprap, and crushed rock has been recorded since 1909. *See* Tables 1, 3, and 7E.

*Sand and Gravel.*—Sand and gravel are used as aggregate in concrete work of all kinds. The output varies from year to year according to the state of activity of the construction industry. *See* Tables 1, 3, and 7E.

*Selenium.*—The only recorded production of selenium, 731 pounds, was in 1931 from the refining of blister copper from the Anyox smelter. *See* Tables 1 and 7C.

*Silver.*—Production of silver began in British Columbia in 1887. Silver is produced from silver ores and is recovered as a by-product of silver-lead-zinc, copper-zinc, or gold ores. Most of it is refined at Trail, but some is exported with concentrates to American or Japanese smelters or may go to the Mint in gold bullion. At present the largest single source of silver is the Sullivan mine. *See* Tables 1, 3, 6, and 7B.

*Sodium Carbonate.*—Sodium carbonate was recovered between 1921 and 1949 from alkali lakes in the dry belt. About 93 per cent was produced from the Clinton area and the balance from around Kamloops. There has been no further production. *See* Tables 1 and 7D.

*Stone.*—Dimensional stone for building purposes is quarried when required from a granite deposit on Nelson Island and an andesite deposit on Haddington Island. Other stone close to local markets is quarried periodically or as needed for special building projects. *See* Tables 1, 3, and 7E.

*Structural Materials.*—Unclassified materials valued at $5,972,171 in Table 7E is the total for structural materials in the period 1886–1919 that cannot be allotted to particular classes of structural materials or assigned to mining divisions, and includes $726,323 shown against 1896 in Table 2 that includes unclassified structural materials in that and previous years not assignable to particular years. The figure 3,150,828 in Table 7E under "Other Clay Products" is the value in the period 1886–1910 that cannot be allotted to particular clay products or assigned to mining divisions. *See* Tables 1, 2, 3, 7A, and 7E.

*Sulphur.*—The production of sulphur has been recorded since 1916. From 1916 to 1927 the amounts include the sulphur content of pyrite shipped. From 1928 the amounts include the estimated sulphur content of pyrite shipped plus the sulphur contained in sulphuric acid made from waste smelter gases. The sulphur content of pyrrhotite roasted at the Kimberley fertilizer plant is included since 1953. Since 1958 elemental sulphur recovered from the Jefferson Lake Petrochemical Co. plant at Taylor has been included. *See* Tables 1, 3, and 7D.

*Talc.*—Between 1916 and 1936, talc was quarried at Leech River and at Anderson Lake for dusting asphalt roofing. There has been no production since 1936. *See* Tables 1, 3, and 7D.

*Tin.*—Tin as cassiterite is a by-product of the Sullivan mine, where it has been produced since 1941. The tin concentrate is shipped to an American smelter for treatment. *See* Tables 1, 3, and 7C.

*Tungsten.*—Tungsten, very largely as scheelite concentrates, was produced from 1937 to 1958, first from the Cariboo in 1937 and during World War II from the Red Rose mine near Hazelton and the Emerald mine near Salmo. The Red Rose closed in 1954 and the Emerald in 1958.

A very small amount of wolframite came from Surprise Creek near Atlin. *See* Tables 1, 3, and 7C.

*Volcanic Ash.*—The only recorded production of volcanic ash is 30 tons from the Cariboo Mining Division in 1954. *See* Tables 1 and 7D.

*Zinc.*—Zinc was first produced in 1905. Currently the total value of all zinc production is greater than that of any of the other metals, lead being in second place.

By far the greatest amount of zinc has been mined in southeastern British Columbia, at the Sullivan mine and at mines near Ainsworth, Invermere, Moyie Lake, Riondel, Salmo, Slocan, and Spillimacheen. The greatest zinc mine is the Sullivan, which has contributed 71 per cent of the total zinc production of the Province.

Records for the period 1905 to 1908 show shipments totalling 18,845 tons of zinc ore and zinc concentrates of unstated zinc content. In 1958, revisions were made to some yearly totals for zinc to adjust them for recovery of zinc from slag treated at the Trail smelter. *See* Tables 1, 3, 6, and 7B.

## PRICES USED IN VALUING PROVINCIAL PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, AND COAL

| Year | Gold,[1] Placer, 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 | ........ | ........ | 56.370 " | 12.920 " | 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 " | 11.750 " | 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 " | 12.800 " | 6.750 " | 7.810 " | 4.68 |
| 1947 | 28.78 | 35.00 | 72.000 " | 20.390 " | 13.670 " | 11.230 " | 5.12 |
| 1948 | 28.78 | 35.00 | 75.000 Mont. | 22.350 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 " | 6.48 |
| 1951 | 30.30 | 36.85 | 94.550 " | 27.700 " | 18.400 " | 19.900 " | 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 |
| 1957 | 27.59 | 33.55 | 87.057 " | 26.031 " | 14.051 " | 11.175 " | 6.76 |
| 1958 | 27.94 | 33.98 | 86.448 " | 23.419 " | 11.755 " | 10 009 " | 7.45 |
| 1959 | 27.61 | 33.57 | 87.469 " | 27.708 " | 11.670 " | 10.978 " | 7.93 |
| 1960 | 27.92 | 33.95 | 88.633 " | 28.985 " | 11.589 " | 12.557 " | 6.64 |
| 1961 | 29.24 | 35.46 | 93.696 " | 28.288 " | 11.011 " | 11.695 " | 7.40 |
| 1962 | 29.25 | 37.41 | 116.029 " | 30.473 " | 10.301 " | 12.422 " | 7.43 |
| 1963 | 29.31 | 37.75 | 137.965 " | 30.646 " | 12.012 " | 13.173 " | 7.33 |
| 1964 | 29.96 | 37.75 | 139.458 " | 33.412 " | 14.662 " | 14.633 " | 6.94 |
| 1965 | 28.93 | 37.73 | 139.374 " | 38.377 " | 17.247 " | 15.636 " | 7.03 |
| 1966 | 29.08 | 37.71 | 139.300 " | 53.344 " | 16.283 " | 15.622 " | 7.28 |
| 1967 | 28.77 | 37.76 | 167.111 " | 50.022 " | 15.102 " | 14.933 " | 7.75 |

[1] *See* page A 16, under gold, placer.

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.

The prices for gold and copper are true average prices. Prior to 1925 the prices of other metals are 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. Since 1925 the prices of all metals are true average prices.

## TABLE 1.—MINERAL PRODUCTION: TOTAL TO DATE, PAST YEAR, AND LATEST YEAR

| Products[1] | Total Quantity to Date | Total Value to Date | Quantity, 1966 | Value, 1966 | Quantity, 1967 | Value, 1967 |
|---|---|---|---|---|---|---|
| *Metals* | | $ | | $ | | $ |
| Antimony lb. | 49,859,826 | 14,653,918 | 1,405,681 | 745,011 | 1,267,686 | 671,874 |
| Bismuth lb. | 6,344,049 | 11,765,019 | 47,435 | 198,848 | 142,507 | 572,878 |
| Cadmium lb. | 35,999,631 | 61,143,642 | 1,169,570 | 3,017,491 | 994,365 | 2,784,222 |
| Chromite tons | 796 | 32,295 | | | | |
| Cobalt lb. | 1,730 | 420 | | | | |
| Copper lb. | 3,718,897,656 | 788,573,005 | 105,800,568 | 56,438,255 | 172,739,548 | 88,135,172 |
| Gold—placer oz. | 5,233,848 | 96,911,921 | 1,535 | 44,632 | 891 | 25,632 |
| „ —lode oz. | 16,684,295 | 491,030,265 | 119,508 | 4,506,646 | 126,157 | 4,763,688 |
| Iron, concentrates tons | 20,257,256 | 180,150,667 | 2,151,804 | 20,778,934 | 2,154,443 | 20,820,765 |
| Lead lb. | 15,171,777,138 | 1,246,368,659 | 211,490,107 | 34,436,934 | 208,131,894 | 31,432,079 |
| Magnesium lb. | 204,632 | 88,184 | | | | |
| Manganese tons | 1,724 | 32,668 | | | | |
| Mercury lb. | 4,171,110 | 10,447,358 | | | 380 | 2,600 |
| Molybdenum lb. | 41,960,948 | 71,354,438 | 17,094,927 | 27,606,061 | 17,517,348 | 31,249,772 |
| Nickel lb. | 32,411,701 | 26,373,985 | 3,622,400 | 3,104,397 | 4,180,842 | 3,946,715 |
| Palladium oz. | 749 | 30,462 | | | | |
| Platinum oz. | 1,407 | 135,008 | | | | |
| Selenium lb. | 731 | 1,389 | | | | |
| Silver oz. | 465,859,503 | 313,557,280 | 5,549,131 | 7,729,939 | 6,180,739 | 10,328,695 |
| Tin lb. | 17,274,649 | 14,809,273 | 710,752 | 1,130,096 | 437,804 | 621,682 |
| Tungsten ($WO_3$) lb. | 16,019,324 | 38,663,751 | | | | |
| Zinc lb. | 13,549,404,824 | 1,255,584,491 | 305,124,440 | 47,666,540 | 262,830,908 | 39,248,539 |
| Others | | 9,944,214 | | 1,632,747 | | 1,327,713 |
| Totals | | 4,631,652,312 | | 209,036,531 | | 235,932,026 |
| *Industrial Minerals* | | | | | | |
| Arsenious oxide lb. | 22,019,420 | 273,201 | | | | |
| Asbestos tons | 683,422 | 133,692,993 | 88,771 | 15,718,741 | 92,192 | 18,273,220 |
| Barite tons | 275,742 | 3,119,031 | 21,888 | 176,240 | 23,466 | 176,882 |
| Bentonite tons | 791 | 16,858 | | | | |
| Diatomite tons | 6,616 | 158,166 | 70 | 3,755 | 2,819 | 14,096 |
| Fluorspar tons | 35,643 | 794,833 | 152 | 4,986 | 80 | 2,464 |
| Fluxes tons | 3,988,104 | 7,229,775 | 23,913 | 112,314 | 48,052 | 221,212 |
| Granules tons | 302,286 | 4,391,005 | 23,956 | 424,667 | 31,283 | 305,655 |
| Gypsum and gypsite tons | 3,287,757 | 12,235,390 | 206,026 | 576,873 | 230,044 | 691,592 |
| Hydromagnesite tons | 2,253 | 27,536 | | | | |
| Iron oxide and ochre tons | 18,108 | 155,050 | | | | |
| Jade lb. | 258,445 | 133,109 | 11,633 | 13,225 | 20,160 | 24,341 |
| Magnesium sulphate tons | 13,894 | 254,352 | | | | |
| Mica lb. | 12,822,050 | 185,818 | | | | |
| Natro-alunite tons | 522 | 9,398 | | | | |
| Perlite tons | 1,112 | 11,120 | | | | |
| Phosphate rock tons | 3,842 | 16,894 | | | | |
| Sodium carbonate tons | 10,492 | 118,983 | | | | |
| Sulphur tons | 6,289,397 | 78,100,899 | 342,478 | 5,834,523 | 314,490 | 9,654,603 |
| Talc tons | 1,805 | 34,871 | | | | |
| Volcanic ash tons | 30 | 300 | | | | |
| Totals | | 240,959,582 | | 22,865,324 | | 29,364,065 |
| *Structural Materials* | | | | | | |
| Cement tons | 10,899,078 | 176,472,503 | 707,506 | 15,959,293 | 708,855 | 16,929,451 |
| Clay products | | 64,038,164 | | 4,100,192 | | 3,945,207 |
| Lime and limestone tons | | 43,927,925 | 1,483,949 | 2,696,011 | 1,645,253 | 2,822,138 |
| Rock tons | | 38,912,410 | 1,590,189 | 1,890,992 | 2,287,407 | 2,967,195 |
| Sand and gravel tons | | 184,910,797 | 24,320,013 | 21,959,733 | 23,210,746 | 20,643,673 |
| Stone tons | 1,158,048 | 9,131,636 | 76,720 | 215,043 | 3,577 | 51,425 |
| Not assigned | | 5,972,171 | | | | |
| Totals | | 523,365,606 | | 46,821,264 | | 47,359,089 |
| *Fuels* | | | | | | |
| Coal tons | 140,633,492 | 602,317,732 | 850,821 | 6,196,219 | 908,790 | 7,045,341 |
| Crude oil bbl. | 86,467,553 | 181,915,757 | 16,638,181 | 36,268,683 | 19,656,799 | 44,748,477 |
| Field condensate bbl. | 161,741 | 355,440 | 39,571 | 86,265 | 40,570 | 92,357 |
| Plant condensate bbl. | 8,618,053 | 4,900,300 | 974,564 | 312,360 | 1,016,045 | 267,941 |
| Nat'l gas to pipe-line M s.c.f. | 1,139,229,860 | 110,335,069 | 161,264,334 | 17,339,587 | 198,626,177 | 21,667,136 |
| Butane bbl. | 3,729,197 | 1,193,343 | 500,973 | 160,312 | 588,118 | 188,197 |
| Propane bbl. | 2,227,300 | 712,733 | 334,315 | 106,980 | 413,058 | 132,178 |
| Totals | | 901,730,374 | | 60,470,406 | | 74,141,627 |
| Grant totals | | 6,297,707,874 | | 339,193,525 | | 386,796,807 |

[1] *See* notes on individual products listed alphabetically on pages A 17 to A 23.

TABLE 2.—TOTAL VALUE OF PRODUCTION, 1836–1967

| Year | Metals | Industrial Minerals | Structural Materials | Fuels | Total |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| 1836–86 | 52,808,750 | — | 43,650 | 10,758,565 | 63,610,965 |
| 1887 | 729,381 | — | 22,168 | 1,240,080 | 1,991,629 |
| 1888 | 745,794 | — | 46,432 | 1,467,903 | 2,260,129 |
| 1889 | 685,512 | — | 77,517 | 1,739,490 | 2,502,519 |
| 1890 | 572,884 | — | 75,201 | 2,034,420 | 2,682,505 |
| 1891 | 447,136 | — | 79,475 | 3,087,291 | 3,613,902 |
| 1892 | 511,075 | — | 129,234 | 2,479,005 | 3,119,314 |
| 1893 | 659,969 | — | — | 2,934,882 | 3,594,851 |
| 1894 | 1,191,728 | — | — | 3,038,859 | 4,230,587 |
| 1895 | 2,834,629 | — | — | 2,824,687 | 5,659,316 |
| 1896 | 4,973,769 | — | 726,323 | 2,693,961 | 8,394,053 |
| 1897 | 7,575,262 | — | 150,000 | 2,734,522 | 10,459,784 |
| 1898 | 7,176,870 | — | 150,000 | 3,582,595 | 10,909,465 |
| 1899 | 8,107,509 | — | 200,000 | 4,126,803 | 12,434,312 |
| 1900 | 11,360,546 | — | 250,000 | 4,744,530 | 16,355,076 |
| 1901 | 14,258,455 | — | 400,000 | 5,016,398 | 19,674,853 |
| 1902 | 12,163,561 | — | 450,000 | 4,832,257 | 17,445,818 |
| 1903 | 12,640,083 | — | 525,000 | 4,332,297 | 17,497,380 |
| 1904 | 13,424,755 | 2,400 | 575,000 | 4,953,024 | 18,955,179 |
| 1905 | 16,289,165 | — | 660,800 | 5,511,861 | 22,461,826 |
| 1906 | 18,449,602 | — | 982,900 | 5,548,044 | 24,980,546 |
| 1907 | 17,101,305 | — | 1,149,400 | 7,637,713 | 25,888,418 |
| 1908 | 15,227,991 | — | 1,200,000 | 7,356,866 | 23,784,857 |
| 1909 | 14,668,141 | — | 1,270,559 | 8,574,884 | 24,513,584 |
| 1910 | 13,768,731 | — | 1,500,000 | 11,108,335 | 26,377,066 |
| 1911 | 11,880,062 | 46,345 | 3,500,917 | 8,071,747 | 23,499,071 |
| 1912 | 18,218,266 | 17,500 | 3,436,222 | 10,786,812 | 32,458,800 |
| 1913 | 17,701,432 | 46,446 | 3,249,605 | 9,197,460 | 30,194,943 |
| 1914 | 15,790,727 | 51,810 | 2,794,107 | 7,745,847 | 26,382,491 |
| 1915 | 20,765,212 | 133,114 | 1,509,235 | 7,114,178 | 29,521,739 |
| 1916 | 32,092,648 | 150,718 | 1,247,912 | 8,900,675 | 42,391,953 |
| 1917 | 27,299,934 | 174,107 | 1,097,900 | 8,484,343 | 37,056,284 |
| 1918 | 27,957,302 | 281,131 | 783,280 | 12,833,994 | 41,855,707 |
| 1919 | 20,058,217 | 289,426 | 980,790 | 11,975,671 | 33,304,104 |
| 1920 | 19,687,532 | 508,601 | 1,962,824 | 13,450,169 | 35,609,126 |
| 1921 | 13,160,417 | 330,503 | 1,808,392 | 12,836,013 | 28,135,325 |
| 1922 | 19,605,401 | 251,922 | 2,469,967 | 12,880,060 | 35,207,350 |
| 1923 | 25,769,215 | 140,409 | 2,742,388 | 12,678,548 | 41,330,560 |
| 1924 | 35,959,566 | 116,932 | 2,764,013 | 9,911,935 | 48,752,446 |
| 1925 | 46,480,742 | 101,319 | 2,766,838 | 12,168,905 | 61,517,804 |
| 1926 | 51,867,792 | 223,748 | 3,335,885 | 11,650,180 | 67,077,605 |
| 1927 | 45,134,289 | 437,729 | 2,879,160 | 12,269,135 | 60,720,313 |
| 1928 | 48,640,158 | 544,192 | 3,409,142 | 12,633,510 | 65,227,002 |
| 1929 | 52,805,345 | 807,502 | 3,820,732 | 11,256,260 | 68,689,839 |
| 1930 | 41,785,380 | 457,225 | 4,085,105 | 9,435,650 | 55,763,360 |
| 1931 | 23,530,469 | 480,319 | 3,538,519 | 7,684,155 | 35,233,462 |
| 1932 | 20,129,869 | 447,495 | 1,705,708 | 6,523,644 | 28,806,716 |
| 1933 | 25,777,723 | 460,683 | 1,025,586 | 5,375,171 | 32,639,163 |
| 1934 | 35,177,224 | 486,554 | 1,018,719 | 5,725,133 | 42,407,630 |
| 1935 | 42,006,618 | 543,583 | 1,238,718 | 5,048,864 | 48,837,783 |
| 1936 | 45,889,944 | 724,362 | 1,796,677 | 5,722,502 | 54,133,485 |
| 1937 | 65,224,245 | 976,171 | 2,098,339 | 6,139,920 | 74,438,675 |
| 1938 | 55,959,713 | 916,841 | 1,974,976 | 5,565,069 | 64,416,599 |
| 1939 | 56,216,049 | 1,381,720 | 1,832,464 | 6,280,956 | 65,711,189 |
| 1940 | 64,332,166 | 1,073,023 | 2,534,840 | 7,088,265 | 75,028,294 |
| 1941 | 65,807,630 | 1,253,561 | 2,845,262 | 7,660,000 | 77,566,453 |
| 1942 | 63,626,140 | 1,434,382 | 3,173,635 | 8,237,172 | 76,471,329 |
| 1943 | 55,005,394 | 1,378,337 | 3,025,255 | 7,742,030 | 67,151,016 |
| 1944 | 42,095,013 | 1,419,248 | 3,010,088 | 8,217,966 | 54,742,315 |
| 1945 | 50,673,592 | 1,497,720 | 3,401,229 | 6,454,360 | 62,026,901 |
| 1946 | 58,834,747 | 1,783,010 | 5,199,563 | 6,732,470 | 72,549,790 |
| 1947 | 95,729,867 | 2,275,972 | 5,896,803 | 8,680,440 | 112,583,082 |
| 1948 | 124,091,753 | 2,358,877 | 8,968,222 | 9,765,395 | 145,184,247 |
| 1949 | 110,219,917 | 2,500,799 | 9,955,790 | 10,549,924 | 133,226,430 |
| 1950 | 117,166,836 | 2,462,340 | 10,246,939 | 10,119,303 | 139,995,418 |

TABLE 2.—TOTAL VALUE OF PRODUCTION, 1836–1967—*Continued*

| Year | Metals | Industrial Minerals | Structural Materials | Fuels | Total |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| 1951 | 153,598,411 | 2,493,840 | 10,606,048 | 10,169,617 | 176,867,916 |
| 1952 | 147,857,523 | 2,181,464 | 11,596,961 | 9,729,739 | 171,365,687 |
| 1953 | 126,755,705 | 3,002,673 | 13,555,038 | 9,528,279 | 152,841,695 |
| 1954 | 123,834,286 | 5,504,114 | 14,395,174 | 9,161,089 | 152,894,663 |
| 1955 | 142,609,505 | 6,939,490 | 15,299,254 | 9,005,111 | 173,853,360 |
| 1956 | 149,441,246 | 9,172,792 | 20,573,631 | 9,665,983 | 188,853,652 |
| 1957 | 125,353,920 | 11,474,050 | 25,626,939 | 8,537,920 | 170,992,829 |
| 1958 | 104,251,112 | 9,958,768 | 19,999,576 | 10,744,093 | 144,953,549 |
| 1959 | 105,076,530 | 12,110,286 | 19,025,209 | 11,439,192 | 147,651,217 |
| 1960 | 130,304,373 | 13,762,102 | 18,829,989 | 14,468,869 | 177,365,333 |
| 1961 | 128,565,774 | 12,948,308 | 19,878,921 | 18,414,318 | 179,807,321 |
| 1962 | 159,627,293 | 14,304,214 | 21,366,265 | 34,073,712 | 229,371,484 |
| 1963 | 172,852,866 | 16,510,898 | 23,882,190 | 42,617,633 | 255,863,587 |
| 1964 | 180,926,329 | 16,989,469 | 26,428,939 | 42,794,431 | 267,139,168 |
| 1965 | 177,101,733 | 20,409,649 | 32,325,714 | 50,815,252 | 280,652,348 |
| 1966 | 209,036,531 | 22,865,324 | 46,821,264 | 60,470,406 | 339,193,525 |
| 1967 | 235,932,026 | 29,364,065 | 47,359,089 | 74,141,627 | 386,796,807 |
| Totals | 4,631,652,312 | 240,959,582 | 523,365,606 | 901,730,374 | 6,297,707,874 |

TABLE 3.—QUANTITY AND VALUE OF MINERAL PRODUCTS FOR YEARS 1958 TO 1967

| Description | | 1958 | | 1959 | | 1960 | | 1961 | | 1962 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| ***Metals*** | | | $ | | $ | | $ | | $ | | $ |
| Antimony | lb. | 858,633 | 284,208 | 1,657,797 | 540,276 | 1,651,786 | 538,482 | 1,331,297 | 469,948 | 1,931,397 | 748,223 |
| Bismuth | lb. | 154,034 | 308,068 | 181,843 | 345,502 | 213,009 | 419,628 | 283,363 | 637,567 | 228,601 | 507,494 |
| Cadmium | lb. | 1,425,108 | 2,166,164 | 1,695,821 | 2,170,651 | 1,778,866 | 2,525,990 | 907,432 | 1,451,891 | 2,086,692 | 3,839,513 |
| Copper | lb. | 12,658,649 | 2,964,529 | 16,233,546 | 4,497,991 | 33,064,429 | 9,583,724 | 31,692,412 | 8,965,149 | 108,979,144 | 33,209,215 |
| Gold—placer, crude | oz. | 5,650 | 157,871 | 7,570 | 208,973 | 3,847 | 107,418 | 3,416 | 99,884 | 3,315 | 96,697 |
| „ —lode, fine | oz. | 194,354 | 6,604,149 | 173,146 | 5,812,511 | 205,580 | 6,979,441 | 159,821 | 5,667,253 | 158,850 | 5,942,101 |
| Iron concentrates | tons | 630,271 | 4,193,442 | 849,248 | 6,363,848 | 1,160,355 | 10,292,847 | 1,335,068 | 12,082,540 | 1,793,847 | 18,326,911 |
| Lead | lb. | 294,573,159 | 34,627,075 | 287,423,357 | 33,542,306 | 333,608,699 | 38,661,912 | 384,284,524 | 42,313,569 | 335,282,537 | 34,537,454 |
| Molybdenum | lb. | — | — | — | — | 9,023 | 9,500 | — | — | — | — |
| Nickel | lb. | 1,408,490 | 996,507 | 1,061,532 | 743,072 | 3,779,878 | 2,645,915 | 4,180,677 | 3,194,037 | — | — |
| Platinum | oz. | 4 | 260 | — | — | — | — | — | — | 3.476,467 | 2,902,850 |
| Silver | oz. | 7,041,058 | 6,086,854 | 6,198,101 | 5,421,417 | 7,446,643 | 6,600,183 | 7,373,997 | 6,909,140 | 5 | 375 |
| Tin | lb. | 795,496 | 625,260 | 747,443 | 627,852 | 621,718 | 522,243 | 1,119,350 | 727,578 | 6,189,804 | 7,181,907 |
| Tungsten ($WO_3$) | lb. | 690,976 | 1,884,209 | — | — | — | — | — | — | 650,941 | 442,640 |
| Zinc | lb. | 432,002,790 | 43,234,839 | 402,342,850 | 44,169,198 | 403,399,319 | 50,656,726 | 387,951,190 | 45,370,891 | 413,430,817 | 51,356,376 |
| Others | | — | 117,677 | — | 632,933 | — | 760,364 | — | 676,327 | — | 535,537 |
| Totals | | — | 104,251,112 | — | 105,076,530 | — | 130,304,373 | — | 128,565,774 | — | 159,627,293 |
| ***Industrial Minerals*** | | | | | | | | | | | |
| Asbestos | tons | 30,078 | 6,398,679 | 33,883 | 7,878,947 | 40,748 | 9,482,923 | 45,113 | 8,648,503 | 55,133 | 10,297,360 |
| Barite | tons | 16,144 | 341,700 | 23,142 | 187,368 | 23,573 | 279,716 | 15,478 | 151,388 | 6,511 | 57,062 |
| Diatomite | tons | 27 | 540 | 5 | 100 | 44 | 1,430 | 214 | 8,817 | 211 | 10,228 |
| Fluorspar | tons | 32 | 1,386 | — | — | — | — | — | — | — | — |
| Fluxes (quartz, limestone) | tons | 90,603 | 310,244 | 70,570 | 248,913 | 83,370 | 294,559 | 53,335 | 190,500 | 62,743 | 228,477 |
| Granules (quartz, limestone, granite) | tons | 22,674 | 284,330 | 19,072 | 254,251 | 19,063 | 257,067 | 17,463 | 253,015 | 18,251 | 311,902 |
| Gypsum and products | tons | 70,498 | 211,494 | 112,223 | 282,030 | 107,900 | 337,200 | 153,300 | 459,900 | 147,900 | 443,700 |
| Jade | lb. | — | — | 15,000 | 5,000 | 50,300 | 10,325 | 69,751 | 20,876 | 56,935 | 20,760 |
| Mica | lb. | — | — | — | — | 122,000 | 3,186 | 250,000 | 8,025 | — | — |
| Sulphur | tons | 211,300 | 2,410,395 | 251,552 | 3,253,677 | 264,705 | 3,095,696 | 242,377 | 3,207,284 | 239,191 | 2,934,725 |
| Totals | | — | 9,958,768 | — | 12,110,286 | — | 13,762,102 | — | 12,948,308 | — | 14,304,214 |
| ***Structural Materials*** | | | | | | | | | | | |
| Brick—common | No. | 427,550 | 15,125 | 385,810 | 11,954 | 2,262,653 | 187,673 | 244,532 | 14,809 | 1,179,165 | 54,849 |
| „ —other | | — | 749,618 | — | 966,666 | — | 766,956 | — | 911,315 | — | 949,889 |
| Clays | tons | 4,105 | 12,579 | 6,250 | 17,001 | 8,003 | 22,671 | 7,908 | 28,396 | 8,105 | 30,027 |
| Structural and drain tile | | — | 762,050 | — | 830,085 | — | 700,700 | — | 732,751 | — | 935,573 |
| Pottery and other clay products | | — | 100,803 | — | 127,812 | — | 395,708 | — | 679,193 | — | 537,100 |
| Cement | tons | 414,396 | 6,755,619 | 427,181 | 7,049,638 | 384,853 | 6,432,752 | 417,336 | 7,122,046 | 397,435 | 7,112,890 |
| Lime and limestone | tons | 269,747 | 997,819 | 519,580 | 1,481,292 | 565,945 | 1,602,019 | 758,882 | 1,864,315 | 559,028 | 1,513,579 |
| Rubble, riprap, crushed rock | tons | 1,866,950 | 2,098,952 | 1,169,854 | 1,128,353 | 1,148,305 | 1,075,373 | 1,539,640 | 1,016,086 | 1,897,272 | 1,284,301 |
| Sand and gravel | tons | 14,173,169 | 8,442,676 | 11,349,121 | 7,342,698 | 12,355,955 | 7,597,278 | 11,424,958 | 7,439,710 | 17,757,391 | 8,862,767 |
| Stone | tons | 2,141 | 64,335 | 13,710 | 69,710 | 4,328 | 48,859 | 5,400 | 70,300 | 8,023 | 85,290 |
| Totals | | — | 19,999,576 | — | 19,025,209 | — | 18,829,989 | — | 19,878,921 | — | 21,366,265 |
| ***Fuels*** | | | | | | | | | | | |
| Coal—sold and used | tons | 796,413 | 5,937,860 | 690,011 | 5,472,064 | 788,658 | 5,242,223 | 919,142 | 6,802,134 | 825,339 | 6,133,986 |
| Crude oil | bbl. | 513,718 | 1,009,609 | 864,750 | 1,573,227 | 867,873 | 1,531,049 | 1,015,568 | 1,900,104 | 8,904,938 | 16,827,118 |
| Field condensate | bbl. | — | — | — | — | — | — | 159 | 297 | 9,621 | 18,184 |
| Plant condensate | bbl. | 590,079 | 380,072 | 895,784 | 367,797 | 750,848 | 459,741 | 813,565 | 737,761 | 837,824 | 674,644 |
| Natural gas delivered to pipe-line | M s.c.f. | 58,039,491 | 3,368,327 | 64,525,633 | 3,928,839 | 80,115,399 | 7,101,949 | 95,967,110 | 8,818,891 | 108,699,997 | 10,226,323 |
| Butane | bbl. | 81,609 | 26,115 | 207,029 | 66,249 | 293,368 | 93,878 | 321,706 | 102,946 | 387,558 | 124,019 |
| Propane | bbl. | 69,095 | 22,110 | 96,925 | 31,016 | 125,091 | 40,029 | 163,079 | 52,185 | 216,995 | 69,438 |
| Totals | | — | 10,744,093 | — | 11,439,192 | — | 14,468,869 | — | 18,414,318 | — | 34,073,712 |
| *Provincial totals* | | — | 144,953,549 | — | 147,651,217 | — | 177,365,333 | — | 179,807,321 | — | 229,371,484 |

| Description | 1963 Quantity | 1963 Value | 1964 Quantity | 1964 Value | 1965 Quantity | 1965 Value | 1966 Quantity | 1966 Value | 1967 Quantity | 1967 Value |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Metals*** | | $ | | $ | | $ | | $ | | $ |
| Antimony ..... lb. | 1,601,253 | 624,489 | 1,591,523 | 700,270 | 1,301,787 | 689,947 | 1,405,681 | 745,011 | 1,267,686 | 671,874 |
| Bismuth ..... lb. | 157,099 | 348,760 | 213,428 | 480,213 | 144,630 | 446,907 | 47,435 | 198,848 | 142,507 | 572,878 |
| Cadmium ..... lb. | 1,981,004 | 4,754,410 | 1,864,255 | 6,040,186 | 466,586 | 1,297,110 | 1,169,570 | 3,017,491 | 994,365 | 2,784,222 |
| Copper ..... lb. | 118,247,104 | 36,238,007 | 115,554,700 | 38,609,136 | 85,197,073 | 32,696,081 | 105,800,568 | 56,438,255 | 172,739,548 | 88,135,172 |
| Gold—placer, crude ..... oz. | 4,620 | 135,411 | 1,842 | 55,191 | 866 | 25,053 | 1,535 | 44,632 | 891 | 25,632 |
| „ —lode, fine ..... oz. | 154,979 | 5,850,458 | 138,487 | 5,227,884 | 117,124 | 4,419,089 | 119,508 | 4,506,646 | 126,157 | 4,763,688 |
| Iron concentrates ..... tons | 2,060,241 | 20,746,424 | 2,012,562 | 20,419,487 | 2,165,403 | 21,498,581 | 2,151,804 | 20,778,934 | 2,154,443 | 20,820,765 |
| Lead ..... lb. | 314,974,310 | 37,834,714 | 268,737,503 | 39,402,293 | 250,183,633 | 43,149,171 | 211,490,107 | 34,436,934 | 208,131,894 | 31,432,079 |
| Mercury ..... lb. | — | — | 5,548 | 22,848 | 1,520 | 12,301 | — | — | 380 | 2,600 |
| Molybdenum ..... lb. | — | — | 28,245 | 47,063 | 7,289,125 | 12,405,344 | 17,094,927 | 27,606,061 | 17,517,348 | 31,249,772 |
| Nickel ..... lb. | 3,699,402 | 3,107,498 | 3,398,560 | 2,854,790 | 3,322,000 | 2,790,480 | 3,622,400 | 3,104,397 | 4,180,842 | 3,946,715 |
| Platinum ..... oz. | 2 | 150 | — | — | — | — | — | — | — | — |
| Silver ..... oz. | 6,422,680 | 8,861,050 | 5,269,642 | 7,348,938 | 4,972,084 | 6,929,793 | 5,549,131 | 7,729,939 | 6,180,739 | 10,328,695 |
| Tin ..... lb. | 927,062 | 648,943 | 352,350 | 535,572 | 377,207 | 735,554 | 710,752 | 1,130,096 | 437,804 | 621,682 |
| Zinc ..... lb. | 402,863,154 | 53,069,163 | 400,796,562 | 58,648,561 | 311,249,250 | 48,666,933 | 305,124,440 | 47,666,540 | 262,830,908 | 39,248,539 |
| Others ..... | — | 633,389 | — | 533,897 | — | 1,339,389 | — | 1,632,747 | — | 1,327,713 |
| Totals ..... | — | 172,852,866 | — | 180,926,329 | — | 177,101,733 | — | 209,036,531 | — | 235,932,026 |
| ***Industrial Minerals*** | | | | | | | | | | |
| Asbestos ..... tons | 63,215 | 11,681,337 | 67,460 | 11,714,494 | 85,851 | 14,491,195 | 88,771 | 15,718,741 | 92,192 | 18,273,220 |
| Barite ..... tons | 8,207 | 69,588 | 10,588 | 119,370 | 17,466 | 182,931 | 21,888 | 176,240 | 23,466 | 176,882 |
| Diatomite ..... tons | 458 | 16,030 | 1,143 | 64,555 | 82 | 4,420 | 70 | 3,755 | 2,819 | 14,096 |
| Fluorspar ..... tons | — | — | — | — | 70 | 2,419 | 152 | 4,986 | 80 | 2,464 |
| Fluxes (quartz, limestone) ..... tons | 60,490 | 223,012 | 73,021 | 237,298 | 59,231 | 240,076 | 23,913 | 112,314 | 48,052 | 221,212 |
| Granules (quartz, limestone, granite) ..... tons | 19,444 | 348,543 | 19,289 | 397,639 | 29,033 | 447,954 | 23,956 | 424,667 | 31,283 | 305,655 |
| Gypsum and products ..... tons | 160,954 | 482,862 | 188,303 | 581,873 | 207,858 | 602,788 | 206,026 | 576,873 | 230,044 | 691,592 |
| Jade ..... lb. | 16,000 | 15,529 | 11,537 | 13,804 | 7,129 | 9,249 | 11,633 | 13,225 | 20,160 | 24,341 |
| Sulphur ..... tons | 254,197 | 3,673,997 | 278,385 | 3,860,436 | 341,873 | 4,428,617 | 342,478 | 5,834,523 | 314,490 | 9,654,603 |
| Totals ..... | — | 16,510,898 | — | 16,989,469 | — | 20,409,649 | — | 22,865,324 | — | 29,364,065 |
| ***Structural Materials*** | | | | | | | | | | |
| Brick—common ..... No. | 1,086,688 | 63,499 | 614,288 | 49,826 | 582,305 | 27,662 | 288,234 | 16,956 | 45,879 | 2,628 |
| „ —other ..... | — | 1,050,543 | — | 872,166 | — | 1,329,849 | — | 1,816,845 | — | 1,817,289 |
| Clays ..... tons | 2,573 | 33,151 | 1,853 | 38,585 | 454 | 18,234 | 1,282 | 34,861 | 444 | 18,668 |
| Structural and drain tile ..... | — | 877,578 | — | 1,102,341 | — | 1,361,227 | — | 1,063,333 | — | 892,485 |
| Pottery and other clay products ..... | — | 799,812 | — | 945,240 | — | 1,162,662 | — | 1,168,197 | — | 1,214,137 |
| Cement ..... tons | 476,071 | 8,546,768 | 537,396 | 10,040,776 | 601,878 | 11,199,607 | 707,506 | 15,959,293 | 708,855 | 16,929,451 |
| Lime and limestone ..... tons | 907,203 | 1,723,796 | 1,211,320 | 2,055,195 | 1,420,085 | 2,482,451 | 1,483,949 | 2,696,011 | 1,645,253 | 2,822,138 |
| Rubble, riprap, crushed rock ..... tons | 1,913,906 | 1,259,002 | 1,449,449 | 1,285,318 | 2,715,411 | 1,938,088 | 1,590,189 | 1,890,992 | 2,287,407 | 2,967,195 |
| Sand and gravel ..... tons | 17,387,026 | 9,514,095 | 17,708,225 | 10,013,970 | 20,936,994 | 12,686,959 | 24,320,013 | 21,959,733 | 23,210,746 | 20,643,673 |
| Stone ..... tons | 1,827 | 13,946 | 846 | 25,522 | 2,252 | 118,975 | 76,720 | 215,043 | 3,577 | 51,425 |
| Totals ..... | — | 23,882,190 | — | 26,428,939 | — | 32,325,714 | — | 46,821,264 | — | 47,359,089 |
| ***Fuels*** | | | | | | | | | | |
| Coal—sold and used ..... tons | 850,541 | 6,237,997 | 911,326 | 6,327,678 | 950,763 | 6,713,590 | 850,821 | 6,196,219 | 908,790 | 7,045,341 |
| Crude oil ..... bbl. | 12,515,137 | 24,900,381 | 11,525,476 | 23,396,716 | 13,470,757 | 28,693,662 | 16,638,181 | 36,268,683 | 19,656,799 | 44,748,477 |
| Field condensate ..... bbl. | 13,671 | 27,205 | 26,367 | 63,436 | 31,782 | 70,874 | 39,571 | 86,265 | 40,570 | 92,357 |
| Plant condensate ..... bbl. | 841,740 | 536,193 | 922,211 | 587,685 | 947,429 | 576,107 | 974,564 | 312,360 | 1,016,045 | 267,941 |
| Natural gas delivered to pipe-line ..... M s.c.f. | 105,525,373 | 10,719,298 | 118,959,880 | 12,192,816 | 138,814,144 | 14,493,255 | 161,264,334 | 17,339,587 | 198,626,177 | 21,667,136 |
| Butane ..... bbl. | 409,087 | 130,908 | 461,759 | 147,763 | 477,990 | 152,956 | 500,973 | 160,312 | 588,118 | 188,197 |
| Propane ..... bbl. | 205,162 | 65,651 | 244,804 | 78,337 | 358,776 | 114,808 | 334,315 | 106,980 | 413,058 | 132,178 |
| Totals ..... | — | 42,617,633 | — | 42,794,431 | — | 50,815,252 | — | 60,470,406 | — | 74,141,627 |
| *Provincial totals* ..... | — | 255,863,587 | — | 267,139,168 | — | 280,652,348 | — | 339,193,525 | — | 386,796,807 |

TABLE 4.—MINERAL PRODUCTION OF BRITISH COLUMBIA—VALUE, 1887–1967

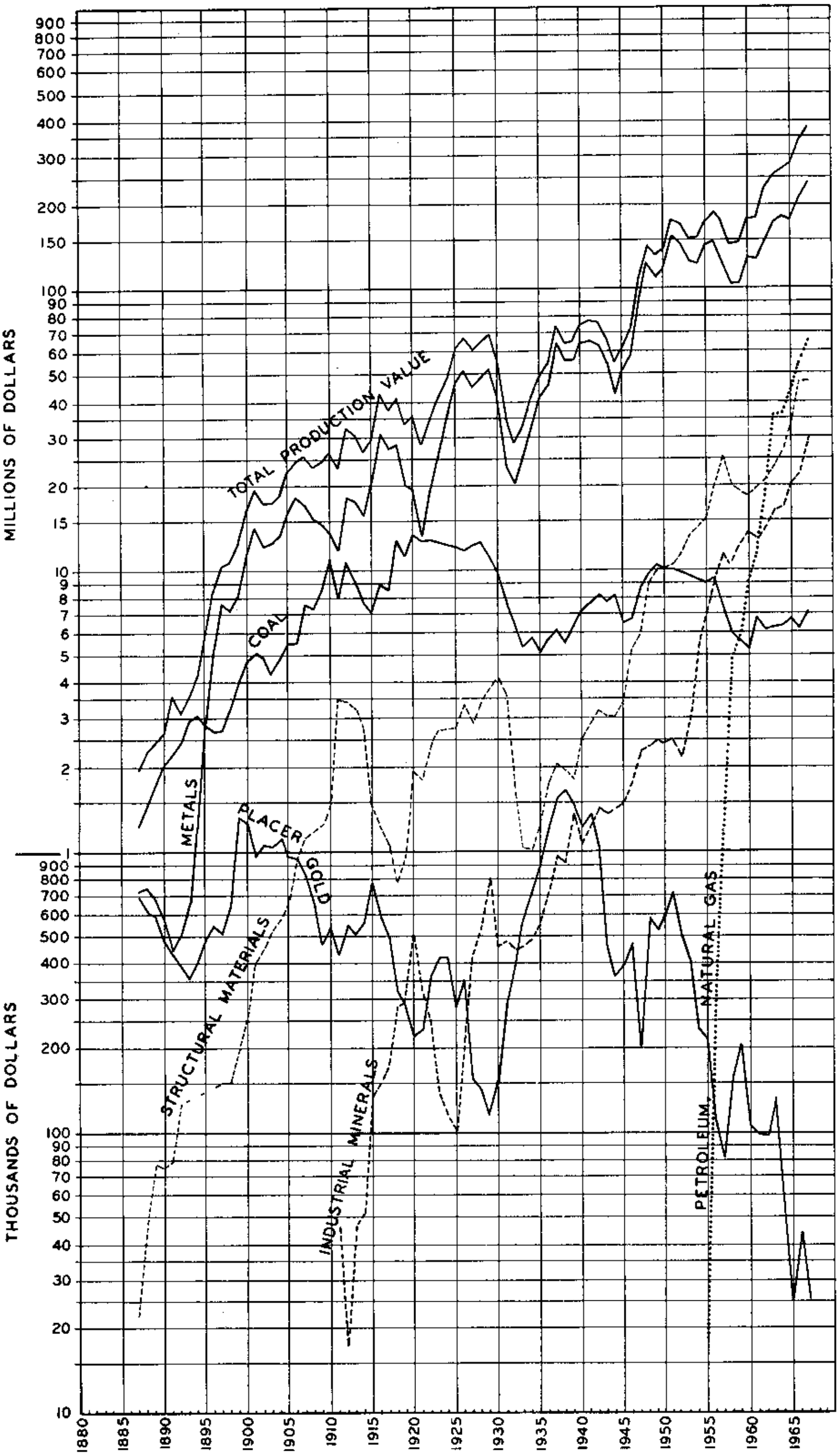


TABLE 5.—MINERAL PRODUCTION OF BRITISH COLUMBIA—QUANTITY, 1897–1967

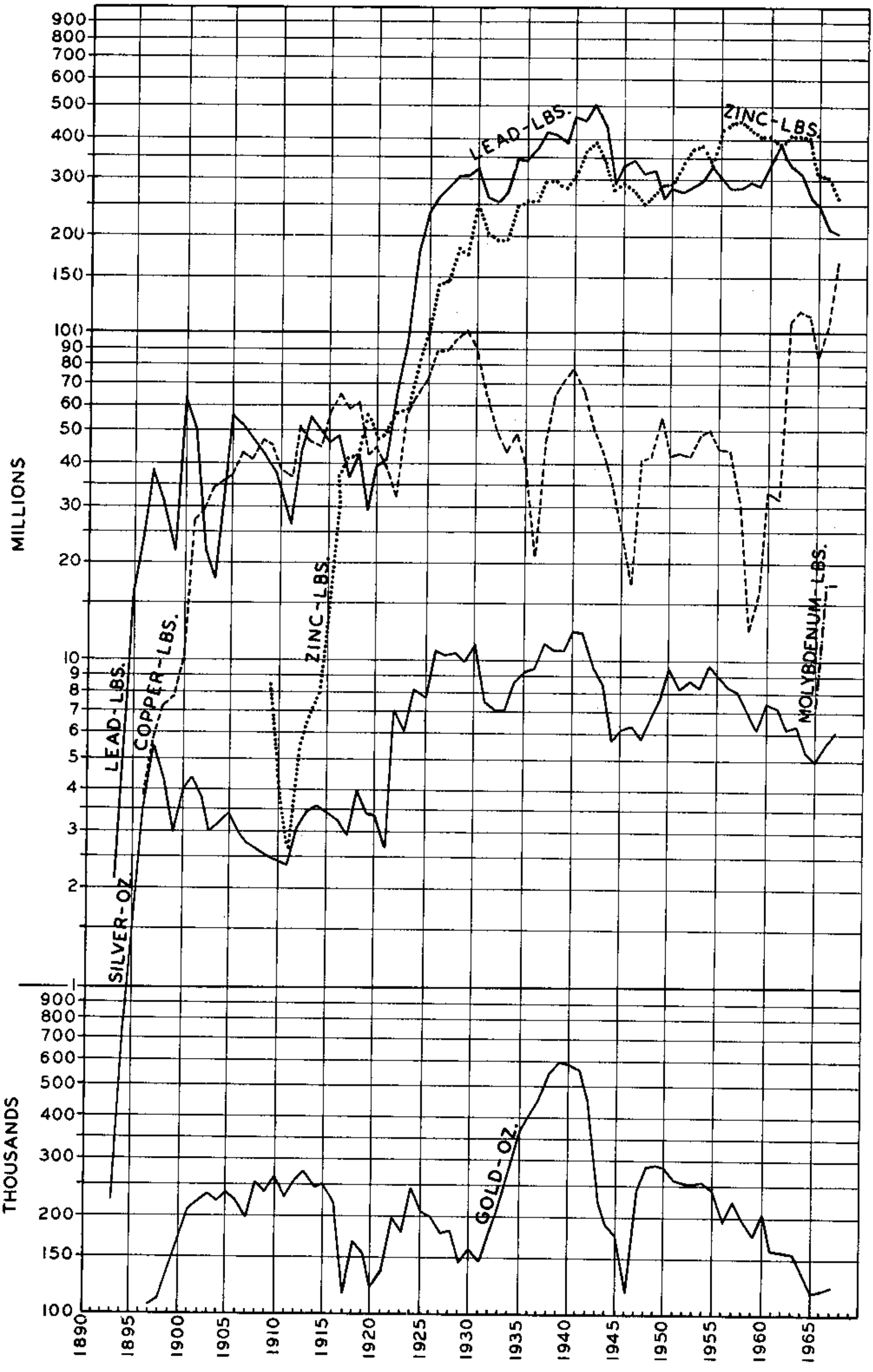


TABLE 6.—PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, MOLYBDENUM, AND IRON CONCENTRATES, 1858–1967

| Year | Placer Gold (Crude) | | Gold (Fine) | | Silver | | Copper | |
|---|---|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| | Oz. | $ | Oz. | $ | Oz. | $ | Lb. | $ |
| 1858–90 | 3,246,585 | 55,192,163 | | | 221,089 | 214,152 | | |
| 1891–1900 | 376,290 | 6,397,183 | 632,806 | 12,858,353 | 22,537,306 | 13,561,194 | 35,416,069 | 4,365,210 |
| 1901 | 57,060 | 970,100 | 210,384 | 4,348,637 | 4,396,447 | 2,462,008 | 27,603,746 | 4,446,963 |
| 1902 | 63,130 | 1,073,140 | 236,491 | 4,888,269 | 3,817,917 | 1,891,779 | 29,652,043 | 3,450,291 |
| 1903 | 62,380 | 1,060,420 | 232,828 | 4,812,554 | 2,996,204 | 1,521,472 | 34,359,921 | 4,547,878 |
| 1904 | 65,610 | 1,115,300 | 222,042 | 4,589,608 | 3,222,481 | 1,719,516 | 35,710,128 | 4,578,037 |
| 1905 | 57,020 | 969,300 | 238,660 | 4,933,103 | 3,439,417 | 1,971,818 | 37,692,251 | 5,876,222 |
| 1906 | 55,790 | 948,400 | 224,027 | 4,630,639 | 2,990,262 | 1,897,320 | 42,990,488 | 8,288,565 |
| 1907 | 48,710 | 828,000 | 196,179 | 4,055,020 | 2,745,448 | 1,703,825 | 40,832,721 | 8,166,544 |
| 1908 | 38,060 | 647,000 | 255,582 | 5,282,879 | 2,631,389 | 1,321,483 | 47,274,614 | 6,240,249 |
| 1909 | 28,060 | 477,000 | 238,224 | 4,924,090 | 2,532,742 | 1,239,270 | 45,597,245 | 5,918,522 |
| 1910 | 31,760 | 540,000 | 267,701 | 5,533,380 | 2,450,241 | 1,245,016 | 38,243,934 | 4,871,512 |
| 1911 | 25,060 | 426,000 | 228,617 | 4,725,512 | 1,892,364 | 958,293 | 36,927,656 | 4,571,644 |
| 1912 | 32,680 | 555,500 | 257,496 | 5,322,442 | 3,132,108 | 1,810,045 | 51,456,537 | 8,408,513 |
| 1913 | 30,000 | 510,000 | 272,254 | 5,627,595 | 3,465,856 | 1,968,606 | 46,460,305 | 7,094,489 |
| 1914 | 33,240 | 565,000 | 247,170 | 5,109,008 | 3,602,180 | 1,876,736 | 45,009,699 | 6,121,319 |
| 1915 | 45,290 | 770,000 | 250,021 | 5,167,934 | 3,366,506 | 1,588,991 | 56,918,405 | 9,835,500 |
| 1916 | 34,150 | 580,500 | 221,932 | 4,587,333 | 3,301,923 | 2,059,739 | 65,379,364 | 17,784,494 |
| 1917 | 29,180 | 496,000 | 114,523 | 2,367,191 | 2,929,216 | 2,265,749 | 59,007,565 | 16,038,256 |
| 1918 | 18,820 | 320,000 | 164,674 | 3,403,811 | 3,998,172 | 3,215,870 | 61,483,754 | 15,143,449 |
| 1919 | 16,850 | 286,500 | 152,426 | 3,150,644 | 3,403,119 | 3,592,673 | 42,459,339 | 7,939,896 |
| 1920 | 13,040 | 221,600 | 120,048 | 2,481,392 | 3,377,849 | 3,235,980 | 44,887,676 | 7,832,899 |
| 1921 | 13,720 | 233,200 | 135,765 | 2,804,197 | 2,673,389 | 1,591,201 | 39,036,993 | 4,879,624 |
| 1922 | 21,690 | 368,800 | 197,856 | 4,089,684 | 7,101,311 | 4,554,781 | 32,359,896 | 4,329,754 |
| 1923 | 24,710 | 420,000 | 179,245 | 3,704,994 | 6,032,986 | 3,718,129 | 57,720,290 | 8,323,266 |
| 1924 | 24,750 | 420,750 | 247,716 | 5,120,535 | 8,341,768 | 5,292,184 | 64,845,393 | 8,442,870 |
| 1925 | 16,476 | 280,092 | 209,719 | 4,335,069 | 7,654,844 | 5,286,818 | 72,306,432 | 10,153,269 |
| 1926 | 20,912 | 355,503 | 201,427 | 4,163,859 | 10,748,556 | 6,675,606 | 89,339,768 | 12,324,421 |
| 1927 | 9,191 | 156,247 | 178,001 | 3,679,601 | 10,470,185 | 5,902,043 | 89,202,871 | 11,525,011 |
| 1928 | 8,424 | 143,208 | 180,662 | 3,734,609 | 10,627,167 | 6,182,461 | 97,908,316 | 14,265,242 |
| 1929 | 6,983 | 118,711 | 145,223 | 3,002,020 | 9,960,172 | 5,278,194 | 102,793,669 | 18,612,850 |
| 1930 | 8,955 | 152,235 | 160,836 | 3,324,975 | 11,328,263 | 4,322,185 | 92,362,240 | 11,990,466 |
| 1931 | 17,176 | 291,992 | 146,133 | 3,020,837 | 7,550,331 | 2,254,979 | 64,134,746 | 5,365,690 |
| 1932 | 20,400 | 395,542 | 181,651 | 4,263,389 | 7,150,655 | 2,264,729 | 50,608,036 | 3,228,892 |
| 1933 | 23,928 | 562,787 | 223,589 | 6,394,645 | 7,021,754 | 2,656,526 | 43,149,460 | 3,216,701 |
| 1934 | 25,181 | 714,431 | 297,216 | 10,253,952 | 8,613,977 | 4,088,280 | 49,651,733 | 3,683,662 |
| 1935 | 30,929 | 895,058 | 365,343 | 12,856,419 | 9,269,944 | 6,005,996 | 39,428,208 | 3,073,428 |
| 1936 | 43,389 | 1,249,940 | 404,578 | 14,172,367 | 9,547,124 | 4,308,330 | 21,671,711 | 2,053,828 |
| 1937 | 54,153 | 1,558,245 | 460,781 | 16,122,767 | 11,305,367 | 5,073,962 | 46,057,584 | 6,023,411 |
| 1938 | 57,759 | 1,671,015 | 557,522 | 19,613,624 | 10,861,578 | 4,722,288 | 65,769,906 | 6,558,575 |
| 1939 | 49,746 | 1,478,492 | 587,336 | 21,226,957 | 10,821,393 | 4,381,365 | 73,254,679 | 7,392,862 |
| 1940 | 39,067 | 1,236,928 | 583,524 | 22,461,516 | 12,327,944 | 4,715,315 | 77,980,223 | 7,865,085 |
| 1941 | 43,775 | 1,385,962 | 571,026 | 21,984,501 | 12,175,700 | 4,658,545 | 66,435,583 | 6,700,693 |
| 1942 | 32,904 | 1,041,772 | 444,518 | 17,113,943 | 9,677,881 | 4,080,775 | 50,097,716 | 5,052,856 |
| 1943 | 14,600 | 462,270 | 224,403 | 8,639,516 | 8,526,310 | 3,858,496 | 42,307,510 | 4,971,132 |
| 1944 | 11,433 | 361,977 | 186,632 | 7,185,332 | 5,705,334 | 2,453,293 | 36,300,589 | 4,356,070 |
| 1945 | 12,589 | 398,591 | 175,373 | 6,751,860 | 6,157,307 | 2,893,934 | 25,852,366 | 3,244,472 |
| 1946 | 15,729 | 475,361 | 117,612 | 4,322,241 | 6,365,761 | 5,324,959 | 17,500,538 | 2,240,070 |
| 1947 | 6,969 | 200,585 | 243,282 | 8,514,870 | 5,708,461 | 4,110,092 | 41,783,921 | 8,519,741 |
| 1948 | 20,332 | 585,200 | 286,230 | 10,018,050 | 6,720,134 | 5,040,101 | 43,025,388 | 9,616,174 |
| 1949 | 17,886 | 529,524 | 288,396 | 10,382,256 | 7,637,882 | 5,671,082 | 54,856,808 | 10,956,550 |
| 1950 | 19,134 | 598,717 | 283,983 | 10,805,553 | 9,509,456 | 7,667,950 | 42,212,133 | 9,889,458 |
| 1951 | 23,691 | 717,911 | 261,274 | 9,627,947 | 8,218,914 | 7,770,983 | 43,249,658 | 11,980,155 |
| 1952 | 17,554 | 494,756 | 255,789 | 8,765,889 | 8,810,807 | 7,326,803 | 42,005,512 | 13,054,893 |
| 1953 | 14,245 | 403,230 | 253,552 | 8,727,294 | 8,378,819 | 7,019,272 | 49,021,013 | 14,869,544 |
| 1954 | 8,684 | 238,967 | 258,388 | 8,803,279 | 9,826,403 | 8,154,145 | 50,150,087 | 14,599,693 |
| 1955 | 7,666 | 217,614 | 242,477 | 8,370,306 | 7,903,149 | 6,942,995 | 44,238,031 | 16,932,549 |
| 1956 | 3,865 | 109,450 | 191,743 | 6,603,628 | 8,405,074 | 7,511,866 | 43,360,575 | 17,251,872 |
| 1957 | 2,936 | 80,990 | 223,403 | 7,495,170 | 8,129,348 | 7,077,166 | 31,387,441 | 8,170,465 |
| 1958 | 5,650 | 157,871 | 194,354 | 6,604,149 | 7,041,058 | 6,086,854 | 12,658,649 | 2,964,529 |
| 1959 | 7,570 | 208,973 | 173,146 | 5,812,511 | 6,198,101 | 5,421,417 | 16,233,546 | 4,497,991 |
| 1960 | 3,847 | 107,418 | 205,580 | 6,979,441 | 7,446,643 | 6,600,183 | 33,064,429 | 9,583,724 |
| 1961 | 3,416 | 99,884 | 159,821 | 5,667,253 | 7,373,997 | 6,909,140 | 31,692,412 | 8,965,149 |
| 1962 | 3,315 | 96,697 | 158,850 | 5,942,101 | 6,189,804 | 7,181,907 | 108,979,144 | 33,209,215 |
| 1963 | 4,620 | 135,411 | 154,979 | 5,850,458 | 6,422,680 | 8,861,050 | 118,247,104 | 36,238,007 |
| 1964 | 1,842 | 55,191 | 138,487 | 5,227,884 | 5,269,642 | 7,348,938 | 115,554,700 | 38,609,136 |
| 1965 | 866 | 25,053 | 117,124 | 4,419,089 | 4,972,084 | 6,929,793 | 85,197,073 | 32,696,081 |
| 1966 | 1,535 | 44,632 | 119,508 | 4,506,646 | 5,549,131 | 7,729,939 | 105,800,568 | 56,438,255 |
| 1967 | 891 | 25,632 | 126,157 | 4,763,688 | 6,180,739 | 10,328,695 | 172,739,548 | 88,135,172 |
| Totals | 5,233,848 | 96,911,921 | 16,684,295 | 491,030,265 | 465,859,503 | 313,557,280 | 3,718,897,656 | 788,573,005 |

TABLE 6.—PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, MOLYBDENUM, AND IRON CONCENTRATES, 1858–1967—*Continued*

| Year | Lead | | Zinc | | Molybdenum | | Iron Concentrates | |
|---|---|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| | Lb. | $ | Lb. | $ | Lb. | $ | Tons | $ |
| 1858–90 | 1,044,400 | 45,527 | | | | | 29,869 | 70,879 |
| 1891–1900 | 205,037,158 | 7,581,619 | | | | | 13,029 | 45,602 |
| 1901 | 51,582,906 | 2,010,186 | | | | | 5,746 | 20,111 |
| 1902 | 22,536,381 | 824,832 | | | | | 10,017 | 35,060 |
| 1903 | 18,089,283 | 689,744 | | | | | 2,290 | 8,015 |
| 1904 | 36,646,244 | 1,421,874 | | | | | | |
| 1905 | 56,580,703 | 2,399,022 | | 139,200 | | | | |
| 1906 | 52,408,217 | 2,667,578 | | 17,100 | | | | |
| 1907 | 47,738,703 | 2,291,458 | | 46,100 | | | 1,500 | 5,250 |
| 1908 | 43,195,733 | 1,632,799 | | 99,296 | | | | |
| 1909 | 44,396,346 | 1,709,259 | 8,500,000 | 400,000 | | | | |
| 1910 | 34,658,746 | 1,386,350 | 4,184,192 | 192,473 | | | | |
| 1911 | 26,872,397 | 1,069,521 | 2,634,544 | 129,092 | | | | |
| 1912 | 44,871,454 | 1,805,627 | 5,358,280 | 316,139 | | | | |
| 1913 | 55,364,677 | 2,175,832 | 6,758,768 | 324,421 | | | | |
| 1914 | 50,625,048 | 1,771,877 | 7,866,467 | 346,125 | 1,987 | 662 | | |
| 1915 | 46,503,590 | 1,939,200 | 12,982,440 | 1,460,524 | 3,618 | 2,000 | | |
| 1916 | 48,727,516 | 3,007,462 | 37,168,980 | 4,043,985 | 12,342 | 20,560 | | |
| 1917 | 37,307,465 | 2,951,020 | 41,848,513 | 3,166,259 | 6,982 | 11,636 | | |
| 1918 | 43,899,661 | 2,928,107 | 41,772,916 | 2,899,040 | 960 | 1,840 | 1,000 | 5,000 |
| 1919 | 29,475,968 | 1,526,855 | 56,737,651 | 3,540,429 | | | 1,230 | 6,150 |
| 1920 | 39,331,218 | 2,816,115 | 47,208,268 | 3,077,979 | | | 1,472 | 7,360 |
| 1921 | 41,402,288 | 1,693,354 | 49,419,372 | 1,952,065 | | | 1,010 | 5,050 |
| 1922 | 67,447,985 | 3,480,306 | 57,146,548 | 2,777,322 | | | 1,200 | 3,600 |
| 1923 | 96,663,152 | 6,321,770 | 58,344,462 | 3,278,903 | | | 243 | 1,337 |
| 1924 | 170,384,481 | 12,415,917 | 79,130,970 | 4,266,741 | | | | |
| 1925 | 237,899,199 | 18,670,329 | 98,257,099 | 7,754,450 | | | | |
| 1926 | 263,023,936 | 17,757,535 | 142,876,947 | 10,586,610 | | | | |
| 1927 | 282,996,423 | 14,874,292 | 145,225,443 | 8,996,135 | | | | |
| 1928 | 305,140,792 | 13,961,412 | 181,763,147 | 9,984,613 | | | 20 | |
| 1929 | 307,999,153 | 15,555,189 | 172,096,841 | 9,268,792 | | | | |
| 1930 | 321,803,725 | 12,638,198 | 250,479,310 | 9,017,005 | | | | |
| 1931 | 261,902,228 | 7,097,812 | 202,071,702 | 5,160,911 | | | | |
| 1932 | 252,007,574 | 5,326,432 | 192,120,091 | 4,621,641 | | | | |
| 1933 | 271,689,217 | 6,497,719 | 195,963,751 | 6,291,416 | | | | |
| 1934 | 347,366,967 | 8,461,859 | 249,152,403 | 7,584,199 | | | | |
| 1935 | 344,268,444 | 10,785,930 | 256,239,446 | 7,940,860 | | | | |
| 1936 | 377,971,618 | 14,790,028 | 254,581,393 | 8,439,373 | | | | |
| 1937 | 419,118,371 | 21,417,049 | 291,192,278 | 14,274,245 | | | | |
| 1938 | 412,979,182 | 13,810,024 | 298,497,295 | 9,172,822 | | | | |
| 1939 | 378,743,663 | 12,002,390 | 278,409,102 | 8,544,375 | | | | |
| 1940 | 466,849,112 | 15,695,467 | 312,020,671 | 10,643,026 | | | | |
| 1941 | 456,840,454 | 15,358,976 | 367,869,579 | 12,548,031 | | | | |
| 1942 | 507,199,704 | 17,052,054 | 387,236,469 | 13,208,636 | | | | |
| 1943 | 439,155,635 | 16,485,902 | 336,150,455 | 13,446,018 | | | | |
| 1944 | 292,922,888 | 13,181,530 | 278,063,373 | 11,956,725 | | | | |
| 1945 | 336,976,468 | 16,848,823 | 294,791,635 | 18,984,581 | | | | |
| 1946 | 345,862,680 | 23,345,731 | 274,269,956 | 21,420,484 | | | | |
| 1947 | 313,733,089 | 42,887,313 | 253,006,168 | 28,412,593 | | | | |
| 1948 | 320,037,525 | 57,734,770 | 270,310,195 | 37,654,211 | | | 679 | 3,735 |
| 1949 | 265,378,899 | 41,929,866 | 288,225,368 | 38,181,214 | | | 5,472 | 27,579 |
| 1950 | 284,024,522 | 41,052,905 | 290,344,227 | 43,769,392 | | | | |
| 1951 | 273,456,604 | 50,316,015 | 337,511,324 | 67,164,754 | | | 113,535 | 790,000 |
| 1952 | 284,949,396 | 45,936,692 | 372,871,717 | 59,189,656 | | | 900,481 | 5,474,924 |
| 1953 | 297,634,712 | 39,481,244 | 382,300,862 | 40,810,618 | | | 991,248 | 6,763,105 |
| 1954 | 332,474,456 | 45,482,505 | 334,124,560 | 34,805,755 | | | 535,746 | 3,733,891 |
| 1955 | 302,567,640 | 45,161,245 | 429,198,565 | 52,048,909 | | | 610,930 | 3,228,756 |
| 1956 | 283,718,073 | 44,702,619 | 443,853,004 | 58,934,801 | | | 369,955 | 2,190,847 |
| 1957 | 281,603,346 | 39,568,086 | 449,276,797 | 50,206,681 | | | 357,342 | 2,200,637 |
| 1958 | 294,573,159 | 34,627,075 | 432,002,790 | 43,234,839 | | | 630,271 | 4,193,442 |
| 1959 | 287,423,357 | 33,542,306 | 402,342,850 | 44,169,198 | | | 849,248 | 6,363,848 |
| 1960 | 333,608,699 | 38,661,912 | 403,399,319 | 50,656,726 | 5,414 | 9,500 | 1,160,355 | 10,292,847 |
| 1961 | 384,284,524 | 42,313,569 | 387,951,190 | 45,370,891 | | | 1,335,068 | 12,082,540 |
| 1962 | 335,282,537 | 34,537,454 | 413,430,817 | 51,356,376 | | | 1,793,847 | 18,326,911 |
| 1963 | 314,974,310 | 37,834,714 | 402,863,154 | 53,069,163 | | | 2,060,241 | 20,746,424 |
| 1964 | 268,737,503 | 39,402,293 | 400,796,562 | 58,648,561 | 28,245 | 47,063 | 2,002,562 | 20,419,487 |
| 1965 | 250,183,633 | 43,149,171 | 311,249,250 | 48,666,933 | 7,289,125 | 12,405,344 | 2,165,403 | 21,498,581 |
| 1966 | 211,490,107 | 34,436,934 | 305,124,440 | 47,666,540 | 17,094,927 | 27,606,061 | 2,151,804 | 20,778,934 |
| 1967 | 208,131,894 | 31,432,079 | 262,830,908 | 39,248,539 | 17,517,348 | 31,249,772 | 2,154,443 | 20,820,765 |
| Totals | 15,171,777,138 | 1,246,368,659 | 13,549,404,824 | 1,255,584,491 | 41,960,948 | 71,354,438 | 20,257,256 | 180,150,667 |

TABLE 7A.—PRODUCTION, 1966 AND 1967, AND

| Division | Period | Placer Gold Quantity (Crude) | Placer Gold Value | Metals | Industrial Minerals | Structural Materials |
|---|---|---|---|---|---|---|
| | | Oz. | $ | $ | $ | $ |
| Alberni | 1966 | ..... | ..... | 6,745,495 | ..... | 174,161 |
| | 1967 | ..... | ..... | 12,878,212 | ..... | 417,822 |
| | To date | 1,617 | 33,253 | 65,773,468 | 9,398 | 2,267,649 |
| Atlin | 1966 | 19 | 556 | 4 | ..... | 6,038 |
| | 1967 | 85 | 2,529 | 22 | ..... | 12,844 |
| | To date | 735,713 | 17,386,199 | 38,047,133 | 20,325 | 330,891 |
| Cariboo | 1966 | 622 | 17,163 | 6,504,568 | 3,755 | 1,619,973 |
| | 1967 | 613 | 17,478 | 5,570,941 | 14,096 | 856,015 |
| | To date | 2,609,164 | 54,128,080 | 57,061,739 | 301,646 | 10,146,368 |
| Clinton | 1966 | ..... | ..... | ..... | ..... | 56,498 |
| | 1967 | ..... | ..... | ..... | ..... | 515,846 |
| | To date | 10,171 | 243,069 | 848,377 | 162,427 | 760,191 |
| Fort Steele | 1966 | ..... | ..... | 55,650,951 | 1,865,100 | 304,305 |
| | 1967 | ..... | ..... | 49,837,128 | 3,293,298 | 335,094 |
| | To date | 20,531 | 468,450 | 1,984,139,159 | 13,758,869 | 6,298,071 |
| Golden | 1966 | ..... | ..... | 1,716,665 | 753,113 | 381,964 |
| | 1967 | ..... | ..... | 1,710,318 | 868,474 | 141,842 |
| | To date | 469 | 11,268 | 60,369,735 | 8,728,241 | 2,451,858 |
| Greenwood | 1966 | ..... | ..... | 6,863,121 | ..... | 156,704 |
| | 1967 | ..... | ..... | 7,249,851 | ..... | 207,946 |
| | To date | 5,074 | 115,662 | 156,913,601 | 2,323,897 | 1,321,137 |
| Kamloops | 1966 | ..... | ..... | 14,861,062 | ..... | 1,040,519 |
| | 1967 | ..... | ..... | 20,466,017 | ..... | 1,236,825 |
| | To date | 27,595 | 604,785 | 61,996,575 | 6,528,308 | 13,889,417 |
| Liard | 1966 | ..... | ..... | 124 | 17,443,990 | 641,364 |
| | 1967 | ..... | ..... | ..... | 20,403,509 | 520,891 |
| | To date | 50,184 | 1,248,151 | 6,522 | 145,882,187 | 4,597,221 |
| Lillooet | 1966 | 836 | 25,356 | 1,641,589 | 4,577 | 143,010 |
| | 1967 | 118 | 3,661 | 1,856,414 | 4,627 | 52,038 |
| | To date | 92,870 | 1,923,321 | 142,226,659 | 103,476 | 2,539,910 |
| Nanaimo | 1966 | ..... | ..... | 19,692,301 | 68,786 | 3,561,079 |
| | 1967 | ..... | ..... | 17,479,327 | 110,057 | 3,212,674 |
| | To date | 866 | 19,300 | 152,219,600 | 1,144,357 | 49,167,615 |
| Nelson | 1966 | ..... | ..... | 16,505,791 | 118,368 | 427,106 |
| | 1967 | 1 | 38 | 8,339,265 | ..... | 427,580 |
| | To date | 3,586 | 89,026 | 311,172,204 | 485,859 | 4,658,071 |
| New Westminster | 1966 | ..... | ..... | 3,930,536 | 50,000 | 8,398,108 |
| | 1967 | 14 | 189 | 4,803,044 | 62,000 | 8,819,722 |
| | To date | 31,279 | 593,762 | 31,503,328 | 1,277,256 | 112,374,054 |
| Nicola | 1966 | ..... | ..... | 17,660,303 | ..... | 134,219 |
| | 1967 | ..... | ..... | 29,968,349 | ..... | 124,980 |
| | To date | 234 | 4,764 | 121,171,508 | 10,050 | 826,256 |
| Omineca | 1966 | ..... | ..... | 22,362,413 | ..... | 998,139 |
| | 1967 | 10 | 302 | 37,709,824 | ..... | 1,625,385 |
| | To date | 56,289 | 1,499,482 | 103,097,546 | 15,860 | 7,807,533 |
| Osoyoos | 1966 | ..... | ..... | ..... | 304,673 | 394,683 |
| | 1967 | ..... | ..... | 743,805 | 357,134 | 256,324 |
| | To date | 240 | 5,466 | 51,884,290 | 5,919,571 | 2,025,661 |
| Revelstoke | 1966 | ..... | ..... | ..... | ..... | 48,083 |
| | 1967 | ..... | ..... | 7,173 | ..... | 492,331 |
| | To date | 7,582 | 164,477 | 11,244,631 | ..... | 2,032,784 |
| Similkameen | 1966 | ..... | ..... | ..... | ..... | 279,687 |
| | 1967 | ..... | ..... | ..... | ..... | 116,968 |
| | To date | 45,507 | 878,204 | 120,195,258 | 18,558 | 3,253,932 |
| Skeena | 1966 | ..... | ..... | 5,643,654 | ..... | 592,571 |
| | 1967 | ..... | ..... | 7,075,817 | ..... | 928,616 |
| | To date | 4,603 | 105,569 | 235,028,160 | 1,229,400 | 10,028,873 |
| Slocan | 1966 | ..... | ..... | 9,275,129 | ..... | 86,049 |
| | 1967 | ..... | ..... | 7,873,945 | ..... | 84,101 |
| | To date | 366 | 9,397 | 237,763,482 | ..... | 1,342,476 |
| Trail Creek | 1966 | ..... | ..... | 745,213 | ..... | 250,614 |
| | 1967 | ..... | ..... | 1,204,469 | ..... | 228,604 |
| | To date | 851 | 24,260 | 85,701,433 | ..... | 2,639,937 |
| Vancouver | 1966 | ..... | ..... | 5,339,748 | 40,322 | 10,193,600 |
| | 1967 | ..... | ..... | 6,669,215 | 122,640 | 10,745,614 |
| | To date | 182 | 5,306 | 239,177,359 | 6,733,153 | 91,632,989 |
| Vernon | 1966 | ..... | ..... | 664 | ..... | 271,748 |
| | 1967 | ..... | ..... | 10,695 | ..... | 659,442 |
| | To date | 2,732 | 72,885 | 209,230 | 3,978 | 4,033,847 |
| Victoria | 1966 | ..... | ..... | 992,729 | 140 | 10,330,132 |
| | 1967 | ..... | ..... | 1,523,437 | 140 | 9,879,862 |
| | To date | 628 | 15,680 | 15,444,922 | 188,791 | 159,091,569 |
| Not assigned | 1966 | 58 | 1,557 | 12,859,839 | 2,212,500 | 6,330,910 |
| | 1967 | 50 | 1,435 | 12,929,126 | 4,128,090 | 5,459,723 |
| | To date | 1,525,515 | 17,262,105 | 251,544,472 | 46,113,975 | 27,852,296 |
| Totals | 1966 | 1,535 | 44,632 | 208,991,899 | 22,865,324 | 46,821,264 |
| | 1967 | 891 | 25,632 | 235,906,394 | 29,364,065 | 47,359,089 |
| | To date | 5,233,848 | 96,911,921 | 4,534,740,391 | 240,959,582 | 523,365,606 |

## Total to Date, by Mining Divisions—Summary

| Fuels | | | | | | | | Division Total |
|---|---|---|---|---|---|---|---|---|
| Coal | | Crude Oil and Condensates | | Natural Gas Delivered to Pipe-line | | Butane and Propane | | |
| Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | |
| Tons | $ | Bbl. | $ | M S.C.F. | $ | Bbl. | $ | $ |
| | | | | | | | | 6,919,656 |
| | | | | | | | | **13,296,034** |
| | | | | | | | | 68,083,768 |
| | | | | | | | | 6,598 |
| | | | | | | | | **15,395** |
| | | | | | | | | 55,784,548 |
| | | | | | | | | 8,145,459 |
| | | | | | | | | **6,458,530** |
| 290 | 1,100 | | | | | | | 121,638,938 |
| | | | | | | | | 56,498 |
| | | | | | | | | **515,846** |
| | | | | | | | | 2,014,064 |
| 823,350 | 5,919,353 | | | | | | | 63,739,709 |
| **895,429** | **6,939,184** | | | | | | | **60,404,704** |
| 58,169,961 | 266,597,688 | | | | | | | 2,271,262,237 |
| | | | | | | | | 2,851,742 |
| | | | | | | | | **2,720,634** |
| | | | | | | | | 71,561,102 |
| | | | | | | | | 7,019,825 |
| | | | | | | | | **7,457,797** |
| | | | | | | | | 160,674,297 |
| | | | | | | | | 15,901,581 |
| | | | | | | | | **21,702,842** |
| 15,087 | 59,765 | | | | | | | 83,078,850 |
| | | 17,652,316 | 36,667,308 | 161,264,334 | 17,339,587 | 835,288 | 267,292 | 72,359,665 |
| | | **20,713,414** | **45,108,775** | **198,626,177** | **21,667,136** | **1,001,176** | **320,375** | **85,020,686** |
| 99,433 | 699,521 | 95,247,347 | 187,171,497 | 1,139,229,860 | 110,335,069 | 5,956,497 | 1,906,076 | 451,846,244 |
| | | | | | | | | 1,814,532 |
| | | | | | | | | **1,916,740** |
| | | | | | | | | 146,793,366 |
| 15,496 | 169,091 | | | | | | | 23,491,257 |
| **374** | **5,362** | | | | | | | **20,807,420** |
| 74,324,378 | 301,143,250 | | | | | | | 503,694,122 |
| | | | | | | | | 17,051,265 |
| | | | | | | | | **8,766,883** |
| | | | | | | | | 316,400,160 |
| | | | | | | | | 12,378,644 |
| | | | | | | | | **13,684,955** |
| | | | | | | | | 145,748,400 |
| | | | | | | | | 17,794,522 |
| | | | | | | | | **30,093,329** |
| 2,929,584 | 11,080,836 | | | | | | | 133,093,414 |
| 11,975 | 107,775 | | | | | | | 23,468,327 |
| **12,987** | **100,795** | | | | | | | **39,436,306** |
| 476,159 | 3,176,723 | | | | | | | 115,597,144 |
| | | | | | | | | 699,356 |
| | | | | | | | | **1,357,263** |
| 1,122 | 5,008 | | | | | | | 59,839,996 |
| | | | | | | | | 48,083 |
| | | | | | | | | **499,504** |
| | | | | | | | | 13,441,892 |
| | | | | | | | | 279,687 |
| | | | | | | | | **116,968** |
| 4,617,442 | 19,553,725 | | | | | | | 143,899,677 |
| | | | | | | | | 6,236,225 |
| | | | | | | | | **8,004,433** |
| 36 | 116 | | | | | | | 246,392,118 |
| | | | | | | | | 9,361,178 |
| | | | | | | | | **7,958,046** |
| | | | | | | | | 239,115,355 |
| | | | | | | | | 995,827 |
| | | | | | | | | **1,433,073** |
| | | | | | | | | 88,365,630 |
| | | | | | | | | 15,573,670 |
| | | | | | | | | **17,537,469** |
| | | | | | | | | 337,548,807 |
| | | | | | | | | 272,412 |
| | | | | | | | | **670,137** |
| | | | | | | | | 4,319,940 |
| | | | | | | | | 11,323,001 |
| | | | | | | | | **11,403,439** |
| | | | | | | | | 174,740,962 |
| | | | | | | | | 21,404,806 |
| | | | | | | | | **22,518,374** |
| | | | | | | | | 342,772,848 |
| 850,821 | 6,196,219 | 17,652,316 | 36,667,308 | 161,264,334 | 17,339,587 | 835,288 | 267,292 | 339,193,525 |
| **908,790** | **7,045,341** | **20,713,414** | **45,108,775** | **198,626,177** | **21,667,136** | **1,001,176** | **320,375** | **386,796,807** |
| 140,633,492 | 602,317,732 | 95,247,347 | 187,171,497 | 1,139,229,860 | 110,335,069 | 5,956,497 | 1,906,076 | 6,297,707,874 |

TABLE 7B.—PRODUCTION, 1966 AND 1967, AND TOTAL TO DATE, BY MINING DIVISIONS—LODE GOLD, SILVER, COPPER, LEAD, AND ZINC

| Division | Period | Lode Gold | | Silver | | Copper | | Lead | | Zinc | | Division Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | |
| | | Oz. | $ | Oz. | $ | Lb. | $ | Lb. | $ | Lb. | $ | $ |
| Alberni | 1966 | 1 | 38 | 14 | 20 | 1,818 | 970 | | | | | 1,028 |
| | **1967** | **10,902** | **411,660** | **402,095** | **671,945** | **8,120,718** | **4,143,353** | **795,547** | **120,144** | **24,168,908** | **3,609,143** | **8,956,245** |
| | To date | 314,660 | 11,776,685 | 564,793 | 751,018 | 10,413,235 | 4,487,841 | 916,891 | 125,563 | 24,168,975 | 3,609,151 | 20,750,258 |
| Atlin | 1966 | | | 3 | 4 | | | | | | | 4 |
| | **1967** | | | **13** | **22** | | | | | | | **22** |
| | To date | 344,197 | 12,126,732 | 3,377,099 | 2,895,609 | 24,777,661 | 8,160,266 | 23,765,211 | 3,437,907 | 91,067,749 | 10,864,497 | 37,485,011 |
| Cariboo | 1966 | 20,312 | 765,966 | 3,476 | 4,842 | | | | | | | 770,808 |
| | **1967** | **5,481** | **206,963** | **1,044** | **1,744** | | | | | | | **208,707** |
| | To date | 1,202,251 | 43,347,296 | 146,678 | 108,792 | 2,352 | 920 | 24,560 | 3,724 | 505 | 19 | 43,460,751 |
| Clinton | 1966 | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | |
| | To date | 23,390 | 827,328 | 31,586 | 14,237 | 57,548 | 5,905 | 193 | 7 | | | 847,477 |
| Fort Steele | 1966 | 226 | 8,522 | 3,099,543 | 4,317,663 | | | 164,266,495 | 26,747,513 | 136,493,338 | 21,322,989 | 52,396,687 |
| | **1967** | **162** | **6,117** | **3,073,082** | **5,135,458** | | | **157,039,309** | **23,716,075** | **121,470,665** | **18,139,214** | **46,996,864** |
| | To date | 7,025 | 216,767 | 227,693,011 | 148,173,665 | 28,592 | 6,193 | 12,730,795,707 | 1,005,888,225 | 9,473,792,111 | 803,806,530 | 1,958,091,380 |
| Golden | 1966 | | | 46,299 | 64,494 | 3,244 | 1,730 | 3,160,034 | 514,548 | 6,856,694 | 1,071,153 | 1,651,925 |
| | **1967** | | | **51,266** | **85,671** | | | **3,527,550** | **532,731** | **6,892,277** | **1,029,224** | **1,647,626** |
| | To date | 170 | 4,882 | 4,121,184 | 3,505,562 | 1,171,455 | 367,261 | 253,450,684 | 25,201,523 | 317,396,116 | 30,236,190 | 59,315,418 |
| Greenwood | 1966 | 14,702 | 554,412 | 841,432 | 1,172,115 | 9,087,920 | 4,847,860 | 1,024,939 | 166,891 | 705,324 | 110,186 | 6,851,464 |
| | **1967** | **14,786** | **558,319** | **810,534** | **1,354,491** | **9,964,959** | **5,084,321** | **974,752** | **147,207** | **643,853** | **96,147** | **7,240,485** |
| | To date | 1,264,334 | 29,215,379 | 38,977,054 | 27,871,181 | 508,364,201 | 95,667,492 | 21,413,084 | 2,023,802 | 22,117,055 | 1,972,055 | 156,749,909 |
| Kamloops | 1966 | 503 | 18,968 | 97,798 | 136,233 | 27,532,516 | 14,686,945 | | | | | 14,842,146 |
| | **1967** | **1,627** | **61,436** | **150,158** | **250,931** | **39,499,922** | **20,153,650** | | | | | **20,466,017** |
| | To date | 57,593 | 1,975,411 | 855,548 | 990,837 | 139,690,798 | 58,715,346 | 538,097 | 45,030 | 438,023 | 29,826 | 61,756,450 |
| Liard | 1966 | | | 39 | 54 | | | 319 | 52 | 115 | 18 | 124 |
| | **1967** | | | | | | | | | | | |
| | To date | 114 | 4,120 | 587 | 507 | 56 | 22 | 10,421 | 1,776 | 115 | 18 | 6,443 |
| Lillooet | 1966 | 43,222 | 1,629,902 | 8,390 | 11,687 | | | | | | | 1,641,589 |
| | **1967** | **48,711** | **1,839,327** | **8,669** | **14,487** | | | | | | | **1,853,814** |
| | To date | 4,027,027 | 141,473,980 | 960,010 | 663,989 | 400 | 41 | 62,513 | 2,548 | 15 | 2 | 142,140,560 |
| Nanaimo | 1966 | 24,088 | 908,359 | 255,355 | 355,710 | 20,415,533 | 10,890,462 | | | | | 12,154,531 |
| | **1967** | **17,614** | **665,105** | **141,749** | **236,878** | **14,181,288** | **7,235,577** | | | | | **8,137,560** |
| | To date | 186,812 | 5,780,866 | 1,392,088 | 1,465,360 | 107,913,815 | 38,903,419 | | | | | 46,149,645 |
| Nelson | 1966 | 1,137 | 42,876 | 125,311 | 174,558 | | | 19,498,654 | 3,174,966 | 76,631,663 | 11,971,398 | 15,363,798 |
| | **1967** | **1,378** | **52,033** | **111,865** | **186,939** | | | **13,629,659** | **2,058,352** | **36,404,069** | **5,436,220** | **7,733,544** |
| | To date | 1,337,651 | 41,864,270 | 9,038,258 | 6,116,252 | 14,915,405 | 1,689,196 | 456,208,897 | 56,973,778 | 1,200,946,401 | 156,343,974 | 262,987,470 |
| New Westminster | 1966 | | | | | 1,548,700 | 826,139 | | | | | 826,139 |
| | **1967** | | | **1** | **2** | **1,678,348** | **856,327** | | | | | **856,329** |
| | To date | 4,466 | 114,164 | 15,115 | 7,722 | 13,901,697 | 5,005,857 | 28,425 | 1,119 | 12,755 | 481 | 5,129,343 |
| Nicola | 1966 | | | | | 33,106,447 | 17,660,303 | | | | | 17,660,303 |
| | **1967** | **7** | **264** | **854** | **1,427** | **58,732,068** | **29,966,276** | **2,375** | **359** | **154** | **23** | **29,968,349** |
| | To date | 8,548 | 235,745 | 276,453 | 135,632 | 318,991,111 | 120,697,872 | 2,241,499 | 91,282 | 323,889 | 10,977 | 121,171,508 |
| Omineca | 1966 | 1,423 | 53,661 | 23,212 | 32,334 | 2,067,930 | 1,103,117 | 147,841 | 24,073 | 231,923 | 36,231 | 1,249,416 |
| | **1967** | **15,868** | **599,176** | **184,443** | **308,225** | **23,594,882** | **12,038,581** | **293,279** | **44,291** | **396,533** | **59,214** | **13,049,487** |
| | To date | 42,444 | 1,429,634 | 9,813,067 | 7,998,801 | 32,410,874 | 14,687,723 | 28,738,531 | 3,664,352 | 32,511,198 | 4,050,079 | 31,830,589 |

| | | Oz. | $ | Oz. | $ | Lb. | $ | Lb. | $ | Lb. | $ | $ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Osoyoos | 1966 | | | | | | | | | | | |
| | **1967** | **892** | **33,682** | **413,715** | **691,363** | | | **39,609** | **5,982** | **85,567** | **12,778** | **743,805** |
| | To date | 1,656,625 | 50,347,159 | 1,013,600 | 1,091,364 | 2,843,616 | 417,190 | 180,374 | 13,190 | 101,731 | 14,367 | 51,883,270 |
| Revelstoke | 1966 | | | | | | | | | | | |
| | **1967** | | | **1,223** | **2,044** | | | **30,894** | **4,666** | **3,103** | **463** | **7,173** |
| | To date | 37,300 | 1,069,260 | 4,109,297 | 2,769,163 | 153,686 | 51,037 | 36,077,602 | 3,858,032 | 27,127,076 | 3,311,895 | 11,059,387 |
| Similkameen | 1966 | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | |
| | To date | 184,016 | 6,327,410 | 4,219,558 | 2,582,429 | 601,197,638 | 111,137,983 | 382,677 | 13,376 | 78,094 | 4,874 | 120,066,072 |
| Skeena | 1966 | 8,199 | 309,184 | 165,554 | 230,617 | 273 | 146 | 43,851 | 7,140 | 108,982 | 17,025 | 564,112 |
| | **1967** | **4,341** | **163,916** | **101,871** | **170,238** | **1,192,867** | **608,825** | | | | | **942,779** |
| | To date | 2,426,950 | 61,458,066 | 69,058,759 | 44,483,926 | 690,299,410 | 98,634,778 | 60,000,228 | 5,438,209 | 17,194,846 | 2,541,146 | 212,556,125 |
| Slocan | 1966 | 41 | 1,546 | 495,091 | 689,662 | | | 25,059,507 | 4,080,440 | 27,103,767 | 4,234,150 | 9,005,798 |
| | **1967** | **38** | **1,435** | **362,646** | **606,021** | | | **21,367,338** | **3,226,895** | **25,307,760** | **3,779,208** | **7,613,559** |
| | To date | 16,085 | 466,814 | 74,756,427 | 50,103,355 | 13,662 | 1,861 | 1,031,460,552 | 92,595,494 | 849,974,195 | 89,967,380 | 233,134,904 |
| Trail Creek | 1966 | | | | | | | | | | | |
| | **1967** | **13** | **490** | **2** | **3** | | | | | | | **493** |
| | To date | 2,984,561 | 63,340,024 | 3,673,072 | 2,102,507 | 122,561,732 | 18,245,404 | 146,421 | 12,293 | 133,571 | 16,242 | 83,716,470 |
| Vancouver | 1966 | 3,717 | 140,168 | 34,441 | 47,976 | 9,017,161 | 4,810,114 | 51,194 | 8,336 | 2,006,190 | 313,407 | 5,320,001 |
| | **1967** | **3,128** | **118,113** | **44,818** | **74,896** | **12,459,529** | **6,357,101** | **8,664** | **1,308** | **729,494** | **108,935** | **6,660,353** |
| | To date | 493,681 | 15,976,417 | 5,133,512 | 3,350,982 | 1,024,249,621 | 186,368,409 | 18,552,603 | 1,880,670 | 234,747,488 | 30,439,735 | 238,016,213 |
| Vernon | 1966 | 6 | 226 | 164 | 228 | | | 1,014 | 165 | 286 | 45 | 664 |
| | **1967** | | | **1,876** | **3,135** | | | **2,752** | **416** | **44,282** | **6,612** | **10,163** |
| | To date | 5,230 | 176,308 | 14,891 | 11,473 | 654 | 100 | 28,679 | 3,514 | 55,384 | 7,803 | 199,198 |
| Victoria | 1966 | 400 | 15,084 | 3,920 | 5,461 | 1,822,480 | 972,184 | | | | | 992,729 |
| | **1967** | **460** | **17,370** | **3,224** | **5,388** | **2,941,240** | **1,500,679** | | | | | **1,523,437** |
| | To date | 41,580 | 960,169 | 916,284 | 559,568 | 53,741,646 | 13,585,977 | 210,097 | 19,848 | 3,568,709 | 283,923 | 15,409,485 |
| Not assigned[1] | 1966 | 1,531 | 57,734 | 349,089 | 486,281 | 1,196,546 | 638,285 | [1]–1,763,741 | [1]–287,190 | 54,986,158 | 8,589,938 | 9,485,048 |
| | **1967** | **749** | **28,282** | **315,591** | **527,387** | **373,727** | **190,682** | **10,420,166** | **1,573,653** | **46,684,243** | **6,971,358** | **9,291,362** |
| | To date | 17,585 | 515,379 | 5,701,572 | 5,803,349 | 51,196,791 | 11,734,912 | 506,543,192 | 45,073,397 | 1,253,648,823 | 118,073,327 | 181,200,364 |
| Totals | 1966 | 119,508 | 4,506,646 | 5,549,131 | 7,729,939 | 105,800,568 | 56,438,255 | 211,490,107 | 34,436,934 | 305,124,440 | 47,666,540 | 150,778,314 |
| | **1967** | **126,157** | **4,763,688** | **6,180,739** | **10,328,695** | **172,739,548** | **88,135,172** | **208,131,894** | **31,432,079** | **262,830,908** | **39,248,539** | **173,908,173** |
| | To date | 16,684,295 | 491,030,265 | 465,859,503 | 313,557,280 | 3,718,897,656 | 788,573,005 | 15,171,777,138 | 1,246,368,659 | 13,549,404,824 | 1,255,584,491 | 4,095,113,700 |

[1] Metals recovered from operations at the Trail smelter but not assignable to individual mines. The minus quantities for lead and zinc are bookkeeping adjustments between the Trail smelter input and output.

TABLE 7C.—PRODUCTION, 1966 AND 1967, AND TOTAL TO DATE, BY MINING DIVISIONS—MISCELLANEOUS METALS

| Division | Period | Antimony Quantity | Antimony Value | Bismuth Quantity | Bismuth Value | Cadmium Quantity | Cadmium Value | Chromite Quantity | Chromite Value | Iron Concentrates Quantity | Iron Concentrates Value | Manganese Quantity | Manganese Value | Mercury Quantity | Mercury Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Lb. | $ | Lb. | $ | Lb. | $ | Tons | $ | Tons | $ | Tons | $ | Lb. | $ |
| Alberni | 1966 | | | | | | | | | 644,459 | 6,744,467 | | | | |
| | **1967** | | | | | **83,852** | **234,786** | | | **383,035** | **3,687,181** | | | | |
| | To date | | | | | 83,852 | 234,786 | | | 4,253,212 | 44,788,424 | | | | |
| Atlin | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | 319,212 | 561,762 | | | | | | | | |
| Cariboo | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | | | | |
| Clinton | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | 126 | 900 | | | | | | |
| Fort Steele | 1966 | | | | | 274,036 | 707,013 | | | 163,950 | 1,417,155 | | | | |
| | **1967** | | | | | **189,896** | **531,709** | | | **172,413** | **1,686,873** | | | | |
| | To date | | | | | 1,396,385 | 4,068,247 | | | 727,045 | 7,082,075 | | | | |
| Golden | 1966 | | | | | 25,093 | 64,740 | | | | | | | | |
| | **1967** | | | | | **22,390** | **62,692** | | | | | | | | |
| | To date | 40,062 | 14,906 | | | 521,377 | 1,039,411 | | | | | | | | |
| Greenwood | 1966 | | | | | 4,518 | 11,657 | | | | | | | | |
| | **1967** | | | | | **3,345** | **9,366** | | | | | | | | |
| | To date | | | | | 65,548 | 132,297 | 670 | 31,395 | | | | | | |
| Kamloops | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | 21,167 | 95,851 | | | 10,987 | 5,795 |
| Liard | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | | | | |
| Lillooet | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | **380** | **2,600** |
| | To date | 13,466 | 4,321 | | | | | | | | | | | 9,231 | 41,304 |
| Nanaimo | 1966 | | | | | | | | | 808,205 | 7,537,770 | | | | |
| | **1967** | | | | | | | | | **954,735** | **9,341,767** | | | | |
| | To date | | | | | | | | | 12,857,428 | 106,069,955 | | | | |
| Nelson | 1966 | | | | | 442,633 | 1,141,993 | | | | | | | | |
| | **1967** | | | | | **216,329** | **605,721** | | | | | | | | |
| | To date | | | | | 7,056,737 | 14,266,045 | | | | | | | | |
| New Westminster | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | | | | |
| Omineca | 1966 | | | | | 1,870 | 4,825 | | | | | | | | |
| | **1967** | | | | | **1,739** | **4,869** | | | | | | | | |
| | To date | 104,489 | 15,217 | | | 268,650 | 536,137 | | | | | | | 4,150,892 | 10,400,259 |
| Osoyoos | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | 16 | | | |

| | | Lb. | $ | Lb. | $ | Lb. | $ | Tons | $ | Tons | $ | Tons | $ | Lb. | $ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revelstoke | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | 9,394 | 3,455 | | | 103,612 | 176,102 | | | | | | | | |
| Similkameen | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | | | | |
| Skeena | 1966 | | | | | | | | | 535,190 | 5,079,542 | | | | |
| | **1967** | | | | | | | | | **644,260** | **6,104,944** | | | | |
| | To date | | | | | 141,890 | 316,764 | | | 2,397,854 | 22,112,437 | | | | |
| Slocan | 1966 | | | | | 104,392 | 269,331 | | | | | | | | |
| | **1967** | | | | | **92,995** | **260,386** | | | | | | | | |
| | To date | 31,865 | 8,133 | | | 2,305,192 | 4,612,285 | | | | | 541 | 8,160 | | |
| Trail Creek | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | 115 | 210 | | | 550 | 1,925 | | | | |
| Vancouver | 1966 | | | | | 7,654 | 19,747 | | | | | | | | |
| | **1967** | | | | | **3,165** | **8,862** | | | | | | | | |
| | To date | | | | | 551,991 | 1,161,146 | | | | | | | | |
| Vernon | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | **190** | **532** | | | | | | | | |
| | To date | | | | | 190 | 532 | | | | | | | | |
| Victoria | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | 7,000 | 10,929 | | | | | 1,167 | 24,508 | | |
| Not assigned[1] | 1966 | 1,405,681 | 745,011 | 47,435 | 198,848 | 309,374 | 798,185 | | | | | | | | |
| | **1967** | **1,267,686** | **671,874** | **142,507** | **572,878** | **380,464** | **1,065,299** | | | | | | | | |
| | To date | 49,660,550 | 14,607,886 | 6,344,049 | 11,765,019 | 23,177,880 | 34,026,989 | | | | | | | | |
| Totals | 1966 | 1,405,681 | 745,011 | 47,435 | 198,848 | 1,169,570 | 3,017,491 | | | 2,151,804 | 20,778,934 | | | | |
| | **1967** | **1,267,686** | **671,874** | **142,507** | **572,878** | **994,365** | **2,784,222** | | | **2,154,443** | **20,820,765** | | | **380** | **2,600** |
| | To date | 49,859,826 | 14,653,918 | 6,344,049 | 11,765,019 | 35,999,631 | 61,143,642 | 796 | 32,295 | 20,257,256 | 180,150,667 | 1,724 | 32,668 | 4,171,110 | 10,447,358 |

[1] Metals recovered from operations at the Trail smelter but not assignable to individual mines.

TABLE 7C.—PRODUCTION, 1966 AND 1967, AND TOTAL TO DATE, BY MINING DIVISIONS—MISCELLANEOUS METALS—*Continued*

| Division | Period | Molybdenum | | Nickel | | Palladium | | Platinum | | Tin | | Tungsten ($WO_3$) | | Other, Value | Division Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | | |
| | | Lb. | $ | Lb. | $ | Oz. | $ | Oz. | $ | Lb. | $ | Lb. | $ | $ | $ |
| Alberni | 1966 | | | | | | | | | | | | | | 6,744,467 |
| | **1967** | | | | | | | | | | | | | | **3,921,967** |
| | To date | | | | | | | | | | | | | | 45,023,210 |
| Atlin | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | 292 | 360 | | 562,122 |
| Cariboo | 1966 | 3,534,893 | 5,733,760 | | | | | | | | | | | | 5,733,760 |
| | **1967** | **3,106,460** | **5,362,234** | | | | | | | | | | | | **5,362,234** |
| | To date | 8,256,576 | 13,577,258 | | | | | 59 | 2,299 | | | 27,698 | 21,431 | | 13,600,988 |
| Clinton | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | | | | 900 |
| Fort Steele | 1966 | | | | | | | | | 710,752 | 1,130,096 | | | | 3,254,264 |
| | **1967** | | | | | | | | | **437,804** | **621,682** | | | | **2,840,264** |
| | To date | | | | | | | | | 17,274,649 | 14,809,273 | | | 88,184[1] | 26,047,779 |
| Golden | 1966 | | | | | | | | | | | | | | 64,740 |
| | **1967** | | | | | | | | | | | | | | **62,692** |
| | To date | | | | | | | | | | | | | | 1,054,317 |
| Greenwood | 1966 | | | | | | | | | | | | | | 11,657 |
| | **1967** | | | | | | | | | | | | | | **9,366** |
| | To date | | | | | | | | | | | | | | 163,692 |
| Kamloops | 1966 | 13,850 | 18,916 | | | | | | | | | | | | 18,916 |
| | **1967** | | | | | | | | | | | | | | |
| | To date | 93,995 | 138,479 | | | | | | | | | | | | 240,125 |
| Liard | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | 2 | 79 | | | | | | 79 |
| Lillooet | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | **2,600** |
| | To date | 1,469 | 2,440 | | | | | 3 | 113 | | | 32,353 | 37,921 | | 86,099 |
| Nanaimo | 1966 | | | | | | | | | | | | | | 7,537,770 |
| | **1967** | | | | | | | | | | | | | | **9,341,767** |
| | To date | | | | | | | | | | | | | | 106,069,955 |
| Nelson | 1966 | | | | | | | | | | | | | | 1,141,993 |
| | **1967** | | | | | | | | | | | | | | **605,721** |
| | To date | 15,035 | 18,378 | | | | | | | | | 13,739,939 | 33,900,311 | | 48,184,734 |
| New Westminster | 1966 | | | 3,622,400 | 3,104,397 | | | | | | | | | | 3,104,397 |
| | **1967** | | | **4,180,842** | **3,946,715** | | | | | | | | | | **3,946,715** |
| | To date | | | 32,411,701 | 26,373,985 | | | | | | | | | | 26,373,985 |
| Omineca | 1966 | 13,229,852 | 21,108,172 | | | | | | | | | | | | 21,112,997 |
| | **1967** | **13,716,016** | **24,655,468** | | | | | | | | | | | | **24,660,337** |
| | To date | 32,568,830 | 55,617,060 | | | | | 3 | 154 | | | 2,210,892 | 4,697,710 | 420[2] | 71,266,957 |
| Osoyoos | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | 612 | 1,020 | | | | | | | | | | | | 1,020 |

| | | Lb. | $ | Lb. | $ | Oz. | $ | Oz. | $ | Lb. | $ | Lb. | $ | $ | $ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revelstoke | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | 7,784 | 5,687 | | 185,244 |
| Similkameen | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | 1,287 | 129,186 | | | | | | 129,186 |
| Skeena | 1966 | | | | | | | | | | | | | | 5,079,542 |
| | **1967** | **16,054** | **28,094** | | | | | | | | | | | | **6,133,038** |
| | To date | 23,867 | 41,114 | | | | | | | | | 366 | 331 | 1,389[3] | 22,472,035 |
| Slocan | 1966 | | | | | | | | | | | | | | 269,331 |
| | **1967** | | | | | | | | | | | | | | **260,386** |
| | To date | | | | | | | | | | | | | | 4,628,578 |
| Trail Creek | 1966 | 316,332 | 745,213 | | | | | | | | | | | | 745,213 |
| | **1967** | **678,818** | **1,203,976** | | | | | | | | | | | | **1,203,976** |
| | To date | 995,150 | 1,949,189 | | | 749 | 30,462 | 53 | 3,177 | | | | | | 1,984,963 |
| Vancouver | 1966 | | | | | | | | | | | | | | 19,747 |
| | **1967** | | | | | | | | | | | | | | **8,862** |
| | To date | | | | | | | | | | | | | | 1,161,146 |
| Vernon | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | **532** |
| | To date | 5,414 | 9,500 | | | | | | | | | | | | 10,032 |
| Victoria | 1966 | | | | | | | | | | | | | | |
| | **1967** | | | | | | | | | | | | | | |
| | To date | | | | | | | | | | | | | | 35,437 |
| Not assigned | 1966 | | | | | | | | | | | | | 1,632,747 | 3,374,791 |
| | **1967** | | | | | | | | | | | | | **1,327,713** | **3,637,764** |
| | To date | | | | | | | | | | | | | 9,944,214 | 70,344,108 |
| Totals | 1966 | 17,094,927 | 27,606,061 | 3,622,400 | 3,104,397 | | | | | 710,752 | 1,130,096 | | | 1,632,747 | 58,213,585 |
| | **1967** | **17,517,348** | **31,249,772** | **4,180,842** | **3,946,715** | | | | | **437,804** | **621,682** | | | **1,327,713** | **61,998,221** |
| | To date | 41,960,948 | 71,354,438 | 32,411,701 | 26,373,985 | 749 | 30,462 | 1,407 | 135,008 | 17,274,649 | 14,809,273 | 16,019,324 | 38,663,751 | 10,034,207 | 439,626,691 |

1 Magnesium, page A 20. 2 Cobalt, page A 18. 3 Selenium, page A 22.

TABLE 7D.—PRODUCTION, 1966 AND 1967, AND TOTAL

| Division | Period | Asbestos | | Barite | | Diatomite | | Fluxes (Quartz and Limestone) | | Granules (Quartz, Limestone, and Granite) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| | | Tons | $ | Tons | $ | Tons | $ | Tons | $ | Tons | $ |
| Alberni | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Atlin | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Cariboo | 1966 | | | | | 70 | 3,755 | | | | |
| | **1967** | | | | | **2,819** | **14,096** | | | | |
| | To date | | | | | 6,616 | 158,166 | | | 48 | 168 |
| Clinton | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Fort Steele | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | 8 | 80 | | | | | | |
| Golden | 1966 | | | 21,888 | 176,240 | | | | | | |
| | **1967** | | | **23,466** | **176,882** | | | | | | |
| | To date | | | 275,734 | 3,118,951 | | | 3,259 | 12,612 | | |
| Greenwood | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | 1,790,502 | 1,540,319 | | |
| Kamloops | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Liard | 1966 | 88,771 | 15,718,741 | | | | | | | | |
| | **1967** | **92,192** | **18,273,220** | | | | | | | | |
| | To date | 683,422 | 133,692,993 | | | | | | | | |
| Lillooet | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Nanaimo | 1966 | | | | | | | | | 3,583 | 68,786 |
| | **1967** | | | | | | | **21,836** | **50,067** | **3,300** | **60,000** |
| | To date | | | | | | | 801,933 | 1,015,571 | 6,883 | 128,786 |
| Nelson | 1966 | | | | | | | | | 4,184 | 118,368 |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | 7,601 | 8,174 | 16,668 | 421,784 |
| New Westminster | 1966 | | | | | | | | | 3,100 | 50,000 |
| | **1967** | | | | | | | | | **3,700** | **62,000** |
| | To date | | | | | | | | | 92,547 | 1,277,256 |
| Nicola | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Omineca | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Osoyoos | 1966 | | | | | | | 23,899 | 112,174 | 13,089 | 187,513 |
| | **1967** | | | | | | | **26,202** | **171,015** | **24,283** | **183,655** |
| | To date | | | | | | | 783,666 | 3,600,892 | 146,843 | 1,987,325 |
| Similkameen | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Skeena | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | 601,019 | 1,050,722 | | |
| Vancouver | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | 29,692 | 418,606 |
| Vernon | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Victoria | 1966 | | | | | | | 14 | 140 | | |
| | **1967** | | | | | | | **14** | **140** | | |
| | To date | | | | | | | 124 | 1,485 | 9,605 | 157,080 |
| Not assigned | 1966 | | | | | | | | | | |
| | **1967** | | | | | | | | | | |
| | To date | | | | | | | | | | |
| Totals | 1966 | 88,771 | 15,718,741 | 21,888 | 176,240 | 70 | 3,755 | 23,913 | 112,314 | 23,956 | 424,667 |
| | **1967** | **92,192** | **18,273,220** | **23,466** | **176,882** | **2,819** | **14,096** | **48,052** | **221,212** | **31,283** | **305,655** |
| | To date | 683,422 | 133,692,993 | 275,742 | 3,119,031 | 6,616 | 158,166 | 3,988,104 | 7,229,775 | 302,286 | 4,391,005 |

Other: *See* notes on individual minerals listed alphabetically on pages A 17 to A 23.

[1] Arsenious oxide.
[2] Bentonite.
[3] Fluorspar.
[4] Hydromagnesite.
[5] Iron oxide and ochre.
[6] Magnesium sulphate.

TO DATE, BY MINING DIVISIONS—INDUSTRIAL MINERALS

| Gypsum and Gypsite | | Jade | | Mica | | Sulphur | | Other, Value | Division Total |
|---|---|---|---|---|---|---|---|---|---|
| Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | | |
| Tons | $ | Lb. | $ | Lb. | $ | Lb. | $ | $ | $ |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | 9,398[7] | 9,398 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | 20,325[4] | 20,325 |
| | | | | | | | | | 3,755 |
| | | | | | | | | | **14,096** |
| | | | | 10,013,800 | 143,012 | | | 300[12] | 301,646 |
| | | | | | | | | | |
| | | | | | | | | | |
| 873 | 6,236 | | | | | | | 156,191[4, 6, 10] | 162,427 |
| | | | | | | 124,340 | 1,865,100 | | 1,865,100 |
| | | | | | | **109,777** | **3,293,298** | | **3,293,298** |
| 112,878 | 298,824 | | | | | 762,304 | 13,443,071 | 16,894[9] | 13,758,869 |
| 206,026 | 576,873 | | | | | | | | 753,113 |
| **230,044** | **691,592** | | | | | | | | **868,474** |
| 1,924,431 | 5,595,402 | | | | | | | 1,276[5, 11] | 8,728,241 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | 783,578[3] | 2,323,897 |
| | | | | | | | | | |
| | | | | | | | | | |
| 1,246,918 | 6,323,178 | | | 424,700 | 2,075 | | | 203,055[6, 10] | 6,528,308 |
| | | 8,493 | 8,648 | | | 66,461 | 1,716,601 | | 17,443,990 |
| | | **14,920** | **19,714** | | | **59,160** | **2,110,575** | | **20,403,509** |
| | | 25,413 | 30,362 | | | 553,159 | 12,158,832 | | 145,882,187 |
| | | 3,140 | 4,577 | | | | | | 4,577 |
| | | **5,240** | **4,627** | | | | | | **4,627** |
| | | 230,832 | 98,347 | | | | | 5,129[11] | 103,476 |
| | | | | | | | | | 68,786 |
| | | | | | | | | | **110,057** |
| | | | | | | | | | 1,144,357 |
| | | | | | | | | | 118,368 |
| | | | | | | | | | |
| | | | | | | | | 55,901[5] | 485,859 |
| | | | | | | | | | 50,000 |
| | | | | | | | | | **62,000** |
| | | | | | | | | | 1,277,256 |
| | | | | | | | | | |
| | | | | | | | | | |
| 2,407 | 10,050 | | | | | | | | 10,050 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | 2,200 | 4,400 | | | | | 11,460[1, 8] | 15,860 |
| | | | | | | | | 4,986[3] | 304,673 |
| | | | | | | | | **2,464**[3] | **357,134** |
| | | | | 1,588,800 | 25,938 | | | 305,416[1, 3, 6] | 5,919,571 |
| | | | | | | | | | |
| | | | | | | | | | |
| 250 | 1,700 | | | | | | | 16,858[2] | 18,558 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | 41,624 | 178,678 | | 1,229,400 |
| | | | | | | 4,177 | 40,322 | | 40,322 |
| | | | | | | **7,950** | **122,640** | | **122,640** |
| | | | | 634,250 | 10,815 | 654,899 | 6,206,343 | 97,389[5] | 6,733,153 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | 160,500 | 3,978 | | | | 3,978 |
| | | | | | | | | | 140 |
| | | | | | | | | | **140** |
| | | | | | | | | 30,226[11] | 188,791 |
| | | | | | | 147,500 | 2,212,500 | | 2,212,500 |
| | | | | | | **137,603** | **4,128,090** | | **4,128,090** |
| | | | | | | 4,277,411 | 46,113,975 | | 46,113,975 |
| 206,026 | 576,873 | 11,633 | 13,225 | | | 342,478 | 5,834,523 | 4,986 | 22,865,324 |
| **230,044** | **691,592** | **20,160** | **24,341** | | | **314,490** | **9,654,603** | **2,464** | **29,364,065** |
| 3,287,757 | 12,235,390 | 258,445 | 133,109 | 12,822,050 | 185,818 | 6,289,397 | 78,100,899 | 1,713,396 | 240,959,582 |

[7] Natro-alunite.
[8] Perlite.
[9] Phosphate rock.
[10] Sodium carbonate.
[11] Talc.
[12] Volcanic ash.

TABLE 7E.—PRODUCTION, 1966 AND 1967, AND TOTAL

| Division | Period | Cement | Lime and Limestone | Building-stone | Rubble, Riprap, and Crushed Rock | Sand and Gravel |
|---|---|---|---|---|---|---|
| | | $ | $ | $ | $ | $ |
| Alberni | 1966 | | | | 19,389 | 154,772 |
| | 1967 | | | | 46,100 | 371,722 |
| | To date | | | | 280,611 | 1,987,038 |
| Atlin | 1966 | | | | | 6,038 |
| | 1967 | | | | | 12,844 |
| | To date | | 1,108 | | 98,478 | 231,305 |
| Cariboo | 1966 | | | | 182,939 | 1,432,024 |
| | 1967 | | 44,616 | | 82,251 | 673,248 |
| | To date | | 52,116 | | 1,375,545 | 8,613,920 |
| Clinton | 1966 | | | | 6,772 | 49,726 |
| | 1967 | | | | 173,446 | 342,400 |
| | To date | | | | 181,824 | 578,367 |
| Fort Steele | 1966 | | | | 66,912 | 237,393 |
| | 1967 | | | | 92,207 | 242,887 |
| | To date | | 43,873 | 71,941 | 1,601,099 | 4,565,240 |
| Golden | 1966 | | | 24,840 | 850 | 356,274 |
| | 1967 | | | | | 114,012 |
| | To date | | 1,000 | 50,840 | 126,189 | 2,214,264 |
| Greenwood | 1966 | | | 16,868 | | 139,836 |
| | 1967 | | | 29,646 | 69,764 | 108,536 |
| | To date | | 42,560 | 83,014 | 241,083 | 833,197 |
| Kamloops | 1966 | | | | 225,977 | 814,942 |
| | 1967 | | | | 337,545 | 899,280 |
| | To date | | 12,000 | 18,000 | 6,759,565 | 7,027,473 |
| Liard | 1966 | | | | 50,917 | 590,447 |
| | 1967 | | | | 30,292 | 490,599 |
| | To date | | | | 178,215 | 4,419,006 |
| Lillooet | 1966 | | | | 73,508 | 69,502 |
| | 1967 | | | | 29,352 | 22,686 |
| | To date | | 100 | 2,000 | 710,764 | 1,827,046 |
| Nanaimo | 1966 | | 2,836,751 | 164,478 | 127,305 | 932,545 |
| | 1967 | | 2,359,595 | | 121,299 | 731,780 |
| | To date | | 38,253,036 | 3,450,735 | 1,061,183 | 5,223,669 |
| Nelson | 1966 | | 72,601 | 3,611 | 4,838 | 346,056 |
| | 1967 | | 72,601 | 3,611 | 5,762 | 345,606 |
| | To date | | 179,745 | 420,191 | 509,589 | 3,521,572 |
| New Westminster | 1966 | | 231,098 | | 312,443 | 4,315,711 |
| | 1967 | | 321,495 | | 701,405 | 4,359,718 |
| | To date | | 2,324,577 | 20,974 | 10,686,895 | 48,133,479 |
| Nicola | 1966 | | | | | 134,219 |
| | 1967 | | | | 23,355 | 101,625 |
| | To date | | | 8,000 | 156,696 | 661,560 |
| Omineca | 1966 | | | | 169,711 | 828,428 |
| | 1967 | | | | 358,194 | 1,267,191 |
| | To date | | 3,077 | | 1,485,578 | 6,313,604 |
| Osoyoos | 1966 | | | | 44,951 | 349,732 |
| | 1967 | | | 18,168 | 10,500 | 227,656 |
| | To date | | 83,784 | 33,018 | 208,698 | 1,750,161 |
| Revelstoke | 1966 | | | | 5,278 | 42,805 |
| | 1967 | | | | 13,556 | 478,775 |
| | To date | | 1,000 | 5,575 | 362,800 | 1,663,409 |
| Similkameen | 1966 | | | | 64,500 | 215,187 |
| | 1967 | | | | 2,280 | 114,688 |
| | To date | 10,500 | 11,571 | 24,000 | 618,049 | 2,576,457 |
| Skeena | 1966 | | 42,061 | | 10,638 | 539,872 |
| | 1967 | | 11,127 | | 612,835 | 304,654 |
| | To date | | 1,645,300 | 144,000 | 2,451,012 | 5,775,312 |
| Slocan | 1966 | | | | | 86,049 |
| | 1967 | | | | | 84,101 |
| | To date | | 1,000 | 115,143 | 118,534 | 1,107,799 |
| Trail Creek | 1966 | | | 4,036 | 375 | 246,208 |
| | 1967 | | | | 1,800 | 226,804 |
| | To date | | 32,500 | 85,520 | 226,224 | 2,295,693 |
| Vancouver | 1966 | 7,020,763 | | 1,200 | 449,872 | 2,721,765 |
| | 1967 | 8,460,929 | | | 147,049 | 2,137,636 |
| | To date | 43,232,647 | 40,885 | 4,012,560 | 8,105,309 | 35,152,996 |
| Vernon | 1966 | | | | 6,372 | 265,376 |
| | 1967 | | | | 28,678 | 630,764 |
| | To date | | 46,499 | 81,052 | 277,059 | 3,467,983 |
| Victoria | 1966 | 8,938,530 | 13,500 | 10 | 2,511 | 819,255 |
| | 1967 | 8,468,522 | 12,704 | | 4,423 | 969,840 |
| | To date | 133,229,356 | 886,696 | 55 | 464,233 | 17,718,644 |
| Not assigned | 1966 | | | | 65,334 | 6,265,576 |
| | 1967 | | | | 75,102 | 5,384,621 |
| | To date | | 315,498 | 505,018 | 627,178 | 17,251,603 |
| Totals | 1966 | 15,959,293 | 2,696,011 | 215,043 | 1,890,992 | 21,959,733 |
| | 1967 | 16,929,451 | 2,822,138 | 51,425 | 2,967,195 | 20,643,673 |
| | To date | 176,472,503 | 43,927,925 | 9,131,636 | 38,912,410 | 184,910,797 |

TO DATE, BY MINING DIVISIONS—STRUCTURAL MATERIALS

| 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 | Unclassified Material | Division Total |
|---|---|---|---|---|---|---|---|---|---|
| $ | $ | $ | $ | $ | $ | $ | $ | $ | $ |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 174,161 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **417,822** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 2,267,649 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 6,038 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **12,844** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 330,891 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | 5,010 | ........ | 1,619,973 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | **55,900** | ........ | **856,015** |
| 1,193 | 184 | 4,651 | 15,807 | ........ | ........ | ........ | 82,952 | ........ | 10,146,368 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 56,498 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **515,846** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 760,191 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 304,305 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **335,094** |
| 7,800 | ........ | ........ | ........ | ........ | ........ | ........ | 8,118 | ........ | 6,298,071 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 381,964 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | **27,830** | ........ | **141,842** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | 59,565 | ........ | 2,451,858 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 156,704 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **207,946** |
| 114,361 | ........ | ........ | 6,922 | ........ | ........ | ........ | ........ | ........ | 1,321,137 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 1,040,519 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **1,236,825** |
| 72,379 | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 13,889,417 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 641,364 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **520,891** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 4,597,221 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 143,010 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **52,038** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 2,539,910 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 3,561,079 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **3,212,674** |
| 1,104,295 | 38,939 | ........ | 35,758 | ........ | ........ | ........ | ........ | ........ | 49,167,615 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 427,106 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **427,580** |
| 19,110 | 2,864 | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 4,653,071 |
| 16,956 | 994,175 | 822,670 | 34,861 | 59,815 | 1,003,518 | 25,568 | 581,293 | ........ | 8,398,108 |
| **2,628** | **1,048,938** | **768,351** | **18,668** | **36,247** | **856,238** | **28,029** | **678,005** | ........ | **8,819,722** |
| 1,828,019 | 8,091,904 | 15,993,680 | 1,023,978 | 3,029,149 | 16,807,021 | 457,722 | 3,976,656 | ........ | 112,374,054 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 134,219 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **124,980** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 826,256 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 998,139 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **1,625,385** |
| 5,274 | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 7,807,533 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 394,683 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **256,324** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 2,025,661 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 48,083 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **492,331** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 2,032,784 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 279,687 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **116,968** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | 11,992 | ........ | 3,253,932 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 592,571 |
| ........ | ........ | ........ | 1,363 | ........ | ........ | ........ | ........ | ........ | **928,616** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | 8,324 | ........ | 10,028,873 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 86,049 |
| ........ | ........ | ........ | 4,925 | ........ | ........ | ........ | ........ | ........ | **84,101** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 1,342,476 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 250,614 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **228,604** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 2,639,937 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 10,193,600 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **10,745,614** |
| 142,208 | 241,216 | 580,778 | 12,724 | ........ | ........ | 23,362 | 88,304 | ........ | 91,632,989 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 271,748 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **659,442** |
| 131,467 | 6,202 | 1,011 | 5 | 18,224 | 4,325 | ........ | 20 | ........ | 4,033,847 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | 556,326 | ........ | 10,330,132 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | **424,373** | ........ | **9,879,862** |
| 1,814,647 | 29,552 | 119,930 | 1,050 | 705,821 | 1,072,346 | 136,504 | 2,912,735 | ........ | 159,091,569 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | 6,330,910 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ | **5,459,723** |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | 3,180,828 | 5,972,171 | 27,852,296 |
| 16,956 | 994,175 | 822,670 | 34,861 | 59,815 | 1,003,518 | 25,568 | 1,142,629 | ........ | 46,821,264 |
| **2,628** | **1,048,938** | **768,351** | **18,668** | **36,247** | **856,238** | **28,029** | **1,186,108** | ........ | **47,359,089** |
| 5,240,753 | 8,410,861 | 16,700,050 | 1,102,532 | 3,753,194 | 17,883,692 | 617,588 | 10,329,494 | 5,972,171 | 523,365,606 |

## TABLE 8A.—QUANTITY[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 | 1915 | 2,076,601 | $7,114,178 |
| 1860 | 15,956 | 56,988 | 1916 | 2,583,469 | 8,900,675 |
| 1861 | 15,427 | 55,096 | 1917 | 2,436,101 | 8,484,343 |
| 1862 | 20,292 | 72,472 | 1918 | 2,575,275 | 12,833,994 |
| 1863 | 23,906 | 85,380 | 1919 | 2,433,540 | 11,975,671 |
| 1864 | 32,068 | 115,528 | 1920 | 2,852,535 | 13,450,169 |
| 1865 | 36,757 | 131,276 | 1921 | 2,670,314 | 12,836,013 |
| 1866 | 28,129 | 100,460 | 1922 | 2,726,793 | 12,880,060 |
| 1867 | 34,988 | 124,956 | 1923 | 2,636,740 | 12,678,548 |
| 1868 | 49,286 | 176,020 | 1924 | 2,027,843 | 9,911,935 |
| 1869 | 40,098 | 143,208 | 1925 | 2,541,212 | 12,168,905 |
| 1870 | 33,424 | 119,372 | 1926 | 2,406,094 | 11,650,180 |
| 1871 | 55,458 | 164,612 | 1927 | 2,553,416 | 12,269,135 |
| 1872 | 55,458 | 164,612 | 1928 | 2,680,608 | 12,633,510 |
| 1873 | 55,459 | 164,612 | 1929 | 2,375,060 | 11,256,260 |
| 1874 | 91,334 | 244,641 | 1930 | 1,994,493 | 9,435,650 |
| 1875 | 123,362 | 330,435 | 1931 | 1,765,471 | 7,684,155 |
| 1876 | 155,895 | 417,576 | 1932 | 1,614,629 | 6,523,644 |
| 1877 | 172,540 | 462,156 | 1933 | 1,377,177 | 5,375,171 |
| 1878 | 191,348 | 522,538 | 1934 | 1,430,042 | 5,725,133 |
| 1879 | 270,257 | 723,903 | 1935 | 1,278,380 | 5,048,864 |
| 1880 | 299,708 | 802,785 | 1936 | 1,352,301 | 5,722,502 |
| 1881 | 255,760 | 685,171 | 1937 | 1,446,243 | 6,139,920 |
| 1882 | 315,997 | 846,417 | 1938 | 1,388,507 | 5,565,069 |
| 1883 | 238,895 | 639,897 | 1939 | 1,561,084 | 6,280,956 |
| 1884 | 441,358 | 1,182,210 | 1940 | 1,662,027 | 7,088,265 |
| 1885 | 409,468 | 1,096,788 | 1941 | 1,844,745 | 7,660,000 |
| 1886 | 365,832 | 979,908 | 1942 | 1,996,000 | 8,237,172 |
| 1887 | 462,964 | 1,240,080 | 1943 | 1,854,749 | 7,742,030 |
| 1888 | 548,017 | 1,467,903 | 1944 | 1,931,950 | 8,217,966 |
| 1889 | 649,411 | 1,739,490 | 1945 | 1,523,021 | 6,454,360 |
| 1890 | 759,518 | 2,034,420 | 1946 | 1,439,092 | 6,732,470 |
| 1891 | 1,152,590 | 3,087,291 | 1947 | 1,696,350 | 8,680,440 |
| 1892 | 925,495 | 2,479,005 | 1948 | 1,604,480 | 9,765,395 |
| 1893 | 1,095,690 | 2,934,882 | 1949 | 1,621,268 | 10,549,924 |
| 1894 | 1,134,509 | 3,038,859 | 1950 | 1,574,006 | 10,119,303 |
| 1895 | 1,052,412 | 2,824,687 | 1951 | 1,573,572 | 10,169,617 |
| 1896 | 1,002,268 | 2,693,961 | 1952 | 1,402,313 | 9,729,739 |
| 1897 | 999,372 | 2,734,522 | 1953 | 1,384,138 | 9,528,279 |
| 1898 | 1,263,272 | 3,582,595 | 1954 | 1,308,284 | 9,154,544 |
| 1899 | 1,435,314 | 4,126,803 | 1955 | 1,332,874 | 8,986,501 |
| 1900 | 1,781,000 | 4,744,530 | 1956 | 1,417,209 | 9,346,518 |
| 1901 | 1,894,544 | 5,016,398 | 1957 | 1,085,657 | 7,340,339 |
| 1902 | 1,838,621 | 4,832,257 | 1958 | 796,413 | 5,937,860 |
| 1903 | 1,624,742 | 4,332,297 | 1959 | 690,011 | 5,472,064 |
| 1904 | 1,887,981 | 4,953,024 | 1960 | 788,658 | 5,242,223 |
| 1905 | 2,044,931 | 5,511,861 | 1961 | 919,142 | 6,802,134 |
| 1906 | 2,126,965 | 5,548,044 | 1962 | 825,339 | 6,133,986 |
| 1907 | 2,485,961 | 7,637,713 | 1963 | 850,541 | 6,237,997 |
| 1908 | 2,362,514 | 7,356,866 | 1964 | 911,326 | 6,327,678 |
| 1909 | 2,688,672 | 8,574,884 | 1965 | 950,763 | 6,713,590 |
| 1910 | 3,314,749 | 11,108,335 | 1966 | 850,821 | 6,196,219 |
| 1911 | 2,541,698 | 8,071,747 | 1967 | 908,790 | 7,045,341 |
| 1912 | 3,211,907 | 10,786,812 | | | |
| 1913 | 2,713,535 | 9,197,460 | Totals | 140,633,492 | $602,317,732 |
| 1914 | 2,237,042 | 7,745,847 | | | |

[1] Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. For 1910 and subsequent years the quantity is that sold and used.

TABLE 8B.—COAL PRODUCTION OF BRITISH COLUMBIA, 1967—PRODUCTION AND DISTRIBUTION, BY COLLIERIES AND BY MINING DIVISIONS

| Mine | Gross Output | Washery Refuse | Output | Used Under Companies' Boilers, Etc. | Used in Making Coke | Sales | | | | | Total Coal Sold and Used | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Canada | | United States | Japan | Total Sales | Amount | Value |
| | | | | | | British Columbia | Other Provinces | | | | | |
| | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | $ |
| *Fort Steele Mining Division* | | | | | | | | | | | | |
| Crows Nest Industries Ltd.—Michel Colliery (underground and strip) | 946,224 | 242,290 | 703,934 | 14,290 | 211,614 | 70,271 | 181,790 | 10,266 | 407,198 | 669,525 | 895,429 | 6,939,184 |
| *Nanaimo Mining Division* | | | | | | | | | | | | |
| Loudon No. 6 Mine | 227 | ........ | 227 | ........ | ........ | 227 | ........ | ........ | ........ | 227 | 227 | 3,277 |
| Undun No. 4 Mine | 147 | ........ | 147 | ........ | ........ | 147 | ........ | ........ | ........ | 147 | 147 | 2,085 |
| Totals | 374 | ........ | 374 | ........ | ........ | 374 | ........ | ........ | ........ | 374 | 374 | 5,362 |
| *Omineca Mining Division* | | | | | | | | | | | | |
| Bulkley Valley Collieries Ltd. and Luscar Sales Ltd. | 12,987 | ........ | 12,987 | ........ | ........ | 12,987 | ........ | ........ | ........ | 12,987 | 12,987 | 100,795 |
| Grand totals for Province | 959,585 | 242,290 | 717,295 | 14,290 | 211,614 | 83,632 | 181,790 | 10,266 | 407,198 | 682,886 | 908,790 | 7,045,341 |

## Table 9.—Principal Items of Expenditure, Reported for Operations of All Classes

| Class | Salaries and Wages | Fuel and Electricity | Process Supplies |
|---|---|---|---|
| Metal-mining | $65,294,038 | $9,310,948 | $29,161,044 |
| Exploration and development | 10,886,506 | ........ | ........ |
| Placer | 843 | ........ | ........ |
| Coal | 2,753,653 | 214,840 | 526,407 |
| Petroleum and natural gas (exploration and production) | 4,250,196 | ........ | ........ |
| Industrial minerals | 4,990,010 | 1,127,194 | 1,945,911 |
| Structural-materials industry | 6,348,249 | 2,937,777 | 2,735,494 |
| Totals, 1967 | $94,523,495 | $13,590,759 | $34,368,856 |
| Totals, 1966 | 93,409,528 | 12,283,477 | 28,120,179 |
| 1965 | 74,938,736 | 11,504,343 | 30,590,631 |
| 1964 | 63,624,559 | 10,205,861 | 27,629,953 |
| 1963 | 57,939,294 | 10,546,806 | 12,923,325 |
| 1962 | 55,522,171 | 9,505,559 | 14,024,799 |
| 1961 | 50,887,275 | 8,907,034 | 17,787,127 |
| 1960 | 52,694,818 | 7,834,728 | 21,496,912 |
| 1959 | 49,961,996 | 7,677,321 | 17,371,638 |
| 1958 | 48,933,560 | 8,080,989 | 15,053,036 |
| 1957 | 56,409,056 | 8,937,567 | 24,257,177 |
| 1956 | 57,266,026 | 9,762,777 | 22,036,839 |
| 1955 | 51,890,246 | 9,144,034 | 21,131,572 |
| 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 | 6,139,470 | 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 |

Note.—This table has changed somewhat through the years, so that the items are not everywhere directly comparable. Prior to 1962 lode-mining referred only to gold, silver, copper, lead, and zinc. Prior to 1964 some expenditures for fuel and electricity were included with process supplies. Process supplies (except fuel) were broadened in 1964 to include " process, operating, maintenance, and repair supplies . . . used in the mine/mill operations; that is, explosives, chemicals, drill steel, bits, lubricants, electrical, etc. . . . not charged to Fixed Assets Account . . . provisions and supplies sold in any company operated cafeteria or commissary." Exploration and development other than in the field of petroleum and natural gas is given, starting in 1966.

## TABLE 10.—AVERAGE NUMBER EMPLOYED IN THE MINERAL INDUSTRY, 1901–67

| Year | Placer | Lode Metals | | | | | | Coal Mines | | | Structural Materials | | Industrial Materials | Petroleum and Natural-gas Exploration and Development | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mines | | Exploration and Development | Concentrators | Smelters | Total | | | | | | | | |
| | | Under | Above | | | | | Under | Above | Total | Quarries and Pits | Plants | | | |
| 1901 | ... | 2,736 | 1,212 | ... | ... | ... | 3,948 | 3,041 | 933 | 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 | ... | ... | ... | 3,836 | 5,275 | 1,855 | 7,130 | ... | ... | ... | ... | 10,966 |
| 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 | 1,866 | 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 | 5,427 | ... | ... | ... | ... | 9,617 |
| 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 | ... | 808 | 2,461 | 7,610 | 3,757 | 1,565 | 5,322 | 493 | 324 | 124 | ... | 14,172 |
| 1927 | 415 | 2,671 | 1,916 | ... | 854 | 2,842 | 8,283 | 3,646 | 1,579 | 5,225 | 647 | 138 | 122 | ... | 14,830 |
| 1928 | 355 | 2,707 | 2,469 | ... | 911 | 2,748 | 8,835 | 3,814 | 1,520 | 5,334 | 412 | 368 | 120 | ... | 15,424 |
| 1929 | 341 | 2,926 | 2,052 | ... | 966 | 2,948 | 8,892 | 3,675 | 1,353 | 5,028 | 492 | 544 | 268 | ... | 15,565 |
| 1930 | 425 | 2,316 | 1,260 | ... | 832 | 3,197 | 7,605 | 3,389 | 1,256 | 4,645 | 843 | 344 | 170 | ... | 14,032 |
| 1931 | 688 | 1,463 | 834 | ... | 581 | 3,157 | 6,035 | 2,957 | 1,125 | 4,082 | 460 | 526 | 380 | ... | 12,171 |
| 1932 | 874 | 1,355 | 900 | ... | 542 | 2,036 | 4,833 | 2,628 | 980 | 3,608 | 536 | 329 | 344 | ... | 10,524 |
| 1933 | 1,134 | 1,786 | 1,335 | ... | 531 | 2,436 | 6,088 | 2,241 | 853 | 3,094 | 376 | 269 | 408 | ... | 11,369 |
| 1934 | 1,122 | 2,796 | 1,729 | ... | 631 | 2,890 | 8,046 | 2,050 | 843 | 2,893 | 377 | 187 | 360 | ... | 12,985 |
| 1935 | 1,291 | 2,740 | 1,497 | ... | 907 | 2,771 | 7,915 | 2,145 | 826 | 2,971 | 536 | 270 | 754 | ... | 13,737 |
| 1936 | 1,124 | 2,959 | 1,840 | ... | 720 | 2,678 | 8,197 | 2,015 | 799 | 2,814 | 931 | 288 | 825 | ... | 14,179 |
| 1937 | 1,371 | 3,603 | 1,818 | ... | 1,168 | 3,027 | 9,616 | 2,286 | 867 | 3,153 | 724 | 327 | 938 | ... | 16,129 |
| 1938 | 1,303 | 3,849 | 2,266 | ... | 919 | 3,158 | 10,192 | 2,088 | 874 | 2,962 | 900 | 295 | 869 | ... | 16,021 |
| 1939 | 1,252 | 3,905 | 2,050 | ... | 996 | 3,187 | 10,138 | 2,167 | 809 | 2,976 | 652 | 311 | 561 | ... | 15,890 |
| 1940 | 1,004 | 3,923 | 2,104 | ... | 1,048 | 2,944 | 10,019 | 2,175 | 699 | 2,874 | 827 | 334 | 647 | ... | 15,705 |
| 1941 | 939 | 3,901 | 1,823 | ... | 1,025 | 3,072 | 9,821 | 2,229 | 494 | 2,723 | 766 | 413 | 422 | ... | 15,084 |
| 1942 | 489 | 2,920 | 1,504 | ... | 960 | 3,555 | 8,939 | 1,892 | 468 | 2,360 | 842 | 378 | 262 | ... | 13,270 |
| 1943 | 212 | 2,394 | 1,699 | ... | 891 | 2,835 | 7,819 | 2,240 | 611 | 2,851 | 673 | 326 | 567 | ... | 12,448 |
| 1944 | 255 | 1,896 | 1,825 | ... | 849 | 2,981 | 7,551 | 2,150 | 689 | 2,839 | 690 | 351 | 628 | ... | 12,314 |
| 1945 | 209 | 1,933 | 1,750 | ... | 822 | 2,834 | 7,339 | 1,927 | 503 | 2,430 | 921 | 335 | 586 | ... | 11,820 |
| 1946 | 347 | 1,918 | 1,817 | ... | 672 | 2,813 | 7,220 | 1,773 | 532 | 2,305 | 827 | 555 | 679 | ... | 11,933 |
| 1947 | 360 | 3,024 | 2,238 | ... | 960 | 3,461 | 9,683 | 1,694 | 731 | 2,425 | 977 | 585 | 869 | ... | 14,899 |
| 1948 | 348 | 3,143 | 2,429 | ... | 1,126 | 3,884 | 10,582 | 1,594 | 872 | 2,466 | 1,591 | 656 | 754 | ... | 16,397 |
| 1949 | 303 | 3,034 | 2,724 | ... | 1,203 | 3,763 | 10,724 | 1,761 | 545 | 2,306 | 2,120 | 542 | 626 | ... | 16,621 |
| 1950 | 327 | 3,399 | 2,415 | ... | 1,259 | 3,759 | 10,832 | 1,745 | 516 | 2,261 | 1,916 | 616 | 660 | ... | 16,612 |
| 1951 | 205 | 3,785 | 3,695 | ... | 1,307 | 4,044 | 12,831 | 1,462 | 463 | 1,925 | 1,783 | 628 | 491 | ... | 17,863 |
| 1952 | 230 | 4,171 | 3,923 | ... | 1,516 | 4,120 | 13,730 | 1,280 | 401 | 1,681 | 1,530 | 557 | 529 | ... | 18,257 |
| 1953 | 132 | 3,145 | 2,589 | ... | 1,371 | 3,901 | 11,006 | 1,154 | 396 | 1,550 | 1,909 | 559 | 634 | ... | 15,790 |
| 1954 | 199 | 2,644 | 2,520 | ... | 1,129 | 3,119 | 9,412 | 1,076 | 358 | 1,434 | 1,861 | 638 | 584 | ... | 14,128 |
| 1955 | 103 | 2,564 | 2,553 | ... | 1,091 | 3,304 | 9,512 | 1,100 | 378 | 1,478 | 1,646 | 641 | 722 | ... | 14,102 |
| 1956 | 105 | 2,637 | 2,827 | ... | 1,043 | 3,339 | 9,846 | 968 | 398 | 1,366 | 1,598 | 770 | 854 | ... | 14,539 |
| 1957 | 67 | 2,393 | 2,447 | ... | 838 | 3,328 | 9,006 | 1,020 | 860 | 1,880 | 1,705 | 625 | 474 | ... | 13,257 |
| 1958 | 75 | 1,919 | 1,809 | ... | 625 | 3,081 | 7,434 | 826 | 260 | 1,086 | 1,483 | 677 | 446 | ... | 11,201 |
| 1959 | 99 | 1,937 | 1,761 | ... | 618 | 3,008 | 7,324 | 765 | 291 | 1,056 | 1,357 | 484 | 459 | ... | 10,779 |
| 1960 | 86 | 1,782 | 1,959 | ... | 648 | 3,034 | 7,423 | 894 | 288 | 1,182 | 1,704 | 557 | 589 | ... | 11,541 |
| 1961 | 74 | 1,785 | 1,582 | ... | 626 | 3,118 | 7,111 | 705 | 237 | 942 | 1,828 | 508 | 571 | ... | 11,034 |
| 1962 | 35 | 1,677 | 1,976 | 270 | 949 | 3,356 | 8,228 | 548 | 228 | 776 | 1,523 | 481 | 517 | ... | 11,560 |
| 1963 | 43 | 1,713 | 2,012 | 450 | 850 | 3,239 | 8,264 | 501 | 247 | 748 | 909 | 460 | 528 | ... | 10,952 |
| 1964 | 5 | 1,839 | 1,967 | 772 | 822 | 3,281 | 8,681 | 446 | 267 | 713 | 1,293 | 444 | 509 | ... | 11,645 |
| 1965 | 2 | 1,752 | 2,019 | 786 | 965 | 3,529 | 9,051 | 405 | 244 | 649 | 1,079 | 422 | 639 | 441 | 12,283 |
| 1966 | 2 | 2,006 | 2,296 | 1,894 | 1,014 | 3,654 | 10,864 | 347 | 267 | 614 | 1,269 | 393 | 582 | 478 | 14,202 |
| **1967** | ... | **1,928** | **2,532** | **1,264** | **992** | **3,435** | **10,151** | **260** | 197[1] | **457** | **1,309** | **372** | **584** | **507** | **13,380** |

[1] Commencing with 1967, does not include employment in by-product plants.

NOTE.—These figures refer only to company employees and do not include the many employees of contracting firms.

## TABLE 11A.—EMPLOYMENT AT METAL MINES, 1967

| | Tons | | Days Operating Mill | Average Number Employed[1] | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mined | Milled | | Administrative, Etc. | Mine: Surface | Mine: Underground | Mill | Others | Total |
| Aetna Investment Corporation Ltd. (Mineral King) | 111,332 | 111,332 | 365 | 4 | ...... | 51 | 9 | 20 | 84 |
| The Anaconda Co. (Canada) Ltd. (Britannia) | 628,346 | 627,868 | 260 | 89 | 70 | 260 | 39 | ...... | 458 |
| Bethlehem Copper Corporation Ltd. (including Floods Mining and Aggregate Co.) (Bethlehem) | 4,331,777 | 3,948,134 | 365 | 30 | 171 | ...... | 78 | ...... | 279 |
| Bralorne Pioneer Mines Ltd. (Bralorne) | 103,706 | 97,332 | 195 | 31 | 30 | 105 | 12 | ...... | 178 |
| British Columbia Molybdenum Ltd. (Alice) | 88,719 | 88,719 | 20 | 8 | 5 | ...... | 4 | 4 | 21 |
| Brynnor Mines Ltd. (Boss Mountain) | 469,444 | 469,444 | 365 | 41 | 76 | 66 | 26 | ...... | 209 |
| Brynnor Mines Ltd. (Kennedy Lake) | 326,283 | 187,588 | 65 | 21 | 41 | ...... | 6 | ...... | 68 |
| Canadian Exploration Ltd. (Jersey) | 490,312 | 493,029 | 365 | 58 | 29 | 122 | 14 | ...... | 223 |
| Cariboo Gold Quartz Mining Co. Ltd. (Aurum) | 6,821 | 6,821 | 105 | ...... | ...... | ...... | ...... | ...... | (2) |
| Coast Copper Co. Ltd. (Old Sport) | 290,524 | 290,524 | 365 | 33 | 38 | 124 | 10 | ...... | 205 |
| Cominco Ltd. (Bluebell) | 255,536 | 255,536 | 351 | 37 | 31 | 148 | 15 | 2 | 233 |
| Cominco Ltd. (Sullivan) | 2,118,377 | 2,456,037 | 252 | 216 | (3) | 467[3] | 127 | ...... | 810 |
| Cowichan Copper Co. Ltd. (Sunloch, Gabbro) | 151,978 | 151,978 | 240 | 18 | 6 | 53 | 22 | ...... | 99 |
| Craigmont Mines Ltd. (Craigmont) | 1,199,123 | 1,934,810 | 364 | 104 | 29 | 145 | 183 | ...... | 461 |
| Empire Development Co. Ltd. (Merry Widow, Kingfisher) | 175,078 | 175,078 | 186 | 6 | 10 | 12 | 3 | ...... | 31 |
| Endako Mines Ltd. (Endako) | 11,069,988 | 6,778,000 | 365 | 113 | 263 | ...... | 87 | ...... | 463 |
| Giant Mascot Mines Ltd. (Pride of Emory) | 338,912 | 338,912 | 253 | 31 | ...... | 96 | 21 | 27 | 175 |
| Giant Soo Mines Ltd. (Estella) | 40,250 | 40,250 | 278 | 3 | 2 | 24 | 8 | 3 | 40 |
| Granby Mining Co. Ltd. (Phoenix) | 800,350 | 713,513 | 365 | 21 | 60 | ...... | 34 | 40 | 155 |
| Granisle Copper Ltd. (Granisle) | 2,379,062 | 1,979,176 | 365 | 29 | 27 | ...... | 40 | 33 | 129 |
| Jedway Iron Ore Ltd. (Jessie, Adonis, Rose) | 871,348 | 928,412 | 365 | 26 | 86 | 10 | 18 | ...... | 140 |
| Mastodon-Highland Bell Mines Ltd. (Highland-Bell) | 38,048 | 34,020 | 310 | 9 | 4 | 30 | 13 | ...... | 56 |
| Minoca Mines Ltd. (Yreka) | 73,247 | 73,279 | 271 | 13 | 6 | 11 | 7 | ...... | 37 |
| Mt. Washington Milling Co. Ltd. (Mt. Washington) | ...... | 29,121 | ...... | ...... | ...... | ...... | ...... | ...... | (4) |
| Red Mountain Mines Ltd. (Coxey) | 160,517 | 159,711 | 326 | 11 | 4 | ...... | 24 | ...... | 39 |
| Reeves MacDonald Mines Ltd. (Reeves MacDonald) | 404,782 | 404,782 | 353 | 22 | 28 | 80 | 18 | ...... | 148 |
| Silbak Premier Mines Ltd. (Silbak Premier) | 6,694 | 6,694 | 194 | ...... | 2 | 2 | 5 | 1 | 10 |
| Texada Mines Ltd. (Texada) | 1,308,000 | 1,380,000 | 365 | 48 | 73 | 114 | 37 | ...... | 272 |
| Utica Mines Ltd. (Horn Silver) | 38,442 | 38,442 | 131 | ...... | 21 | 29 | 7 | ...... | 57 |
| Wesfrob Mines Ltd. (Tasu) | 984,003 | 984,003 | 253 | 47 | 48 | ...... | 66 | ...... | 161 |
| Western Mines Ltd. (Lynx) | 310,604 | 310,604 | 363 | 12 | 52 | 37 | 23 | ...... | 124 |
| Zeballos Iron Mines Ltd. (F.L.) | 338,779 | 372,198 | 272 | 16 | 2 | 35 | 3 | 31 | 87 |
| Total number employed | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 5,452 |

[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] Mine closed April 15, 1967. Statistics estimated as records not available.
[3] No breakdown between number of surface and underground employees.
[4] Company in receivership, records not available. Quantity milled obtained from monthly reports.

TABLE 11B.—EMPLOYMENT AT COLLIERIES, 1967

| Colliery | Average Number Employed[1] | | |
|---|---|---|---|
| | Under-ground | Above | Total |
| Bulkley Valley Collieries Ltd. and Luscar Sales Ltd. | ...... | 9 | 9 |
| Crows Nest Industries Ltd.—Michel Colliery | 258 | 188 | 446 |
| Loudon No. 6 | 1 | ...... | 1 |
| Undun No. 4 | 1 | ...... | 1 |
| Totals | 260 | 197 | 457 |

[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.

## Table 12.—Metal Production in 1967

| Property or Mine | Location of Mine | See Page | Owner or Agent | Ore Shipped or Treated | Product Shipped | Gross Metal Contents | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Gold | Silver | Copper | Lead | Zinc | Cadmium |
| | | | | Tons | | Oz. | Oz. | Lb. | Lb. | Lb. | Lb. |
| *Alberni Mining Division* | | | | | | | | | | | |
| Brynnor Mine | Kennedy Lake | 75 | Brynnor Mines Ltd., Kennedy Lake Division | 187,588 | Iron concentrates, 137,229 tons | | | | | | |
| F.L. | Zeballos | 73 | Zeballos Iron Mines Ltd. | 372,198 | Iron concentrates, 245,806 tons | | | | | | |
| Lynx Mine | Buttle Lake | 77 | Western Mines Ltd. | 310,604 | Copper concentrates, 18,683 tons; zinc concentrates, 23,563 tons; lead-zinc concentrates, 1,815 tons | 10,902 | 410,301 | 8,967,376 | 3,937,898 | 32,032,048 | 119,789 |
| *Atlin Mining Division* | | | | | | | | | | | |
| *Nil* | | | | | | | | | | | |
| *Cariboo Mining Division* | | | | | | | | | | | |
| Aurum | Wells | 121 | The Cariboo Gold Quartz Mining Co. Ltd. | 6,821 | Bullion | 5,481 | 960 | | | | |
| Boss Mountain Mine | Big Timothy Mountain | 125 | Brynnor Mines Ltd., Boss Mountain Division | 469,444 | Molybdenite concentrates, 2,705 tons containing 3,106,460 lb. of molybdenum | | | | | | |
| *Clinton Mining Division* | | | | | | | | | | | |
| *Nil* | | | | | | | | | | | |
| *Fort Steele Mining Division* | | | | | | | | | | | |
| Estella Mine | Wasa | 272 | Giant Soo Mines Ltd. | 40,250 | Lead concentrates, 2,489 tons; zinc concentrates, 5,316 tons | 28 | 73,079 | 2,641 | 3,350,330 | 5,705,358 | 15,985 |
| Sullivan Mine | Kimberley | 270 | Cominco Ltd. | 2,456,037 | Lead concentrates, 113,317 tons; zinc concentrates, 126,053 tons; tin concentrates, 251 tons containing 437,804 lb. of tin; iron sinter, 172,413 tons | 134 | 3,062,720 | 291,200 | 164,766,000 | 133,838,000 | 255,297 |
| *Golden Mining Division* | | | | | | | | | | | |
| Mineral King Mine | Windermere | 267 | Aetna Investment Corporation Ltd. | 111,332 | Lead concentrates, 2,831 tons; zinc concentrates, 6,894 tons | | 52,312 | 48,971 | 3,599,541 | 7,658,086 | 31,985 |
| *Greenwood Mining Division* | | | | | | | | | | | |
| Barnato | Kettle River | 225 | Amcana Gold Mine Ltd. | 21 | Crude ore | 7 | | | | | |
| Highland-Bell Mine | Beaverdell | 223 | Mastodon-Highland Bell Mines Ltd. | 34,020 | Lead concentrates, 3,153 tons; zinc concentrates, 494 tons; jig concentrates, 247 tons | 780 | 713,911 | | 1,003,546 | 930,431 | 4,778 |
| Marshall | Phoenix | 228 | P. Gouthro and J. W. MacLean, Jr., Greenwood | 97 | Crude ore | 107 | 68 | | 359 | 371 | |
| Phoenix Mine | Phoenix | 227 | The Granby Mining Co. Ltd., Phoenix Copper Division | 713,513 | Copper concentrates, 19,170 tons | 13,892 | 113,096 | 10,156,659 | | | |

| | | | | Tons | | Oz. | Oz. | Lb. | Lb. | Lb. | Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Kamloops Mining Division* | | | | | | | | | | | |
| Bethlehem Mine | Highland Valley | 153 | Bethlehem Copper Corporation Ltd. | 3,948,134 | Copper concentrates, 62,383 tons | 1,627 | 153,222 | 40,123,750 | | | |
| *Liard Mining Division* | | | | | | | | | | | |
| *Nil* | | | | | | | | | | | |
| *Lillooet Mining Division* | | | | | | | | | | | |
| Bralorne Mine | Bridge River | 129 | Bralorne Pioneer Mines Ltd. | 97,332 | Bullion | 48,711 | 8,652 | | | | |
| Eagle | Yalakom River | | Lillooet Mercury Mines Ltd. | 125 | Mercury, 380 lb. | | | | | | |
| *Nanaimo Mining Division* | | | | | | | | | | | |
| Copper Road | Quadra Island | 72 | Ribco Leasing Ltd. | 563 | Crude ore | 5 | 304 | 36,450 | | | |
| Mount Washington Mine | Courtenay | 72 | Mount Washington Milling Co. Ltd. | 10,665 | Copper concentrates, 1,568 tons | 418 | 16,121 | 567,732 | | | |
| Merry Widow and Kingfisher | Quatsino-Port Hardy | 70 | Empire Development Co. Ltd. | 175,078 | Iron concentrates, 90,407 tons | | | | | | |
| Old Sport | Quatsino-Port Hardy | 71 | Coast Copper Co. Ltd. | 290,524 | Copper concentrates, 11,626 tons; iron concentrates, 102,226 tons | 15,322 | 37,115 | 7,654,858 | | | |
| Texada Mine | Texada Island | 72 | Texada Mines Ltd. | 1,380,000 | Iron concentrates, 762,102 tons; copper concentrates, 6,088 tons | 1,228 | 33,154 | 2,656,434 | | | |
| Yreka | Quatsino-Port Hardy | 70 | Minoca Mines Ltd. | 73,279 | Copper concentrates, 8,037 tons | 641 | 57,947 | 3,540,636 | | | |
| *Nelson Mining Division* | | | | | | | | | | | |
| Gold Belt | Salmo, Sheep Creek | 245 | A. Endersby, Fruitvale | 100 | Crude ore | 43 | 16 | | 200 | 315 | |
| Jersey | Salmo, Iron Mountain | 245 | Canadian Exploration Ltd. | 493,029 | Lead concentrates, 5,724 tons; zinc concentrates, 15,121 tons | | 35,275 | | 9,002,461 | 18,013,821 | 149,582 |
| Kootenay Belle | Salmo | 245 | W. D. Tames, Nelson | 281 | Crude ore | 10 | 42 | | 698 | 562 | |
| New Arlington | Salmo, Erie Creek | 244 | G. D. Fox, Trail | 7,325 | Crude ore | 851 | 3,241 | | 61,605 | 79,813 | |
| Reeves MacDonald Mine | Nelway | 247 | Reeves MacDonald Mines Ltd. | 404,782 | Lead concentrates, 4,997 tons; zinc concentrates, 20,924 tons | | 65,253 | 19,668 | 5,535,662 | 22,917,119 | 159,460 |
| Silver Dollar | Salmo, Erie Creek | 244 | D. H. Norcross, Nelson | 446 | Crude ore | 215 | 9,920 | | 15,856 | 16,152 | |
| Yosemite | Salmo | 245 | W. D. Tames, Nelson | 3,160 | Crude ore | 259 | 401 | | 7,158 | 6,318 | |
| *New Westminster Mining Division* | | | | | | | | | | | |
| Pride of Emory | Hope | 63 | Giant Mascot Mines Ltd. | 338,912 | Nickel-copper concentrates, 22,777 tons; nickel content, 4,750,957 lb. | | | 1,974,527 | | | |

TABLE 12.—METAL PRODUCTION IN 1967—*Continued*

| Property or Mine | Location of Mine | See Page | Owner or Agent | Ore Shipped or Treated | Product Shipped | Gross Metal Contents | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Gold | Silver | Copper | Lead | Zinc | Cadmium |
| | | | | Tons | | Oz. | Oz. | Lb. | Lb. | Lb. | Lb. |
| *Nicola Mining Division* | | | | | | | | | | | |
| Craigmont Mine | Merritt | 163 | Craigmont Mines Ltd. | 1,934,810 | Copper concentrates, 106,634 tons | | | 59,798,408 | | | |
| Law, Len | Merritt | 166 | Copper Hill Mining & Exploration Ltd. | 73 | Crude ore | 6 | 681 | | 2,041 | | |
| Mary Reynolds | Stump Lake | | D. Faulkner, Merritt | 19 | Crude ore | 1 | 191 | | 383 | 307 | |
| *Omineca Mining Division* | | | | | | | | | | | |
| Cronin Mine | Smithers | 89 | New Cronin Babine Mines Ltd. | 750 | Lead concentrates, 56 tons; zinc concentrates, 84 tons | 6 | 4,675 | | 74,064 | 104,770 | 1,091 |
| Emerald Glacier Mine | Tahtsa Lake | 110 | Emerald Glacier Mines Ltd. | 2,001 | Lead concentrates, 129 tons; zinc concentrates, 356 tons | 7 | 9,604 | 4,930 | 201,567 | 348,992 | 1,393 |
| Endako Mine | Endako | 114 | Endako Mines Ltd. | 6,773,000 | Molybdenite concentrates, 7,770 tons; molybdenum trioxide, 4,820 tons. Total content, 13,716,016 lb. of molybdenum | | | | | | |
| Granisle Mine | Babine Lake | 104 | Granisle Copper Ltd. | 1,979,176 | Copper concentrates, 36,064 tons | 15,820 | 157,403 | 23,953,000 | | | |
| Lucky Luke | Usk | | Lucky Luke Mining Co. Ltd. | 3 | Crude ore | 3 | 108 | 2,552 | | | |
| Silver Standard | Hazelton | 84 | Northwestern Midland Development Co. Ltd. | 402 | Lead concentrates, 37 tons; lead ore, 117 tons; crude, ore, 80 tons | 32 | 16,415 | | 36,903 | 30,855 | |
| *Osoyoos Mining Division* | | | | | | | | | | | |
| Horn Silver Mine | Keremeos | 219 | Utica Mines Ltd. | 38,442 | Silver concentrates, 1,254 tons | 892 | 422,158 | | 79,218 | 95,074 | |
| *Revelstoke Mining Division* | | | | | | | | | | | |
| Stannite | Albert Canyon | 263 | Stannex Minerals Ltd. | 36 | Crude ore | | 1,248 | | 31,524 | 6,205 | |
| *Similkameen Mining Division* | | | | | | | | | | | |
| *Nil* | | | | | | | | | | | |
| *Skeena Mining Division* | | | | | | | | | | | |
| Alice | Alice Arm | 47 | British Columbia Molybdenum Ltd. | 88,719 | Molybdenite concentrates, 15 tons containing 16,249 lb. of molybdenum | | | | | | |
| Jessie, Adonis, Rose | Moresby Island | 57 | Jedway Iron Ore Ltd. | 928,412 | Iron concentrates, 417,852 tons | | | | | | |
| Silbak Premier Mine | Stewart | 34 | Silbak Premier Mines Ltd. | 6,694 | Gold-silver concentrates and precipitates, 276 tons | 3,589 | 82,898 | | 47,415 | 61,123 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tasu | Tasu Harbour | 54 | Wesfrob Mines Ltd. | Tons<br>984,003 | Iron concentrates, 226,408 tons; copper concentrates, 3,099 tons | Oz.<br>752 | Oz.<br>19,360 | Lb.<br>1,223,857 | Lb. | Lb. | Lb. |
| *Slocan Mining Division* | | | | | | | | | | | |
| Antoine | Sandon | 253 | Antoine Silver Mines Ltd. | 25 | Crude ore | | 4,254 | | 28,891 | 6,235 | |
| Bluebell Mine | Riondel | 259 | Cominco Ltd. | 255,536 | Lead concentrates, 15,409 tons; zinc concentrates, 27,957 tons | | 314,760 | 377,000 | 22,196,400 | 28,341,600 | 131,876 |
| Caledonia | Retallack-Three Forks | 254 | Blue Star Mines Ltd. | 3,800 | Lead concentrates, 151 tons; zinc concentrates, 239 tons | 11 | 15,012 | | 258,826 | 260,432 | 975 |
| Colorado | Slocan | 250 | Western Standard Silver Mines Ltd. | 23 | Crude ore | | 279 | | 231 | 646 | |
| Dublin Queen | Kaslo | 254 | P. Kabatoff, Winlaw | 32 | Crude ore | | 2,166 | | 22,915 | 14,847 | |
| Freddy | Silverton | 252 | V. Hansen, New Denver | 30 | Crude ore | 3 | 1,013 | | 303 | 243 | |
| Hewitt, Lorna Doone | Silverton | 251 | A. K. Lotze, Colville, Wash. | 5 | Crude ore | | 136 | | 730 | 484 | |
| Joyce | Silverton | 249 | J. Nesbitt, Silverton | 10 | Crude ore | 2 | 305 | | 39 | 20 | |
| Meteor | Slocan | 249 | C. Thickett and J. C. McWhirter, Slocan | 116 | Crude ore | 11 | 1,999 | | 372 | 372 | |
| Ottawa | Springer Creek | 250 | Brimont Mining Ltd. | 1,612 | Crude ore | | 24,256 | | | | |
| R.F.G. | Ainsworth | 256 | E. Savage, Nakusp | 19 | Crude ore | | 173 | | 3,893 | 944 | |
| Silver Hoard | Ainsworth | 256 | S. L. McLellan, Ainsworth | 14 | Crude ore | | 302 | | 873 | 1,914 | |
| Victor | Sandon | 252 | E. H. Peterson and E. Perepolkin | 52 | Crude ore | 11 | 5,238 | | 67,801 | 2,225 | |
| Wetwater | Woodbury Creek | | W. Turley, Nelson | 2 | Crude ore | | 12 | | 712 | 125 | |
| Winona | Retallack-Three Forks | 254 | Hilroy Mines Ltd. | 2 | Crude ore | | 142 | | 1,951 | 650 | |
| *Trail Creek Mining Division* | | | | | | | | | | | |
| Coxey | Rossland | 239 | Red Mountain Mines Ltd. | 159,711 | Molybdenite concentrates, 656 tons containing 678,818 lb. of molybdenum | | | | | | |
| I.X.L. | Rossland | 235 | J. A. Ruelle, Rossland | .08 | High-grade ore | 13 | 2 | | | | |
| *Vancouver Mining Division* | | | | | | | | | | | |
| Britannia Mine | Howe Sound | 61 | The Anaconda Co. (Canada) Ltd. | 627,868 | Copper concentrates, 21,335 tons; zinc concentrates, 757 tons | 3,128 | 45,733 | 12,672,879 | 17,328 | 810,549 | 4,522 |
| *Vernon Mining Division* | | | | | | | | | | | |
| Waterloo No. 3 | Lightning Peak | 223 | D. Pearce, Nelson | Clean-up | Lead concentrates, 2 tons; zinc concentrates, 42 tons | | 1,914 | | 4,929 | 49,375 | 271 |
| *Victoria Mining Division* | | | | | | | | | | | |
| Sunloch, Gabbro | Jordan River | 78 | Cowichan Copper Co. Ltd. | 151,978 | Copper concentrates, 5,876 tons | 460 | 3,290 | 3,000,000 | | | |

# Departmental Work

## RETIREMENTS

**Robert B. Bonar** retired as Deputy Chief Inspector of Mines on July 31, 1967. Mr. Bonar was born in Glasgow, Scotland, and immigrated to Canada in 1910. He received his early education on Vancouver Island and later attended the Tri-State College of Engineering in Indiana, where he graduated with a degree of B.Sc. in civil engineering. He holds a first-class certificate of competency and a mine surveyor's certificate in coal-mining. He joined the Department as Inspector and Resident Engineer at Cumberland in June, 1941, after some years as mine foreman at Michel Colliery, Michel, and mine manager at Canadian Collieries (Dunsmuir), Cumberland. He served as Inspector and Resident Engineer at Fernie before moving to the headquarters office in Victoria in 1956. He is a member of the Association of Professional Enginers of British Columbia and the Canadian Institute of Mining and Metallurgy.

**E. R. Hughes** retired as Senior Inspector of Mines on August 31, 1967. Mr. Hughes was born in Wales and educated in Yorkshire, England. After employment in Yorkshire Collieries he came to Canada in 1928, where he worked in coal mines in Saskatchewan, Alberta, and at Telkwa, Cumberland, and Nanaimo in British Columbia and at the Hidden Creek copper mine at Anyox. He was appointed Inspector of Mines and Resident Engineer at Cumberland in 1938. He was transferred to Princeton in 1941 and was moved to the Victoria office in 1956 as Senior Inspector in charge of administering the Department's road and trail programme and the grubstaking of prospectors. He holds a first-class certificate of competency in coal-mining and is a member of the Canadian Institute of Mining and Metallurgy and the Association of Professional Engineers of British Columbia. He served with the R.A.S.C. in the Army of Occupation in Turkey after the First World War.

## ORGANIZATION

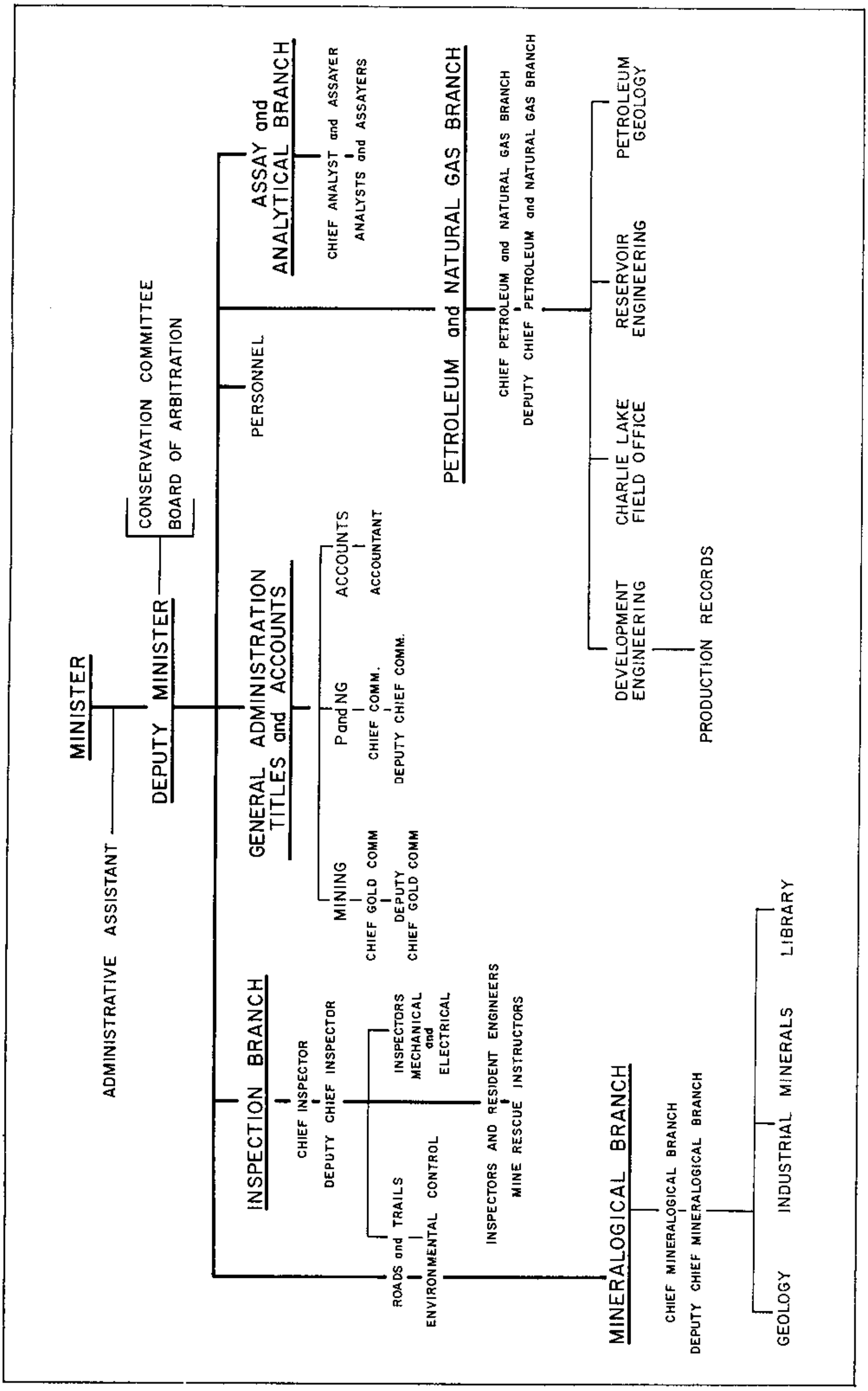
The organization of the Department of Mines and Petroleum Resources is displayed in the diagram on page A 57.

## ADMINISTRATION BRANCH

The Administration Branch is responsible for the administration of the Provincial laws regarding the acquisition of rights to mineral and 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 *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


MINISTER
ADMINISTRATIVE ASSISTANT
DEPUTY MINISTER
CONSERVATION COMMITTEE
BOARD OF ARBITRATION
ASSAY and ANALYTICAL BRANCH
CHIEF ANALYST and ASSAYER
ANALYSTS and ASSAYERS
PERSONNEL
PETROLEUM and NATURAL GAS BRANCH
CHIEF PETROLEUM and NATURAL GAS BRANCH
DEPUTY CHIEF PETROLEUM and NATURAL GAS BRANCH
PETROLEUM GEOLOGY
RESERVOIR ENGINEERING
CHARLIE LAKE FIELD OFFICE
DEVELOPMENT ENGINEERING
PRODUCTION RECORDS
GENERAL ADMINISTRATION TITLES and ACCOUNTS
ACCOUNTS
ACCOUNTANT
P and NG
CHIEF COMM.
DEPUTY CHIEF COMM.
MINING
CHIEF GOLD COMM
DEPUTY CHIEF GOLD COMM
INSPECTION BRANCH
CHIEF INSPECTOR
DEPUTY CHIEF INSPECTOR
INSPECTORS MECHANICAL and ELECTRICAL
INSPECTORS AND RESIDENT ENGINEERS
MINE RESCUE INSTRUCTORS
ROADS and TRAILS
ENVIRONMENTAL CONTROL
MINERALOGICAL BRANCH
CHIEF MINERALOGICAL BRANCH
DEPUTY CHIEF MINERALOGICAL BRANCH
GEOLOGY
INDUSTRIAL MINERALS
LIBRARY

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 320, 890 West Pender Street, Vancouver 1. 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 below.

## Central Records Offices (Victoria and Vancouver)

Transcripts of all recordings 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 surveyed 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 320, 890 West Pender Street. The approximate position of mineral claims held by record and of placer-mining leases are plotted from details supplied by locators.

During 1967, 14 investigations were carried out pursuant to section 80 of the *Mineral Act*. Two investigations with regard to certificates of work being wrongfully or improperly obtained resulted in 36 certificates of work being cancelled. Twelve investigations with regard to mineral claims having been located or recorded otherwise than in accordance with the *Mineral Act* resulted in 99 mineral claims being cancelled.

## List of Gold Commissioners and Mining Recorders

| Mining Division | Location of Office | Gold Commissioner | Mining Recorder |
|---|---|---|---|
| Alberni | Alberni | T. G. O'Neill | T. G. O'Neill. |
| Atlin | Atlin | D. P. Lancaster | D. P. Lancaster. |
| Cariboo | Quesnel | F. E. P. Hughes | F. E. P. Hughes. |
| Clinton | Clinton | R. H. Archibald | R. H. Archibald. |
| Fort Steele | Cranbrook | B. J. H. Ryley | B. J. H. Ryley. |
| Golden | Golden | W. G. Mundell | W. G. Mundell. |
| Greenwood | Grand Forks | R. Macgregor | R. Macgregor. |
| Kamloops | Kamloops | F. J. Sell | F. J. Sell. |
| Liard | Victoria | E. J. Bowles | E. A. H. Mitchell (Deputy). |
| Lillooet | Lillooet | J. A. Baker | J. A. Baker. |
| Nanaimo | Nanaimo | E. B. Offin | E. B. Offin. |
| Nelson | Nelson | G. L. Brodie | G. L. Brodie. |
| New Westminster | New Westminster | J. F. McDonald | E. W. Pedersen. |
| Nicola | Merritt | T. S. Dobson | T. S. Dobson. |
| Omineca | Smithers | G. H. Beley | G. H. Beley. |
| Osoyoos | Penticton | T. S. Dalby | T. S. Dalby. |
| Revelstoke | Revelstoke | D. V. Drew | D. V. Drew. |
| Similkameen | Princeton | B. Kennelly | B. Kennelly. |
| Skeena | Prince Rupert | T. H. W. Harding | T. H. W. Harding. |
| Slocan | Kaslo | T. P. McKinnon | T. P. McKinnon. |
| Trail Creek | Rossland | W. L. Draper | W. L. Draper. |
| Vancouver | Vancouver | J. Egdell | Mrs. S. Jeannotte (Deputy). |
| Vernon | Vernon | W. T. McGruder | W. T. McGruder. |
| Victoria | Victoria | E. J. Bowles | E. A. H. Mitchell (Deputy). |

## GOLD COMMISSIONERS' AND MINING RECORDERS' OFFICE STATISTICS, 1967

| Mining Division | Free Miners' Certificates | | Lode-mining | | | | | | Placer-mining | | | | | Revenue | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Individual | Company | Mineral Claims | Certificates of Work | Cash in Lieu | Certificates of Improvements | Bills of Sale, Etc. | Leases | Placer Claims | Leases | Certificates of Work | Cash in Lieu | Bills of Sale, Etc. | Free Miners' Certificates | Mining Receipts | Total |
| Alberni | 106 | 2 | 709 | 1,055 | $6,400.00 | ...... | 54 | 2 | 1 | 12 | ...... | $250.00 | 12 | $830.00 | $21,380.00 | $22,210.00 |
| Atlin | 163 | 4 | 752 | 286 | 8,900.00 | ...... | 27 | 1 | 1 | 19 | 32 | 7,025.00 | 12 | 1,315.00 | 11,826.00 | 13,141.00 |
| Cariboo | 1,223 | 10 | 4,087 | 3,533 | 6,900.00 | ...... | 193 | 2 | 7 | 108 | 255 | 3,750.00 | 193 | 7,779.00 | 72,211.75 | 79,990.75 |
| Clinton | 79 | ...... | 1,840 | 2,076 | 1,200.00 | ...... | 70 | 1 | ...... | 25 | 37 | ...... | 61 | 395.00 | 23,841.75 | 24,236.75 |
| Fort Steele | 122 | 4 | 1,187 | 2,126 | 4,912.00 | ...... | 77 | 5 | ...... | 8 | 22 | 750.00 | 15 | 1,110.00 | 23,781.00 | 24,891.00 |
| Golden | 67 | 5 | 1,482 | 1,421 | 2,400.00 | ...... | 112 | 2 | ...... | 17 | 22 | ...... | 39 | 835.00 | 22,485.25 | 23,320.25 |
| Greenwood | 147 | 6 | 1,815 | 2,513 | 3,516.00 | ...... | 132 | 39 | ...... | 3 | 13 | ...... | 1 | 1,835.00 | 34,909.50 | 36,744.50 |
| Kamloops | 237 | 10 | 5,046 | 8,410 | 9,800.00 | ...... | 350 | 3 | ...... | 5 | 19 | ...... | 10 | 2,785.00 | 89,426.25 | 92,211.25 |
| Liard | 304 | 3 | 3,222 | 5,244 | 31,202.50 | ...... | 238 | ...... | ...... | 14 | 39 | 250.00 | 27 | 2,022.00 | 80,501.50 | 82,523.50 |
| Lillooet | 179 | 2 | 591 | 1,737 | 2,800.00 | ...... | 60 | 3 | ...... | 15 | 43 | 250.00 | 16 | 1,196.00 | 18,641.50 | 19,837.50 |
| Nanaimo | 147 | 2 | 3,068 | 989 | 3,336.00 | ...... | 104 | | ...... | ...... | ...... | ...... | ...... | 1,135.00 | 21,848.00 | 22,983.00 |
| Nelson | 387 | 10 | 962 | 787 | 800.00 | ...... | 83 | 24 | ...... | 1 | 24 | 250.00 | 12 | 3,536.00 | 15,798.50 | 19,334.50 |
| New Westminster | 409 | 10 | 1,593 | 3,019 | 8,200.00 | ...... | 130 | 5 | 4 | 87 | 18 | 750.00 | 7 | 4,414.00 | 40,737.00 | 45,151.00 |
| Nicola | 118 | 9 | 2,773 | 4,906 | 6,000.00 | ...... | 278 | 4 | ...... | ...... | 2 | ...... | ...... | 2,390.00 | 52,210.00 | 54,600.00 |
| Omineca | 542 | 8 | 9,799 | 12,530 | 28,700.00 | 98 | 459 | 15 | ...... | 12 | 68 | 1,250.00 | 44 | 4,011.00 | 167,739.25 | 171,750.25 |
| Osoyoos | 261 | 11 | 2,976 | 3,612 | 8,100.00 | ...... | 209 | 10 | ...... | ...... | ...... | ...... | ...... | 3,207.00 | 51,156.50 | 54,363.50 |
| Revelstoke | 85 | 6 | 1,363 | 982 | 3,400.00 | ...... | 25 | 1 | ...... | ...... | 16 | ...... | ...... | 1,625.00 | 20,555.25 | 22,180.25 |
| Similkameen | 259 | 7 | 2,315 | 3,677 | 6,500.00 | ...... | 167 | 2 | ...... | 69 | 170 | 5,750.00 | 159 | 2,497.00 | 59,857.75 | 62,354.75 |
| Skeena | 148 | 1 | 1,922 | 5,521 | 20,816.00 | ...... | 158 | 54 | ...... | 7 | ...... | ...... | ...... | 840.00 | 29,725.99 | 30,565.99 |
| Slocan | 186 | 6 | 924 | 1,937 | 4,444.00 | ...... | 177 | 46 | ...... | ...... | 3 | ...... | 4 | 1,945.00 | 25,136.00 | 27,081.00 |
| Trail Creek | 113 | 4 | 402 | 285 | 236.00 | ...... | 21 | 9 | ...... | ...... | ...... | ...... | ...... | 1,365.00 | 7,056.75 | 8,421.75 |
| Vancouver | 2,831 | 536 | 1,428 | 1,412 | 7,500.00 | ...... | 85 | 7 | ...... | 2 | 1 | ...... | 6 | 114,510.00 | 35,270.09 | 149,780.09 |
| Vernon | 294 | 3 | 680 | 591 | 100.00 | ...... | 64 | 6 | 1 | 10 | 25 | ...... | 11 | 1,871.00 | 9,740.50 | 11,611.50 |
| Victoria | 373 | 58 | 342 | 261 | 800.00 | ...... | 45 | 3 | ...... | 6 | 4 | ...... | 1 | 12,468.00 | 5,602.00 | 18,070.00 |
| Totals for 1967 | 8,780 | 717 | 51,278 | 68,910 | $176,962.50 | 98 | 3,318 | 244 | 14 | 420 | 813 | $20,275.00 | 630 | $175,916.00 | $941,438.08 | $1,117,354.08 |
| Totals for 1966 | 10,086 | 746 | 91,703 | 56,138 | $175,732.00 | 77 | 3,776 | 275 | 12 | 428 | 758 | $12,600.00 | 586 | $186,636.00 | $1,173,244.30 | $1,359,880.30 |

## Coal

Information concerning the ownership and standing of coal licences and coal leases may be obtained upon application to the office of the Chief Gold Commissioner, Department of Mines and Petroleum Resources, Victoria. Maps showing location of coal licences and coal leases are also available upon application and payment of the required fee.

*Coal Revenue, 1967*

| | |
|---|---|
| Licences— | |
| Fees | $7,650.00 |
| Rental | 15,868.45 |
| Total | $23,518.45 |

## Petroleum and Natural Gas

The Administration Branch is responsible for the administration of the *Petroleum and Natural Gas Act* and the collecting of revenue from fees, rents, dispositions, and royalties. Information concerning all forms of title issued under the *Petroleum and Natural Gas Act* may be obtained upon application to the office of the Chief Commissioner, Department of Mines and Petroleum Resources, Victoria. Maps showing the locations of all forms of title issued under the *Petroleum and Natural Gas Act* are available, and copies may be obtained upon application to the office of the Department of Mines and Petroleum Resources, Victoria. Monthly land reports and monthly reports listing additions and revisions to permit-location maps and 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 the required fee.

During the year there were four dispositions of Crown reserve petroleum and natural-gas rights resulting in tender bonus bids of $14,297,815.64.

As at December 31, 1967, 34,822,715 acres, or approximately 54,410 square miles, of Crown petroleum and natural-gas rights, issued under the *Petroleum and Natural Gas Act,* were held in good standing by operators ranging from small independent companies to major international ones. The form of title held, total number issued, and acreage in each case were as follows:—

| Form of Title | Number | Acreage |
|---|---|---|
| Permits | 346 | 23,214,363 |
| Natural-gas licences | ------ | ------ |
| Drilling reservations | 38 | 462,138 |
| Leases (all types) | 4,056 | 11,146,214 |
| Total | | 34,822,715 |

*Petroleum and Natural-gas Revenue, 1967*

| | | |
|---|---|---|
| Rentals and fees— | | |
| Permits | $1,369,232.18 | |
| Drilling reservations | 86,303.30 | |
| Natural-gas licences | ------ | |
| Petroleum, natural-gas, and petroleum and natural-gas leases | 8,901,195.69 | |
| Total rentals and fees | | $10,356,731.17 |

| | | |
|---|---|---|
| Disposal of Crown reserves— | | |
| Permits | $8,428,408.91 | |
| Drilling reservations | 3,013,978.50 | |
| Leases | 2,855,428.23 | |
| Total Crown reserves disposal | | $14,297,815.64 |
| Royalties— | | |
| Gas | $2,870,655.93 | |
| Oil | 6,678,244.53 | |
| Processed products | 58,536.56 | |
| Total royalties | | 9,607,437.02 |
| Miscellaneous fees | | 17,916.73 |
| Total petroleum and natural-gas revenues | | $34,279,900.56 |

## ANALYTICAL AND ASSAY BRANCH

### Staff

S. W. Metcalfe ........ Chief Analyst and Assayer
N. G. Colvin ........ Analyst
R. J. Hibberson ........ Analyst
R. S. Young ........ Analyst
F. F. Karpick ........ Assayer

### Samples

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. A form for use in applying for free assays may be obtained from the office of any Mining Recorder.

During 1967 the chemical laboratory in Victoria issued reports on 2,402 samples from prospectors and Departmental engineers. A laboratory examination of a prospector's samples generally consist 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 in the table below.

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

| | Samples | Spectrographic Analyses | Assays |
|---|---|---|---|
| Prospectors (not grantees) | 2,017 | 1,947 | 5,337 |
| Prospectors (grantees) | 165 | 164 | 410 |
| Departmental Engineers | 220 | 96[1] | 546 |
| Totals | 2,402 | 2,207 | 6,293 |

[1] An additional 124 spectrographic analyses were done for Departmental engineers but the results were not reported.

Samples submitted to the laboratory for identification are examined by the Mineralogical Branch of the Department. During the year 56 such samples were examined.

Reports were issued on 48 petroleum and natural-gas samples. Of this number, 27 were samples of formation waters from wells being drilled for gas and oil in the Province and 15 were natural-gas samples of the same origin, three were suspected gas seeps, and two were suspected oil seeps. In addition, a sample suspected to be asphalt was examined and found to be excretion of a pack rat.

Reports were issued on 81 samples of coal submitted by the Purchasing Commission for proximate analyses and calorific values.

Reports were issued on 458 samples of a miscellaneous nature. Six hundred and eighty-nine assays and 32 spectrographic analyses were reported in this category; an additional spectrographic analysis was not reported.

For the Minister of Mines and Petroleum Resources, three samples of ore were assayed.

For the Minister of Lands, Forests, and Water Resources, one sample of ore was assayed.

For the Inspection Branch of the Department of Mines and Petroleum Resources, the fuel-oil content of three samples of AN/FO was determined.

For the Field Crops Branch of the Department of Agriculture, one marl sample was analysed for its content of calcium and magnesium oxides, and a sample of soil was spectrographed.

For the Purchasing Commission, the water contents of three samples of liquid soap were determined.

For the Fish and Game Branch of the Department of Recreation and Conservation, a white material near a coal pile was examined and found to be aluminium sulphate.

For the Materials Testing Branch of the Department of Highways, 39 water samples were analysed; brown particles in a sample of water were spectrographed and found to contain iron as the major constituent; a white powder in the Centennial Fountain was examined and found to be calcium carbonate; scum on a water sample and 18 samples of clay were spectrographed.

For the Forest Research Branch of the Department of Lands, Forests, and Water Resources, a rock sample was spectrographed and its potassium content determined.

For Ocean Cement Limited, two samples of slag and two of cement were spectrographed.

For the Smoke Inspector of the City of Victoria, determination was made of the weight of residues collected in 356 bottles of water placed in various locations in the city; for the City Engineer, the specific gravity of seven samples of sea water was determined, and 12 samples of sea water were examined for their fluorescein content.

For citizens of the Province, one sample of natural gas was analysed; a sediment in water was spectrographed, one ore sample was assayed, one coal sample was analysed, one alloy was spectrographed, and a yellow stain on a rock, believed to be due either to uranium or vanadium, was examined and found to be a lichen.

### X-ray Powder Diffraction Analyses

Seventy-three analyses of this type were performed for identification purposes.

### Examinations for Assayers

The Provincial Government examinations for certificates of efficiency were held in May and December. As a result of the May examination, five candidates passed, two were granted supplementals, and four failed. In the December examination nine candidates were examined, of whom two passed, four were granted supplementals, and three failed.

## INSPECTION BRANCH

### Organization and Staff

*Inspectors and Resident Engineers*

| | |
|---|---|
| J. W. Peck, Chief Inspector | Victoria |
| J. E. Merrett, Deputy Chief Inspector of Mines | Victoria |
| L. Wardman, Senior Inspector, Electrical-Mechanical | Victoria |
| D. R. Morgan, Senior Inspector, Mining Roads | Victoria |
| V. E. Dawson, Inspector, Mechanical | Victoria |
| [redacted], Senior Inspector, Environmental Control | Vancouver |
| S. Elias, Inspector, Environmental Control | Vancouver |
| A. R. C. James, Inspector and Resident Engineer | Vancouver |
| W. C. Robinson, Inspector and Resident Engineer | Vancouver |
| David Smith, Inspector and Resident Engineer | Kamloops |
| [redacted]d, Inspector and Resident Engineer | Kamloops |
| P. E. Olson, Inspector and Resident Engineer | Nelson |
| Harry Bapty, Inspector and Resident Engineer | Prince Rupert |
| W. G. Clarke, Inspector and Resident Engineer | Prince George |

An inspection office is maintained at Cranbrook, but at the end of 1967 this appointment was vacant. Inspectors are stationed at the places listed above and inspect coal mines and other mines and quarries in the districts shown on the accompanying Figure 1. They also examine prospects, mining properties, roads and trails, and carry out special investigations under the *Mineral Act*. The Environmental Control Inspectors conduct dust, ventilation, and noise surveys at all mines and quarries, and where necessary make recommendations to improve environmental conditions. D. R. Morgan supervises the roads and trails programme and prospectors' grub-stakes.

*Instructors, Mine-rescue Stations*

| | |
|---|---|
| Arthur Williams | Fernie Station |
| W. H. Childress | Nanaimo Station |
| T. H. Robertson | Kamloops Station |
| G. J. Lee | Nelson Station |

*Staff Changes*

J. E. Merrett was transferred from Vancouver to Victoria to replace R. B. Bonar on his retirement at the end of July. D. R. Morgan was transferred from Cranbrook to Victoria to replace E. R. Hughes on his retirement at the end of August. W. C. Robinson was transferred from Victoria to Vancouver to replace J. E. Merrett. His position, that of a special investigator and claims inspector under the *Mineral Act*, was cancelled. On December 12, 1967, R. J. Craig died, and in February, 1968, S. Elias was appointed to his position.

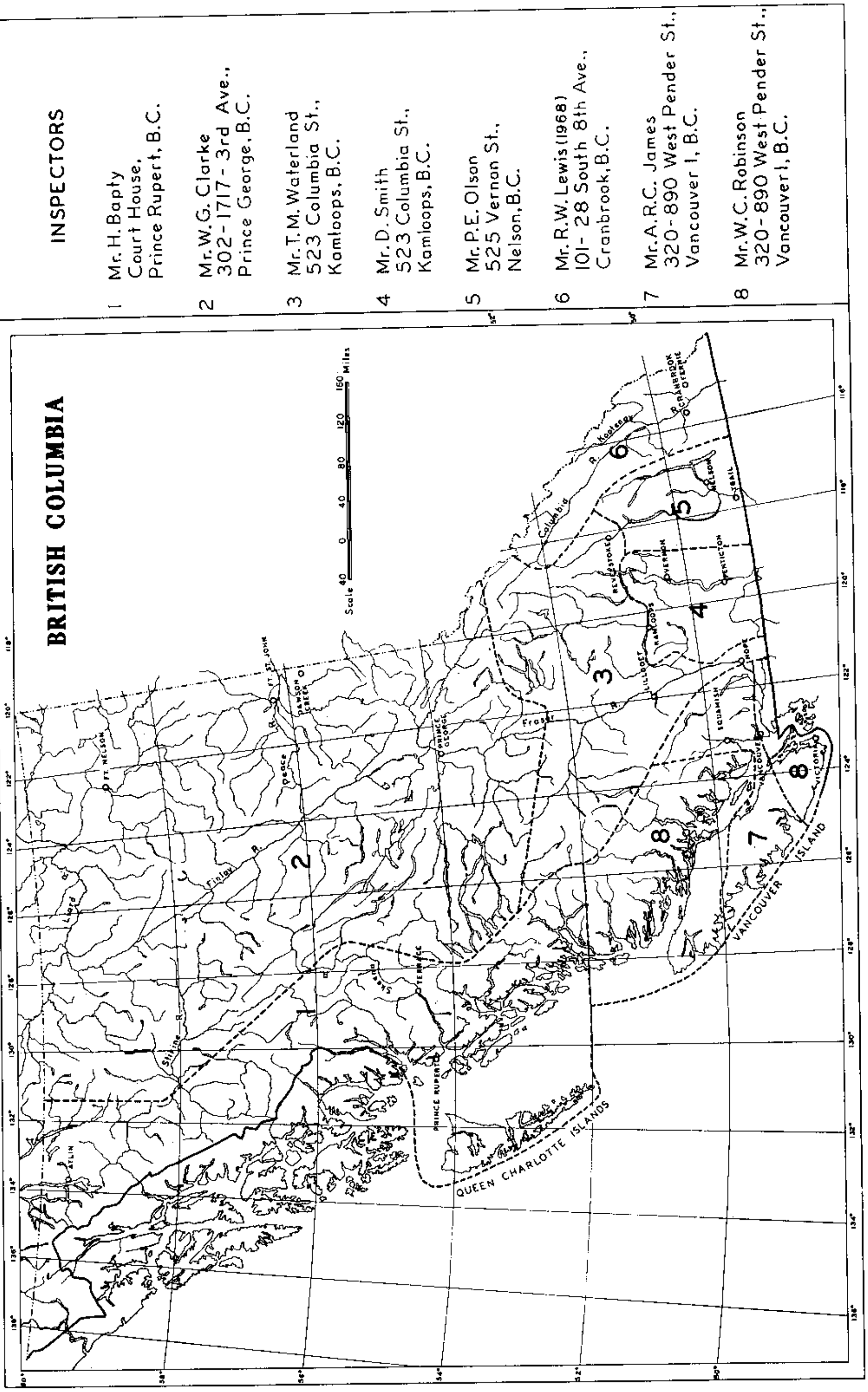



Figure 1. Index map showing inspectoral districts.

*Board of Examiners (Coal Mines Regulation Act)*

| | |
|---|---|
| J. W. Peck, Chairman | Victoria |
| A. R. C. James, Member | Vancouver |
| D. R. Morgan, Member | Victoria |

A. R. C. James, D. R. Morgan, and the mine-rescue instructors for the district in which an examination is being held form the Board for granting certificates of competency to coal-miners.

An Inspector is empowered to grant provisional certificates to coal-miners for a period not exceeding 60 days between regular examinations.

*Board of Examiners (Mines Regulation Act)*

| | |
|---|---|
| J. E. Merrett, Chairman | Victoria |
| A. R. C. James, Member | Vancouver |
| W. C. Robinson, Member | Vancouver |

The Board conducts written examinations in various mining centres for applicants for underground shiftboss certificates. The Board is also empowered to grant provisional certificates without examination and under such conditions as the Board considers necessary.

## MINERALOGICAL BRANCH

The Mineralogical Branch supplies general geological information, and information regarding mineral deposits and the mineral industry, provides rock and mineral identification of specimens submitted by prospectors and others, contributes lectures in courses on prospecting, and participates in scientific discussions and educational exhibits.

Field work by officers of the Mineralogical Branch includes areal geological mapping, detailed geological examinations of mineral deposits, examination of properties of current interest, and studies related to engineering geology. The results of major projects are published in a series of bulletins, and shorter reports are published in the Annual Reports of the Minister of Mines and Petroleum Resources.

Technical editing of the Annual Report of the Minister of Mines and Petroleum Resources and other publications is the responsibility of Stuart S. Holland. Copy for printing is prepared by and under the direction of Mrs. Rosalyn J. Moir.

### Professional Staff

On December 31, 1967, the professional staff included the following geologists:—

| | |
|---|---|
| M. S. Hedley | Chief of the Branch |
| Stuart S. Holland | Deputy Chief of the Branch |
| J. M. Carr | Geologist |
| N. C. Carter (on leave of absence) | Geologist |
| G. E. P. Eastwood | Geologist |
| James T. Fyles | Geologist |
| E. W. Grove | Geologist |
| R. V. Kirkham (on leave of absence) | Geologist |
| J. W. McCammon | Geologist |
| N. D. McKechnie | Geologist |
| K. E. Northcote | Geologist |

V. A. G. Preto ........................ Geologist
A. F. Shepherd ........................ Geologist
A. Sutherland Brown ........................ Geologist

All are registered professional engineers or are applying for registration, and most have a Ph.D. degree.

## Staff Changes

W. G. Jeffery, geologist, resigned, effective June 20, 1967.

V. A. G. Preto, geologist, a graduate of the University of British Columbia and a Ph.D. from McGill University, joined the staff on July 1, 1967.

K. E. Northcote, geologist, a graduate of the University of British Columbia and a Ph.D. from the University of British Columbia, joined the staff on November 1, 1967.

R. V. Kirkham continues to be on leave of absence to continue postgraduate study at the University of Wisconsin.

N. C. Carter continues to be on leave of absence to continue postgraduate study at the University of British Columbia.

## Field Work, 1967 Season

J. M. Carr mapped the geology of the Brenda Lake area west of Peachland.

N. C. Carter made a study of the age of copper and molybdenum deposits in the Babine, Tahtsa, Smithers, and Alice Arm areas.

G. E. P. Eastwood began an inventory of the mineral deposits of Vancouver Island.

James T. Fyles spent about a month with E. W. Grove in the Unuk River area and studied several molybdenite and other deposits in the Kootenays.

E. W. Grove completed the geological mapping of an area between the Granduc mine and the Unuk River.

R. V. Kirkham completed a geological study of Hudson Bay Mountain and the Glacier Gulch molybdenum deposit.

J. W. McCammon studied non-metallic industrial mineral deposits in the southern part of the Province.

N. D. McKechnie examined various mines and prospects in the southern interior and on Vancouver Island.

V. A. G. Preto studied copper deposits in the Kamloops-Princeton region and elsewhere.

A. Sutherland Brown continued the investigation of deposits of copper and molybdenum in the central interior of the Province, combined with R. V. Kirkham to map an area north of Hudson Bay Mountain, and studied coal resources in several areas.

A total of 11 field assistants was employed on the various mapping projects undertaken in 1967.

## Airborne Magnetometer Mapping

The project of airborne magnetometer mapping, jointly financed by the Geological Survey of Canada and the British Columbia Department of Mines and Petroleum Resources, continued in 1967. The contractor, Spartan Air Services Ltd., did the field work, covering 46 map-sheets, mostly in 93N, 93M, 103P, and 94D lying between latitudes 55 degrees and 57 degrees.

Seventeen aeromagnetic maps at a scale of 1 mile to 1 inch covering part of the area flown in 1966 were released on May 21, 1968. The maps may be obtained from the British Columbia Department of Mines and Petroleum Resources, Room 411, Douglas Building, Victoria, or the Geological Survey of Canada, 326 Howe Street, Vancouver 1.

The basic data used in compiling the maps are on open file at the Geological Survey of Canada in Ottawa, where interested parties may arrange to obtain them for special processing.

The Department of Energy, Mines and Resources (Observatories Branch) operates a magnetic observatory at Victoria. Services available to geophysical exploration companies and other interested agencies include:—

(*a*) Three-hour range indices of magnetic activity; these provide a measure of the intensity of the magnetic disturbance (on a 0–9 scale) for each three-hour period. The monthly listings of these indices are normally mailed within a few days after the end of each month.

(*b*) Copies of magnetograms are available through a local duplicating firm at a charge of $7.50 for a monthly set. These recordings of the magnetic field can be used to control field surveys, in particular to correct for the diurnal changes and magnetic disturbances. The area over which this control is valid depends on the required accuracy; for ±5 gamma accuracy, it covers an elliptic region reaching roughly as far as longitude 118 degrees to the east and latitude 50.5 degrees to the north.

Further details can be obtained by writing to the Officer-in-charge, Victoria Magnetic Observatory, R.R. 7, Victoria.

## PETROLEUM AND NATURAL GAS BRANCH

The Petroleum and Natural Gas Branch is responsible for the administration of the Regulations Governing the Drilling of Wells and the Production and Conservation of Oil and Natural Gas, and the Regulations Establishing Gas-Oil Ratio Adjustment Factors, Oil Production Allowables, Overproduction and Underproduction, made pursuant to the *Petroleum and Natural Gas Act.*

The drilling regulations provide for the use of efficient and safe practices in the drilling, completion, and abandonment of wells; for the orderly development of fields discovered within the Province; and for the conservation and prevention of waste of oil and natural gas within the reservoir and during production operations.

The regulations concerning gas-oil ratio factors, production allowables, and overproduction and underproduction provide for conservation of reservoir energy by limiting the volume of oil that can be produced during any day, month, or year from a well or pool in accordance with the schedule of gas-oil ratio adjustment factors. The factors, which are applied against oil production, are applicable when the average volume of gas produced with each barrel of oil exceeds a specified level, and when applied result in reduction of the producing rate. Overproduction and underproduction are adjusted on a monthly basis.

Every well location must be approved by the Branch before the well is drilled. All operations related to drilling and production are inspected frequently to ensure compliance with all regulations, including such features as facilities and practices used, adequate plugging of abandoned wells, surface restoration of well-sites, well testing and measurement procedures employed, disposal of produced water, protection of installations against fire, and general conservation.

Investigations are made of complaints of property damage resulting from drilling and producing operations, and from geophysical work programmes.

Comprehensive records of all drilling and producing operations are maintained at Victoria and are made available for study, or are published, for the use and benefit of anyone interested in oil or gas development in British Columbia. Samples of bit cuttings, as well as all core, obtained from every well drilled in the Province are collected and retained at the field office at Charlie Lake, where they may be studied by interested persons. Charlie Lake is adjacent to the Alaska Highway about 5 miles northwest of Fort St. John.

Detailed reservoir engineering and geological studies are conducted on the basis of technical information submitted to the Branch from operating companies, as well as information acquired through field work by Branch personnel. Estimates of the reserves of oil and natural gas are made twice a year, at the end of June and December. Crown-owned oil and natural-gas rights are evaluated prior to their disposal by public tender.

## Administration

The Petroleum and Natural Gas Branch is subdivided for administrative purposes into three sections—namely, Development Engineering, Reservoir Engineering, and Geology. The Development Engineering and Geology sections are supervised by W. L. Ingram and S. S. Cosburn respectively. Following the resignation, in July, of the Senior Reservoir Engineer, responsibility for the Reservoir Engineering section was assumed temporarily by K. C. Gilbart.

The field office at Charlie Lake, which includes the core and sample laboratory, is supervised by the District Engineer, G. E. Blue.

## Staff

### *Headquarters, Victoria*

| | |
|---|---|
| J. D. Lineham | Chief of Branch |
| W. L. Ingram | Deputy Chief of Branch and Senior Development Engineer |
| M. B. Hamersley | Development Technician |
| J. F. Tomczak | Statistician |
| R. R. McLeod (until July 24th) | Senior Reservoir Engineer |
| K. C. Gilbart | Reservoir Engineer |
| G. V. Rehwald (until August 31st) | Reservoir Engineer |
| P. K. Huus | Reservoir Technician |
| S. S. Cosburn | Senior Petroleum Geologist |
| H. B. Fulton (until October 17th) | Petroleum Geologist |
| D. L. Griffin | Petroleum Geologist |
| J. E. Hughes | Petroleum Geologist |
| A. S. Nemeth | Petroleum Geologist |

The headquarters staff includes also two geological draughtsmen, one clerk-stenographer, four clerks, and three clerk-typists.

### *Field Office, Charlie Lake*

| | |
|---|---|
| G. E. Blue | District Engineer |
| D. L. Johnson | Field Engineer |
| D. A. Selby | Field Technician |
| G. T. Mohler | Field Technician |
| W. B. Holland | Field Technician |
| L. A. Gingras | Field Technician |

The field office staff includes also three core and sample laboratory assistants and one clerk-stenographer.

### *Staff Changes*

L. A. Gingras, field technician, joined the staff on January 3rd.
A. S. Nemeth, petroleum geologist, joined the staff on March 1st.
R. R. McLeod, reservoir engineer, resigned, effective July 24th.
G. V. Rehwald, reservoir engineer, resigned, effective August 31st.
H. B. Fulton, petroleum geologist, resigned, effective October 17th.

### Board of Arbitration

Chairman: A. W. Hobbs, solicitor, Department of the Attorney-General. Members: S. G. Preston, agrologist, Department of Agriculture; J. D. Lineham, engineer, Department of Mines and Petroleum Resources. The latter was appointed on June 27th, replacing R. R. McLeod.

The Board of Arbitration, established under the authority of the *Petroleum and Natural Gas Act,* grants right of entry by oil and gas companies upon alienated land and determines conditions of entry and compensation therefor. It also terminates the right of entry when a company has ceased to use the land.

A hearing was held at Fort St. John on July 24th at which 10 applications carried over from 1965 and 1966 were heard and subsequently settled by Board awards. Also heard was the matter of a dispute concerning whether or not the Board had jurisdiction to grant right of entry for the purpose of installing pipe-line facilities necessary to transport gas from a well-head to the gas-gathering system. It was decided that the Board had jurisdiction and, subsequently, six orders were made for immediate right of entry.

Two applications on which right of entry had been granted in July, 1966, were settled by agreement between the parties involved.

### Conservation Committee

Chairman: K. B. Blakey, Deputy Minister of Mines and Petroleum Resources. Members: N. D. McKechnie, geologist, Department of Mines and Petroleum Resources; M. H. A. Glover, economist, Department of Industrial Development, Trade, and Commerce.

The Conservation Committee is responsible to the Minister of Mines and Petroleum Resources and was established on October 11, 1957, under the authority of the *Petroleum and Natural Gas Act.* Its duties are as follows:—

(1) To act as an advisory committee to the Minister on such questions of conservation that the Minister, in writing, shall refer to the Committee for consideration and recommendation.

(2) To deal with such questions of conservation and production in the various fields of British Columbia as may arise between two or more operators in the same field or between operators and the Branch when appeals on such questions are made to the Minister and referred by him to the Committee.

The Conservation Committee did not meet in 1967.

## GRUB-STAKING PROSPECTORS

Under the authority of the *Prospectors' Grub-stake Act* the Department has provided grub-stakes each year since 1943 to a limited number of applicants able to qualify.

Grub-stakes up to $500 for food, shelter, and clothing, plus a reasonable travelling allowance, are available to a limited number of qualified prospectors who undertake to prospect in British Columbia in areas considered favourable by the Department in accordance with a long-range plan for the development of the Province. Experienced prospectors may be granted a maximum of $300 for travelling expenses where prospecting is to be done in remote areas where air transportation is necessary.

Application forms and terms and conditions under which grub-stakes are granted may be obtained from D. R. Morgan, Senior Inspector, Department of Mines and Petroleum Resources, Victoria.

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 |
| 1957 | 22,000 | 46 | 174 | 101 |
| 1958 | 24,850 | 47 | 287 | 211 |
| 1959 | 21,575 | 38 | 195 | 202 |
| 1960 | 28,115 | 50 | 358 | 241 |
| 1961 | 29,175 | 47 | 309 | 325 |
| 1962 | 26,730 | 52 | 233 | 189 |
| 1963 | 29,000 | 50 | 150 | 843 |
| 1964 | 31,751 | 53 | 213 | 351 |
| 1965 | 24,717 | 42 | 241 | 219 |
| 1966 | 26,787 | 43 | 224 | 239 |
| 1967 | 29,891 | 47 | 148 | 432 |

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

Seventy-two applications were received in 1967, and 47 grub-stakes were authorized. Two grantees were unable to go out, and their initial payments were returned. Grantees who were unable to complete the terms and conditions of the grant received only partial payment. Fourteen prospectors were given grants for the first time. Seven grantees proved to be unsatisfactory. A few grantees used aircraft for transportation to their prospecting areas. Two grantees were taken ill and were unable to continue prospecting.

D. H. Rae interviewed applicants in Vancouver and contacted 26 grantees in the field to give advice and direction to those who needed it. The following notes are Mr. Rae's summaries of the prospecting activities and results. They are based on observations made by him in the field and from information contained in the diaries of the grantees.

*Alberni Mining Division.*—Some prospecting was done in the west Cameron River valley; a considerable amount of graphitic material in schistose rock was reported. Prospecting was also carried on in belts of limestone near Horne Lake. Nothing of interest was reported there, or near Patterson or Father and Son Lakes.

On the east side of Great Central Lake, about 10 miles from Port Alberni, an important mineralized zone was discovered; claims were located and a considerable amount of prospecting was done. The main zone exposes a width of 10 feet of gossan material containing copper carbonates and chalcopyrite.

North of Sproat Lake, about 20 miles from Port Alberni, copper mineralization in andesite was thoroughly prospected; some good assay values were obtained from a wide zone. Other outcrops of granite and volcanics were investigated. Narrow stringers and disseminations of bornite were found in the granite.

A camp was established on Silver Creek at the head of Uchucklesit Inlet, and this rugged area was prospected. Limestone, pyritized skarn, and diorite containing some magnetite were reported.

Close to the half-way point on the Port Alberni–Ucluelet road, claims were located on a small exposure of magnetite showing minor amounts of molybdenite. A considerable amount of work was done on this ground, but no further information was submitted.

*Atlin Mining Division.*—A base camp was established beside a small lake, locally known as Redfish Lake, lying about 15 miles due south of the east end of Swan Lake. Three weeks were spent prospecting the area within reasonable reach of the camp, but the results of the work were disappointing. The underlying rock throughout the area is coarse-grained granite showing considerable reddish feldspar. Several small barren gossans were examined; a few narrow pegmatite dykes were seen; small amounts of molybdenite and chalcopyrite were found in quartz stringers; and a few small pieces of copper-bearing float were picked up. Panning of the streams in the area was unproductive.

Some work was done north of Tootsee Lake. It was found that granite underlies much of the area. Some fairly important gossans were found containing minor amounts of pyrrhotite and magnetite, and one exposure of quartzite containing limonite was examined, but nothing of economic interest was discovered.

In the Talbot Creek area (6 miles south of Mile 90 on the Haines Road), outcrops of limestone, marble, and some shale were observed. Nothing else was reported.

A short time was spent prospecting an area adjacent to Datlaska Creek (4 miles west of Kelsall Lake). The geology of the area is fairly complex. Outcrops of pyroxenite, gneiss, volcanic breccia, argillite, serpentine, and limestone were examined; float containing minor amounts of scheelite and chalcopyrite was picked up, but nothing of importance was reported.

*Cariboo Mining Division.*—Prospecting was done in the Torpy River valley, where some trenching on several outcrops exposed heavy mineralization of pyrite, chalcopyrite, and copper carbonates. There seems to be very little continuity to this mineralization, but further work is warranted. The rock exposures are mainly quartzite showing a considerable amount of quartz and calcite, schist, and black limestone containing small amounts of pyrite and chalcopyrite.

Six miles north of Sinclair Mills some work was done in an area underlain by basic rocks. Nothing of interest was reported.

Prospecting was done 20 miles southwest of Prince George where the exposed rocks are mainly basic types including some serpentine.

East of Prince George, near Purden Lake, a granite-limestone contact was prospected, and along the Willow River some barren-looking quartz veins were examined. Nothing of interest resulted from any of this work.

A base camp was established at an old placer mine in Pearce Gulch, about a mile south of the Cariboo-Hudson mine. From this camp, and by setting up a number of fly camps, a large area was prospected. Nothing of economic importance was found, but the following observations were made: Grouse Creek—barren quartz veins in schist; Mount Guyet—folded black limestone, phyllite, quartzite, and a few narrow quartz veins; McNeill Creek—limestone and quartzite carrying some iron pyrites. A considerable amount of work was done in the Cunningham and McBean Creek areas, but nothing of interest was reported. At Nugget Mountain the rock exposures are mainly pyritized slate, grey quartzite, and chlorite schist; at Craze Creek—schistose quartzite; at Antler and Victorian Creeks—quartz-sericite schist; at Pitman Creek—black argillaceous schist; at Copper Creek—minor amounts of scheelite associated with a fault zone; at Pearce Gulch—limestone and schist; at Roundtop Mountain—limestone. Eight claims were located in the Trehouse Creek valley, and the ground was carefully prospected. The underlying rocks were found to be slate, slaty schist, and quartz-sericite schist containing narrow quartz stringers. Very few rock outcrops were seen near Simlock or Harveys Creeks. At Peter Gulch argillaceous schist, a gossan area, some shear zones, and barren quartz veins in quartzite were reported. At the head of French Snowshoe Creek some prospecting was done in an area underlain by dark-coloured sericite schist, quartzite, and conglomerate. At the head of Cunningham Creek an anticlinal structure was examined.

*Clinton Mining Division.*—Some work was done in the Maiden Creek area, where the underlying rocks are mainly limestone, conglomerate, and red sandstone. Nothing of interest was reported.

Near Jesmond, veinlets of grey copper were found along a limestone contact.

*Greenwood Mining Division.*—The following information was submitted from the Goatskin Creek-Rendell Creek areas. Observed rock exposures include syenite with narrow quartz stringers, granite, rhyolite, basalt, micaceous schist, quartz diorite, limestone, and serpentine in varying amounts over a wide area. Nothing of economic interest was reported.

In the Conkle Lake area the geology was reported to be fairly complex. Several fault zones, pyritized serpentine, narrow dykes and sills, granite, and granodiorite were observed.

In the vicinity of Baldy Mountain, coarse granite, quartz pegmatite dykes, rusty-coloured chert, limestone, and schist were reported.

*Kamloops Mining Division.*—Near Lytton, dolomitic seams in a quartzose dyke were found to contain disseminated cinnabar, and just south of Walhachin small pockets of chalcocite were noted in several rock exposures.

Some work was done in the Raft River valley, a very rugged area where outcrops of basalt, granite, and barren volcanics were reported.

A base camp was established at O'Connor Lake, which lies on the west side of the North Thompson River about 20 miles from Kamloops. From there a large area was prospected, both conventionally and by using geochemical methods. Nothing of economic importance was reported, but the following general information was submitted: Discouraging results were obtained from the soil-testing, which was conducted after careful traversing of the area; much of the ground is covered with deep overburden; outcrops of limestone, various types of metamorphic rocks, granite, schist, and shale were investigated; some minor mineralization was noted in both metamorphic rocks and granite in the form of disseminated hematite, pyrite, and arsenopyrite; several old mine workings were examined. No staking was done, and little of economic interest was reported.

In the Mount Hagen area, near Gorman Lake, granite intrusives were encountered, and some exposures of chloritic-sericitic rock containing quartz and graphite were examined. In the Fadear Creek valley, and near Cicero Creek, serpentine was found, and some lead-zinc float was picked up near Mount Fadear. Some work was done near Forest, Saskum, and North Barriere Lakes, and in the Harper and Chuck Creek areas. On the Wood Lake road, outcrops of granodiorite and andesite were examined. Northeast of Barriere, the underlying rocks are diorite, granite with considerable feldspar, and graphitic schist.

Several base camps were established in an area roughly 10 miles north and northeast of the north end of Adams Lake. This sector is made accessible by numerous logging-roads, but field work was hampered by excessive overburden. In general the geology was not favourable. The following general information was furnished by the prospector: Beaver Creek valley—granodiorite; Harbour Creek valley and Harbour Lake area—chlorite schist and mica schist; Gannett Mountain—granite and some metamorphic rocks; Wallace Creek—chlorite schist and mica schist; Meadow and Cayeene Creek areas—argillite; Samatosum Creek—some sedimentaries and some volcanics; and Spapilem Creek—granite, gneiss, and quartzite. In the Tumtum Lake area much overburden was encountered, but some outcrops of granite and mica schist were examined.

South of Johnson Lake, outcroppings of both sedimentary and volcanic rocks were investigated.

On the west side of Mara Lake, phyllites and schists were found to be well pyritized.

A short aerial survey of part of the Adams Plateau was undertaken by helicopter; numerous landings were made, float material was examined, rock exposures investigated, and silt samples were taken. Nothing of importance was found.

*Liard Mining Division.*—Several main base camps were established in the general vicinity of Dall Lake. Fly camps were also used at a number of convenient locations, and a large area was prospected during the season. Near Colt Lake and east toward the Kechika River, the underlying rocks are mainly quartzite, sericite schist, and a few greenstone dykes. Veinlets of radioactive fluorite, some copper sulphides in narrow quartz stringers, and limestone containing narrow bands and disseminations of pyrrhotite were prospected. In the Hizaza Creek valley, metamorphosed limestone and shale; quartz veinlets showing green chlorite, muscovite, and siderite; and quartz stringers in graphitic schist were noted. Near the southeast corner of Dall Lake the following features were reported: Limestone gossans with associated calcite and other carbonates; pyritization along an intrusive contact; small pieces of lead and zinc sulphide float; limestone float with some iron pyrites; and narrow quartz veins with minor amounts of chalcopyrite in schist. Along Moodie Creek some faulting and shearing were found, and chloritic quartz stringers in schist carry minor amounts of chalcopyrite. Eight miles northwest of Moodie Creek, on the Turnagain River, a medium-sized pyritized zone in sediments was prospected. Nothing of immediate economic interest was reported from all this work.

*Lillooet Mining Division.*—A small amount of prospecting was done up the Yalakom River valley and in the Bridge River district.

*Nanaimo Mining Division.*—Some work was done at the headwaters of the Gold River. This was a continuation of a programme that was started in the area in 1966. Nothing of importance was reported.

Some distance north of the Gold River valley, copper-bearing float was found in an area underlain by andesite.

The Mount Kains area near the north end of Vancouver Island was prospected. Access is by logging-road, and the area is difficult to prospect owing to rugged terrain, lack of rock exposures, and heavy undergrowth. It was found that the positions of certain magnetic anomalies were hard to reach. Sketch maps showing the complex geology were submitted.

Some prospecting was done about 10 miles west of Duncan.

*Nelson Mining Division.*—Some prospecting was done 8 miles west of Tye, in the Cultus Creek valley, and between Lake and Midge Creeks. In the Hughes Creek valley, oxidized and copper-stained float was picked up, and a fine-grained oxidized dyke was prospected. In the Midge Creek valley, some float was found but nothing of further importance was reported.

By using an old cabin 12 miles up Cultus Creek from Tye as a main base of operations and establishing several other temporary camps at convenient locations, a considerable area was prospected in the general vicinity of the old Bayonne mine. Nothing of economic importance was reported.

In the Rossland area, at Grouse Ridge and Baldy Mountain, granite and argillite are the common underlying rocks. A considerable amount of chalcopyrite was found in the dump at the old Lake Mountain mine, and in the vicinity both monzonite outcrops and conglomerate containing small amounts of galena were reported. Near Monte Cristo Mountain, float quartz showing minor amounts of molybdenite was picked up; at Deer Park Mountain, exposures of granite and argillite were seen; and up Tiger Creek, float containing some mixed sulphides was found. Nothing of economic interest was reported.

In the Boundary Creek area, along Grass Creek, some work was done along a schist-gneiss contact, where a quartz vein carrying values in copper, silver, and molybdenite had been uncovered. Near the junction of Nun and Monk Creeks, some chalcopyrite float was picked up, and altered limestone carrying low values in lead and silver was prospected. At North Star Mountain, limestone outcrops showed minor amounts of fine galena. In the Corn Creek valley, some work was done on quartz veins which occur in limestone, on altered limestone containing some siderite, and on quartz veins containing small amounts of chalcopyrite and galena. No commercial ore was discovered.

*New Westminster Mining Division.*—In the Chehalis River area a 9-foot quartz vein, showing complex copper, zinc, gold, and silver mineralization, was prospected. Assay values were low.

*Nicola Mining Division.*—North of Stump Lake, near Frogmoore Creek, claims were located on an exposure of chalcocite in andesite, and on narrow bands of bornite along a granite contact. Further work will be done on the claims.

*Omineca Mining Division.*—Close to the north end of Whitesail Lake, some magnetite float and pyritized granite containing minor amounts of chalcopyrite were found. At Coles Creek a considerable amount of argillite is exposed and a gossan area was examined. At the east end of Tahtsa Lake a heavily pyritized zone was exposed. At Cheslatta Lake the rock exposures are schist, gneiss, granite, and granodiorite. On Huckleberry Mountain copper-stained outcrops were examined. Near Mosquito Hills float carrying bornite and chalcopyrite was picked up, and on Smaby Creek patches of magnetite were found to contain narrow stringers of bornite and chalcopyrite. Some inconclusive work was done near Musclow and Michel Lakes and in the McCuish and Falls Creek areas. Near Goodrich Lake several narrow copper-bearing veins were exposed, and at Cosgrove Lake a gossan containing small amounts of bornite and chalcopyrite was investigated. Some work was done around Sandifer Lake; at Spud Lake several small gossans were prospected, and exposures of basalt, gabbro, and limestone were noted; traces of chalcopyrite and pyrite were also seen. Near Coyote Lake the underlying rocks are basalt and limestone, and some quartz stringers and a small amount of perlite were seen.

Some inconclusive work was done near Gale Lake, on Chikamin Mountain, and up Troitsa Creek. Near Sweeney Mountain, outcrops of pyritized volcanic rocks were investigated.

Some work was done around a pinkish-coloured plug of diorite in the Shelford Hills, where epidote and narrow quartz veins were seen.

The easterly slopes of the Wolverine Range due east from Manson Creek received some attention, and outcrops of limestone and quartzite were examined; traces of copper sulphides were found but assays of samples taken were disappointing. Some prospecting was done near Manson Creek: Near the first of the Manson Lakes, one outcrop showed traces of nickel; in the Darkwater Creek area, quartzite, skarn, limestone, and lightly mineralized schist were reported; at central Lost Creek a small showing of nickel silicate was examined; at upper Lost Creek altered argillite showed small amounts of scheelite; and at Boulder Creek small amounts of galena, scheelite, and nickel silicate occur along a granite-limestone contact.

Sixty miles south of Manson Creek and about 5 miles east of the mining-road, a fairly extensive outcropping of skarn was located and prospected; disseminated molybdenite and powellite are visible in part of the skarn, but assays of samples were low.

Base camps were established about 60 miles from Finlay Forks, to the north and to the northeast, and some prospecting was done in these areas. The following information was submitted at the end of the season: Chowika Creek valley—thin beds of limestone; Deserters Peak—sandstone and narrow coal seams, and iron pyrites in quartz stringers; Akie River area—schist, shale, conglomerate, and limestone, with minor showings of chalcopyrite and galena; Akie Range—quartz veins containing interesting amounts of pyrite; and at Del Creek—outcrops of barren chlorite schist.

A base camp was established 80 miles south of Burns Lake, on the north side of Oppy Lake near the west end. The season was spent prospecting the north side of the lake commencing at about a mile from the shoreline. The area is underlain by volcanic rocks, some syenite, argillite, quartzite, and a few lightly mineralized porphyry dykes. A considerable amount of time was spent stripping and opening up a shear zone containing copper carbonates, chalcopyrite, and pyrite. This work was hampered by deep overburden and very bad weather. The area adjacent to the shear zone is covered with heavy underbrush and windfalls. These showings warrant further investigation.

Two discoveries were made in the McConnell Lake area—one copper, the other copper and molybdenum. No information regarding the geology or extent of these mineral zones was submitted, but the samples brought out are interesting and assays returned commercial values. The following general information on the area was submitted: At Meadow Creek—copper float was picked up; at Dewar Peak—copper float was also found; at Fredrickson Peak—a granite-greenstone contact was prospected; and at Serrated Peak—finely disseminated chalcopyrite was found associated with epidote and magnetite.

In the Kitsumkalum Lake area, diorite and granite exposures were common around Sand Lake and in the Goat River valley, and at Maroon Creek argillite and greywacke were observed. Southwest of Kispiox, outcrops of pyritized diorite, granodiorite, and argillite were examined; and at Date Creek, outcrops of shale, argillite, granodiorite, and sandstone were reported. East of Cedarvale a sample of float containing low values in gold, silver, and lead was found in an area underlain by argillite and greenstone showing patches of magnetite. North of Cedarvale, at the Cranberry River and at Mill Creek, outcrops of shale and argillite were observed.

In the Blunt Mountain area (southeast of Hazelton) some prospecting was done where argillite, chert, and obsidian containing narrow quartz stringers are fairly common. At Mount Thomlinson, shale, argillite, granodiorite, and greywacke outcrops were exposed. In the Sediesh Creek valley, the underlying rocks appear to be mainly argillite and pyritized bands of quartzite. Several pieces of float, well mineralized with molybdenite and other sulphides, were picked up, but the source of these was not found. At Utsun Creek, outcrops of argillite were found to contain large crystals of pyrite.

North of Perow volcanic rocks are common, and near Topley Landing some inconclusive soil-testing was done.

*Osoyoos Mining Division.*—Near Apex Mountain, heavy pyritization was prospected along a granite contact. Samples were taken of massive pyrrhotite carrying disseminations of chalcopyrite, and fairly good assays were obtained. Granite and limestone were found in the Mount Brent area.

In the Ashnola River valley, younger granitic dykes were found to contain some chalcopyrite, and quartz stringers with minor galena.

More prospecting was done near Allendale Lake, where bornite and copper carbonates were found in coarse-grained granodiorite. This area warrants further prospecting.

Some work was done in the Peachland Creek valley, in an area underlain by granite, andesite, and conglomerate.

*Revelstoke Mining Division.*—Some work was done on Legerwood Creek, 5 miles northeast of Malakwa, where the principal underlying rocks are pinkish granite, gneiss, and mica schist. Small amounts of fine molybdenite were seen in the granite.

Some work was done in the Tangier Creek watershed, around Mount Tilley, and on Quartz Creek.

On the east side of Trout Lake north of Gerrard, outcrops of siltstone and phyllite mineralized with pyrite and pyrrhotite were examined. In the Trout Creek valley skarn float fairly well mineralized with mixed sulphides was found.

The following information was submitted from work done in the general vicinity of Revelstoke: Greely Creek—porphyry with much disseminated pyrrhotite and pyrite, and minor chalcopyrite; between Anstey Arm and Columbia River—many gossans were observed; Silver Creek—phyllite, schist, and calcareous rocks, but no mineralization; Hanner Lake—peridotite; Freeze Creek—muscovite granite, phyllite containing pyrrhotite, granodiorite (sulphides more common in altered sediments); at Montana Lake—heavily mineralized skarn was prospected; some work was done in the valleys of Drimmie and Greenslide Creeks; near Mount Macpherson, between Begbie Creek and Tumtum station, outcrops of highly siliceous metamorphic rocks, schists, and gneisses were found to be fairly well mineralized; at Horsefly Creek—a mineralized shear zone was investigated; at Watson Creek—breccia float was found to contain flakes of graphite.

*Similkameen Mining Division.*—In the Princeton area, on the north side of Granite Creek, exposures of volcanic rocks and chlorite schist were prospected.

*Skeena Mining Division.*—An attempt made to get up the Exstew River by canoe failed because the water was too high at the time. Some prospecting was done south of Williams Creek, but nothing of importance was reported. East of Kitimat, exposures of impure limestone were examined and near Fire Mountain prospecting was done where outcrops of diorite and limestone were exposed.

East of Horetzky Creek near The Jaws, an important mineral zone was located. The zone is characterized by large pods of bornite and chalcopyrite in granite plus extensive areas of green and blue copper carbonates. High assays were obtained from samples taken from the zone.

*Slocan Mining Division.*—Near the headwaters of Eagle Creek, east of Granby River, small arounts of copper, mercury, and zinc mineralization were reported; at Galloping Creek some copper mineralization was seen; and at Winnifred Creek some quartz float containing molybdenite was found. In the Inonoaklin Mountain area, float carrying fine disseminated molybdenite was picked up and some pieces of silver-lead float were found. The source of this material was not found. Near Barnes Creek lightly mineralized quartz float was found. At Bisson Lake some claims were located on what was reported to be showings of cinnabar in volcanics. North of Lightning Peak, claims were located on a mineral zone carrying values in nickel, silver, and lead.

Using a float camp at Verandah Point on the east side of Kootenay Lake as a base, considerable work was done north and south along the lakeshore. The geology is not favourable; most of the rock exposures encountered were unaltered crystalline limestone with no evidence of mineralization, barren mica, or hornblende schist. Specks of scheelite were seen in several narrow pegmatite dykes.

Claims were located up the Kaslo River, on Blue Ridge, where encouraging mineralization of bornite and galena was found in quartz veins. Much galena float was picked up, and some high assays in lead and silver were obtained.

Some prospecting was done on the east side of Duncan Lake.

Some inconclusive work was done in the New Denver area, where float containing galena and sphalerite was picked up.

On Perry Ridge, south of Slocan City, gneisses and schists showed considerable graphite and garnet.

Between Needles and Nakusp some exposures of granite and altered granite with a varied sporadic showing of sulphides were examined. Nothing of interest was reported.

*Vancouver Mining Division.*—North of Alice Lake in the Squamish area, exposures of galena and sphalerite in altered limestone received some attention.

*Vernon Mining Division.*—Prospecting was continued in the area close to the junction of Harris and McAuley Creeks.

Some work was done in other parts of the Vernon area.

Early in the season an attempt was made to initiate a prospecting programme a few miles south of Monashee Pass. Snow conditions interfered and the work was abandoned.

Some claims were located north of Kingfisher Creek, west of the north end of Mabel Lake and in the Joss Mountain area.

High up in the Whiteman Creek valley, outcrops of gneiss were found to contain pyrrhotite and minor amounts of both chalcopyrite and pyrite. Geochemical investigations were made in the Ewings Landing area.

*Victoria Mining Division.*—Some prospecting and locating was done a few miles west of Duncan.

## MINING ROADS AND TRAILS

Provision is made in the *Department of Mines and Petroleum Resources Act* whereby the Minister may, with the approval of the Lieutenant-Governor in Council, authorize the expenditure of public funds for the construction or repair of roads and trails into mining areas. Assistance on a half-cost basis may also be provided on roads and trails to individual properties. Application forms may be obtained from D. R. Morgan, Senior Inspector, Department of Mines and Petroleum Resources, Victoria.

Requests for road and trail assistance must be made to the Department before the commencement of work. The type of access upon which assistance may be given depends upon the value of the property, the stage of development, and the amount of work to be done. A trail is sometimes sufficient for initial exploration, and a tractor-road may be adequate for preliminary work. Subsequent development might warrant assistance on the construction of a truck-road. A carefully drawn sketch or plan of the location of the road is required to be submitted and, where warranted by the amount of assistance requested, a report on the property by a professional geological or mining engineer may be required. An engineer from the Department may be required to report on the property before a grant is made and to inspect the road after the work has been done.

The total mileages and disbursements under " Grants in Aid of Mining Roads and Trails " during the 1967/68 fiscal year were as follows:—

| | Miles | Cost |
|---|---|---|
| Roads— | | |
| Construction | 146.1 | $229,010.12 |
| Maintenance | 235.5 | 40,220.32 |
| Bridges— | | |
| Maintenance | | 23,000.00 |
| Construction | | 2,630.99 |
| Total | | $294,861.43 |

In addition to the above, work was continued on the Stewart–Cassiar road, which is being constructed under the " Roads to Resources " agreement between the Governments of Canada and British Columbia. The construction is supervised by the Department of Highways on behalf of the Department of Mines and Petroleum Resources. The only new road construction was on Project No. 1391, the 29.08-mile section between Burrage River and Ningunsaw River, the contract for which was awarded on November 18, 1965, to Ben Ginter Construction Company in the amount of $3,978,553.50 and started in 1966. Operations have been suspended each winter owing to climatic conditions. The project was 30 per cent completed at the end of 1967.

Further construction was done on the Bell-Irving No. 1 bridge, which is approximately 58 miles north of Stewart. The Benray Bridge Company completed the substructure, for which it was awarded a contract in the amount of $116,872 on July 2, 1965, and Canada Iron Foundries Ltd., Western Bridge Division, completed the fabrication and erection of steelwork, for which the company was awarded a contract in the amount of $384,696.40 on June 16, 1966. A temporary deck has been erected for the transportation of supplies, and the permanent deck is expected to be installed in 1968.

The Federal Government's contribution of $7,500,000 on the construction of this road was expended toward the end of September. Since that time the whole expense has been provided by the Provincial Government.

## EXHIBITS

The Department has an exhibit of rock and mineral specimens in the Douglas Building, Victoria; collections are also on display in the offices of the Inspectors of Mines at Nelson, Prince Rupert, and Vancouver.

Specimens from the collection in Victoria are displayed in wall cases lining the corridor of the fourth floor of the Douglas Building. The collection includes specimens of ore from many mines and prospects in the Province, and also type rocks and special minerals from British Columbia and elsewhere.

British Columbia material includes specimens collected over a period of more than 60 years by officers of the Department. Some type specimens have been purchased and other valuable specimens or groups have been donated or loaned.

## ROCK AND MINERAL SETS

Information regarding sets of rocks and minerals available for sale to prospectors, schools, and individuals in British Columbia may be obtained from the Chief of the Mineralogical Branch.

## PUBLICATIONS

Annual Reports of the Minister of Mines and Petroleum Resources, bulletins, and other publications of the Department, with prices charged for them, are listed in the Department of Mines and Petroleum Resources List of Publications, available from the Chief of the Mineralogical Branch or Chief of the Petroleum and Natural Gas Branch.

Publications may be obtained from the offices of the Department in Victoria and from the office of the Geological Survey of Canada in Vancouver. They are also available for reference use in the Departmental library, Room 430, Douglas Building, Victoria, in the reading-room of the office of the Geological Survey of Canada in Vancouver, and in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in public libraries.

## 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 mineral reference maps that may be inspected in the central records offices of the Department of Mines and Petroleum Resources in Victoria and Vancouver. Copies of these maps may be obtained on request made to the Chief Gold Commissioner, Victoria (price, $1.25 per print).

The boundaries of surveyed claims and leases are shown on the reference maps and other maps of the British Columbia Department of Lands, Forests, and Water Resources.

## OFFICES OF THE BRITISH COLUMBIA DEPARTMENT OF MINES AND PETROLEUM RESOURCES AND THE GEOLOGICAL SURVEY OF CANADA.

The Provincial Inspectors of Mines and Resident Engineers for the Vancouver Island and Lower Mainland districts, the Silicosis Control Inspectors, and the Gold Commissioner and Mining Recorder for Vancouver Mining Division occupy offices at Room 320, 890 West Pender Street, Vancouver 1. Officers of the Geological Survey of Canada are stationed at 100 West Pender Street.

The combined services offered to the public at these two offices include technical information on mining and the geology of the Province, the identification of mineral specimens, distribution of Federal and Provincial mining and geological publications, a reference library, a display of rocks and minerals, and a central records office.

# Topographic Mapping and Air Photography

The Annual Report of the British Columbia Lands Service, 1967, describes in detail the activities of the Legal Surveys, Topographic, Air, and Geographic Divisions of the Surveys and Mapping Branch.

Indexes to air photographic cover, to published maps, reference maps, and manuscript maps are available through the Director, Surveys and Mapping Branch, British Columbia Lands Service, Victoria.

# Department of Energy, Mines and Resources

The Canadian Government Department of Energy, Mines and Resources performs many functions related to mining and the mineral industry in general. The Geological Survey of Canada, Mines Branch, Mineral Resources Division, Observatories Branch, and Surveys and Mapping Branch all provide services of direct interest to the mineral industry.

## GEOLOGICAL SURVEY OF CANADA

The Geological Survey of Canada each year has several geological parties in the field in British Columbia.

Over a period of nearly a hundred years numerous reports and maps covering areas of the Province have been published by the Geological Survey of Canada. These publications provide geological information of great benefit to mining, exploration, and prospecting activities in the Province.

The Geological Survey of Canada maintains an office at 100 West Pender Street, Vancouver 3, with Dr. J. E. Armstrong in charge. Geological reports and maps may be obtained there.

### Field Work by the Geological Survey in British Columbia, 1967

Geological mapping and special studies were done in the following areas:—

| Officers | Area | Remarks |
|---|---|---|
| H. Gabrielse and S. L. Blusson | 104 O, 104 I, 104 J | Complete Operation Selwyn and unmapped sheets of Operation Stikine. |
| N. W. Rutter | Parts of 94 B, C, F, 93 H, O | Surficial geology of the Peace River dam and reservoir area. |
| D. T. A. Symons | 93 C, D, 103 A, 104 G | Palæomagnetic studies in Dean Channel and vicinity and at Mount Edziza. |
| T. N. Irvine | 94 C/W | Complete sampling and mapping of ultrabasic rocks in the Lay Range. |
| J. E. Reesor and E. Froese | 82 L/1, parts of 82 L/9 and 82 K/4 | Study of granitoid and metamorphic rocks of the Pinnacle Peaks area. |
| J. A. Fortescue, E. H. W. Hornbrook, and L. Usik | Central and southern British Columbia | Biogeochemistry — test field methods by surveys over known mineral deposits. |
| R. B. Campbell | 93 H | Structure and stratigraphy of the Cariboo Mountains. |
| C. A. Giovanella | Parts of 83 D/11E, 83 D/6E, 83 D/7W, 83 D/10W | Complete study of structure and metamorphism of the gneisses straddling the Rocky Mountain Trench. |
| J. E. Muller | Part of 92 F | Complete Alberni map-area. |
| J. G. Souther | Parts of 104 G/7, G/10, G/15, G/16 | Volcanology of Mount Edziza area. |
| F. G. Young | Parts of 93 H, A, 83 E | Structure and stratigraphy of the Cariboo and Gog Groups. |
| J. O. Wheeler | 82 K/W | Structure and metamorphism of the Monashee Mountains. |
| J. W. H. Monger | Parts of 104 J, 104 N, 104 K | Structure and Permian stratigraphy of part of the Atlin Horst. |
| J. A. Roddick, W. W. Hutchison, and S. L. Blusson | 92 M, 92 N, 92 L, 92 K, 92 J, 92 G/W, 92 F | Reconnaissance in Coast Mountains south of latitude 52 degrees north. |
| H. W. Tipper and J. A. Jeletzky | Northeastern part of 92 N | Mezozoic stratigraphy and structure, Mount Waddington area. |
| B. E. Lowes | Parts of 92 H/5 and 92 H/12 | Structural study of the Cascade Mountains. |
| H. R. Balkwill | 82 N/7W and parts of N/7E, N/2, N/10W, N/6E | Structural analyses of the western ranges of the Rocky Mountains in the Golden area. |
| J. E. Armstrong and S. F. Leaming | 93 G | Surficial geology of the Prince George area. |
| R. J. Fulton | Columbia and Kootenay Valleys | Surficial geology of the reservoir area in the Columbia and Kootenay River valleys. |
| J. D. Aitken | Part of 82 N | Palæontology and stratigraphy of the Burgess shale. |
| W. H. Fritz | Eastern Cordillera in British Columbia and Alberta | Cambrian biostratigraphy in the eastern Cordillera. |
| R. Mulligan | 104 O, 104 P | Metallogeny of the Cassiar batholith. |

### Publications of the Geological Survey

All current publications of the Geological Survey of Canada relating to British Columbia were added to the library of the British Columbia Department of Mines and Petroleum Resources in 1967.

## MINES BRANCH

The Mines Branch has divisions concerned with mineral dressing and process metallurgy, physical metallurgy, radioactivity, and fuels. Current publications of the Mines Branch pertaining to British Columbia were added to the library of the British Columbia Department of Mines and Petroleum Resources in 1967.

## MINERAL RESOURCES DIVISION

The Mineral Resources Division publishes studies on mineral resources, mineral economics, mineral legislation, mineral taxation, mining technology, and miscellaneous subjects related to the mineral industry. Current publications of the Mineral Resources Division were added to the library of the British Columbia Department of Mines and Petroleum Resources in 1967.

## OBSERVATORIES BRANCH

The Observatories Branch operates a magnetic observatory at Victoria. Services available to geophysical exploration companies and other interested agencies include:—

(*a*) Three-hour range indices of magnetic activity; these provide a measure of the intensity of the magnetic disturbance (on a 0–9 scale) for each three-hour period. The monthly listings of these indices are normally mailed within a few days after the end of each month.

(*b*) Copies of magnetograms are available through a local duplicating firm at a charge of $7.50 for a monthly set. These recordings of the magnetic field can be used to control field surveys, in particular to correct for the diurnal changes and magnetic disturbances. The area over which this control is valid depends on the required accuracy; for $\pm 5$ gamma accuracy, it covers an elliptic region reaching roughly as far as longitude 118 degrees to the east and latitude 50.5 degrees to the north.

Further details can be obtained by writing to the Officer-in-charge, Victoria Magnetic Observatory, R.R. 7, Victoria, B.C.

# LODE METALS

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# GENERAL REVIEW OF METAL MINING AND EXPLORATION

By Stuart S. Holland

*Production.*—Metal production in British Columbia in 1967 set a new record with a value of $235,932,026, an increase of 12.9 per cent over 1966. This increase over the previous year's record was very largely the result of a tremendous increase in copper production, accompanied by increases in molybdenum and silver and despite further decreases in lead and zinc.

The quantity of gold produced again increased slightly over that of the previous year despite the closure in March of the Aurum mine at Wells. The gain in production was very largely from by-product gold contributed by the Granisle copper mine, the Lynx copper-zinc-silver mine, and other base-metal operations. Their increasing contribution is reflected in the fact that in 1967, 53.5 per cent of the gold production came from base-metal mines, compared with 39 per cent in 1966.

Silver production, which in 1966 began to increase after having been declining steadily since 1950, increased a further 11.3 per cent, a direct result of the contributions of the Lynx and Horn Silver mines, both new producers in 1967.

Copper production increased by 63.2 per cent to 172.7 million pounds. As the Province's number one metal, its value is more than twice that of zinc, which now ranks second. This tremendous additional production came from the first full year's operation at Granisle, from new operations at the Tasu and Lynx mines, and from increased capacity at Bethlehem.

The future for copper-mining is bright, and one can look forward to a full year's production from the Tasu mine in 1968, the probable opening of the Brenda mine in 1969, and of the Granduc mine either in late 1969 or 1970.

Production of lead and zinc, which is dominated by the Sullivan, Bluebell, Jersey, and Reeves MacDonald mines, declined again. The lead production of 208 million pounds was only slightly down, but a 13.8-per-cent reduction in zinc to 262 million pounds reflected the closure of the H.B. mine in November, 1966. The Mineral King mine at Windermere closed in December, 1967, and its lost production in 1968 will contribute to the downward trend.

The production of iron concentrates increased slightly. New production from the Tasu mine on Moresby Island compensated for the closure of the Empire (Merry Widow and Kingfisher) mine. Brynnor mine ceased mining operations at the end of 1967, but milling will continue into 1968.

The quantity of molybdenum increased by 2.3 per cent. Production at Endako was only slightly greater than in 1966 despite a 21-per-cent increase in tonnage treated, and new production from the Alice mine was still small because of metallurgical difficulties. The effect of a full year's operation at the Alice and of greatly increased tonnage at Endako should be apparent in the 1968 production.

The year's record production of metal was contained in 25,869,520 tons of ore mined at 64 mines. Of these, six produced more than 1 million tons each, 17 produced more than 100,000 tons each, and 13 produced more than 1,000 tons.

Ore produced from 12 open-pit mines in total amounted to more than 16 million tons. Both the largest and second largest mines in the Province, Endako at 6,773,000 tons and Bethlehem at 3,948,134 tons, are open-pit operations. The largest underground mines are the Sullivan at 2,456,037 tons and the Texada at 1,380,000 tons.

In 1967, 35 concentrating mills were in operation: 11 treated silver-lead-zinc ore, 7 treated copper ore, 3 treated copper-iron ore, 2 treated copper-zinc ore, 1 treated nickel-copper ore, 4 treated iron ore, 4 treated molybdenum ore, 3 treated gold-silver ore, and in addition a mercury retort handled a small tonnage of ore from the Yalakom River.

In 1967 three new mills were completed and production was started at the Tasu mine by Wesfrob Mines Limited, at the Alice mine by British Columbia Molybdenum Limited, and at the Horn Silver mine by Utica Mines Ltd. In addition, a small mill was set up at the Silver Standard mine and operated for a short time, and mining and milling were resumed by Cowichan Copper Co. Ltd. Continuous production began at the Lynx mine by Western Mines Ltd. in January, 1967.

The capacity of the mill at Endako Mines Ltd. was enlarged from 17,000 to 24,000 tons per day, at Bethlehem Copper Corporation Ltd. from 10,000 to 12,000 tons per day, and at Granisle Copper Limited from 5,000 to 6,000 tons per day.

During the year, mining and milling operations were terminated by Aetna Investment Corporation Limited, by The Cariboo Gold Quartz Mining Company Limited, by Empire Development Company Limited, by Giant Soo Mines Limited, and by Minoca Mines Ltd. Mining ceased at Brynnor Mines Limited, Kennedy Lake mine, although milling will continue in 1968 until the stockpiled ore is exhausted. The Mount Washington Milling Co. Ltd., whose mine closed in 1966, completed the milling of stockpiled ore in March, 1967.

At the year's end, new mills were under construction by Brenda Mines Ltd. to treat copper-molybdenum ore and by Cominco Ltd. (Pinchi Lake mine) to treat mercury ore.

The Trail smelter, owned and operated by Cominco Ltd., received 128,762 tons of lead concentrates and 154,010 tons of zinc concentrates from its two British Columbia mines. It treated on a custom basis 6,403 tons of lead concentrates and 5,562 tons of zinc concentrates from nine British Columbia mines, 13,650 tons of crude ore from 23 British Columbia mines, and 1,530 tons of gold-silver concentrates from two British Columbia mines. The smelter also treated a large tonnage of ore, concentrates, and scrap from sources outside the Province, of which the company's Pine Point mine was the main contributor.

Products exported to American smelters were: Copper concentrates, 11,667 tons; copper matte, 367 tons; lead concentrates, 13,552 tons; zinc concentrates, 65,154 tons. The value of these was $17,456,695, a decline from last year, and was about 7.4 per cent of the 1967 metal production of the Province.

Concentrates exported to Japanese smelters were: Copper concentrates, 283,020 tons; iron concentrates, 1,982,030 tons; nickel-copper concentrates, 22,777 tons; zinc concentrates, 14,010 tons. The value of these concentrates was $112,071,759, up $32,663,079 from 1966, and was about 47.5 per cent of the value of 1967 metal production of the Province.

*Development.*—Pre-production development, including mine preparation, concentrator construction, and the provisions of transportation, power, and other necessary facilities culminated in 1967 with the coming into production of the Tasu iron-copper mine of Wesfrob Mines Limited at a rate of 8,000 tons per day, the Alice molybdenum mine of British Columbia Molybdenum Limited at a rate of 6,000 tons per day, and the Horn Silver mine of Utica Mines Ltd. at a rate of 400 tons per day.

Development of Granduc continues, the Leduc camp was occupied, and a considerable amount of underground work was done at the mine. At the Tide Lake camp the main access tunnel was driven to a total length at the year's end of 34,296 feet.

Preparations were begun during the year for bringing the Brenda copper-molybdenum mine into production at a rate of 24,000 tons per day. It is expected that production will begin in 1969.

Cominco Ltd. began work preparatory to bringing the Pinchi Lake mercury mine into production in 1969 at 800 tons per day.

Statistical returns received from mining companies indicate that in 1967 about $32 million was spent on pre-production mine development and preparation and on additions to existing plant capacity by Wesfrob Mines Limited, Granduc Mines, Limited, Endako Mines Ltd., British Columbia Molybdenum Limited, Bethlehem Copper Corporation Ltd., Cominco Ltd., and other companies.

*Exploration.*—The number of mineral claims recorded in 1967 was considerably less than in 1966, the record year. In 1967, 51,278 mineral claims were recorded, a decrease of 44 per cent from the 91,703 recorded in 1966. Only two mining divisions recorded more claims in 1967 than in the previous year: the 3,068 in Nanaimo reflected the staking activity engendered by the favourable results of exploration at the Bay on Holberg Inlet, and the 1,363 in Revelstoke reflected the activity surrounding the molybdenite occurrence on Mount Copeland. The number of recordings in Skeena was about the same as in 1966 but that in all other mining divisions was less.

On the other hand, the number of certificates of work issued reached a new record of 68,910, an increase of 22.5 per cent over 1966. The increase in the number of certificates of work issued is a better measure of the increased amount of exploration work currently being done than is the number of new claims recorded.

The number of free miners' certificates was down to 8,780 in 1967 from the previous record of 10,086 in 1966.

In order to obtain information about exploration in the Province and to provide some statistics useful to the industry, the Department for the past several years has mailed a questionnaire to mining exploration companies. It is thought that by this means a useful record and a reasonably good coverage of activities can be obtained.

In 1967 Departmental exploration forms were sent out to 895 registered companies and replies were received from 574 (or from 64 per cent). The information supplied indicates that 277 companies were inactive in 1967 and that 297 companies were actively engaged in exploration of 440 properties.

Properties on which major exploration programmes were being undertaken were the Lornex and Highmont copper-molybdenum deposits in Highland Valley, the Copper Mountain and Ingerbelle copper deposits at Princeton, the Bay copper-molybdenum deposit at Holberg Inlet, and the Glacier Gulch molybdenum deposit on Hudson Bay Mountain at Smithers. In 1967 more than 10,000 feet of diamond drilling and (or) percussion drilling was done at each of the following: The Cariboo Bell, Bethlehem, June, Morrison, Newman, Copper Mountain, and Ingerbelle copper properties; the Lornex, Highmont, Bay, and Berg copper-molybdenum properties; the Bam copper-silver property; and the Red Bird, Huber, Glacier Gulch, Nu-Elk, Moly, Giant, and Golden Queen molybdenum properties.

Information provided to the Department by exploration companies regarding the work done by them on 440 properties is summarized in Table 13. Of the 440 properties enumerated, geological mapping was done at 210, geophysical surveys at 188, and geochemical surveys at 189; this work in many instances was preparatory to surface work being done at 180 and drilling of one sort or another done at 203. On only 6.5 per cent of the properties was underground exploration work undertaken.

In 1967 more drilling was done than in the previous year, amounting to not less than 687,987 feet of diamond drilling and 142,539 feet of percussion drilling.

The exploration companies also reported that a total of not less than 12,000 man-months were expended in the field on exploration by company and contractor employees.

Statistical returns received from mining exploration companies indicate that about $28 million was spent in the exploration of 440 properties.

TABLE 13.—SUMMARY OF EXPLORATION INFORMATION

| Mining Division | Type of Work Done | | | | | | | | | | Employment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Properties | Geological Mapping | Geophysical Surveys | Geochemical Surveys | Surface Work | Underground Work | Surveys and Mapping | Number of Properties Drilled | Drilling: Diamond (Ft.) | Drilling: Percussion (Ft.) | By Company Man-mos. | By Contractor Man-mos. |
| Alberni | 12 | 5 | 7 | 3 | 5 | ...... | 4 | 6 | 11,230 | ...... | 134 | 67 |
| Atlin | 6 | 2 | 4 | 1 | 2 | ...... | 1 | 3 | 10,000 | ...... | 116 | 123 |
| Cariboo | 21 | 8 | 10 | 9 | 5 | 1 | 3 | 11 | 30,507 | 11,255 | 249 | 259 |
| Clinton | 10 | 4 | 6 | 5 | 6 | ...... | ...... | 3 | 5,611 | 4,620 | 124 | 70 |
| Fort Steele | 10 | 6 | 5 | 7 | 2 | 1 | 5 | 3 | 11,986 | ...... | 114 | 146 |
| Golden | 7 | 3 | 1 | 2 | 5 | ...... | 3 | 3 | 1,236 | ...... | 30 | 22 |
| Greenwood | 21 | 12 | 14 | 6 | 6 | ...... | 4 | 12 | 13,079 | 8,366 | 108 | 121 |
| Kamloops | 58 | 25 | 27 | 32 | 25 | 5 | 22 | 26 | 91,984 | 73,651 | 941 | 1,692 |
| Liard | 22 | 10 | 11 | 2 | 9 | 2 | 3 | 11 | 46,538 | ...... | 285 | 316 |
| Lillooet | 8 | 3 | 2 | 1 | 7 | 2 | 1 | 3 | 135 | 1,165 | 110 | 18 |
| Nanaimo | 11 | 5 | 5 | 2 | 3 | ...... | 3 | 5 | 21,549 | 1,414 | 286 | 240 |
| Nelson | 9 | 4 | 3 | 3 | 2 | 2 | 3 | 4 | 6,249 | ...... | 122 | 35 |
| New Westminster | 14 | 5 | 3 | 4 | 1 | 2 | 2 | 8 | 16,582 | 460 | 208 | 117 |
| Nicola | 30 | 13 | 18 | 12 | 14 | ...... | 12 | 18 | 17,929 | 5,413 | 349 | 225 |
| Omineca | 89 | 44 | 38 | 54 | 40 | 3 | 21 | 36 | 159,347 | ...... | 915 | 840 |
| Osoyoos | 19 | 8 | 5 | 12 | 7 | ...... | 5 | 7 | 12,248 | 1,075 | 457 | 107 |
| Revelstoke | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 2,000 | ...... | 100 | 106 |
| Similkameen | 12 | 3 | 7 | 5 | 8 | 2 | 9 | 7 | 66,225 | 35,120 | 333 | 687 |
| Skeena | 30 | 22 | 8 | 9 | 8 | 2 | 12 | 14 | 48,755 | ...... | 423 | 419 |
| Slocan | 16 | 8 | 1 | 44 | 10 | 3 | 8 | 7 | 18,928 | ...... | 302 | 168 |
| Trail Creek | 9 | 5 | 4 | 3 | 5 | 1 | 1 | 6 | 78,035 | ...... | 125 | 142 |
| Vancouver | 16 | 9 | 7 | 6 | 6 | 2 | 7 | 8 | 17,238 | ...... | 114 | 122 |
| Vernon | 4 | 2 | 1 | 3 | 2 | ...... | 1 | 1 | 596 | ...... | 8 | 3 |
| Victoria | 3 | 2 | ...... | 3 | 1 | ...... | ...... | ...... | ...... | ...... | 54 | ...... |
| Totals | 440 | 210 | 188 | 189 | 180 | 30 | 132 | 203 | 687,987 | 142,539 | 6,007 | 6,045 |

Much of the detailed information supplied by the exploration companies is incorporated in the " Notes on Metal Mines," which are written by Departmental staff, with or without benefit of making property examinations. The " Notes " also contain geological reports by staff geologists on some of the major newly discovered and currently explored mineral deposits of the Province. Amongst them are important reports on the Brenda Lake area, page 183; Emerald Glacier, page 110; Fog, Fly, page 97; Glacier-dammed Summit Lake, page 38; Iron Mask batholith, page 137; Knox, page 261; Kofit, page 105; Norcan (Joker), page 91; Northstar, page 86; Red Mountain, page 236; and others. Reports such as these provide basic information on the geology and mineral resources of the Province and publicize the geological features essential to efficient mineral exploration. Additional geological, geophysical, and geochemical data are contained in "Assessment Reports," details of which are given on pages 275 to 292. Details of newly released aeromagnetic maps are given in the section on Departmental Work.

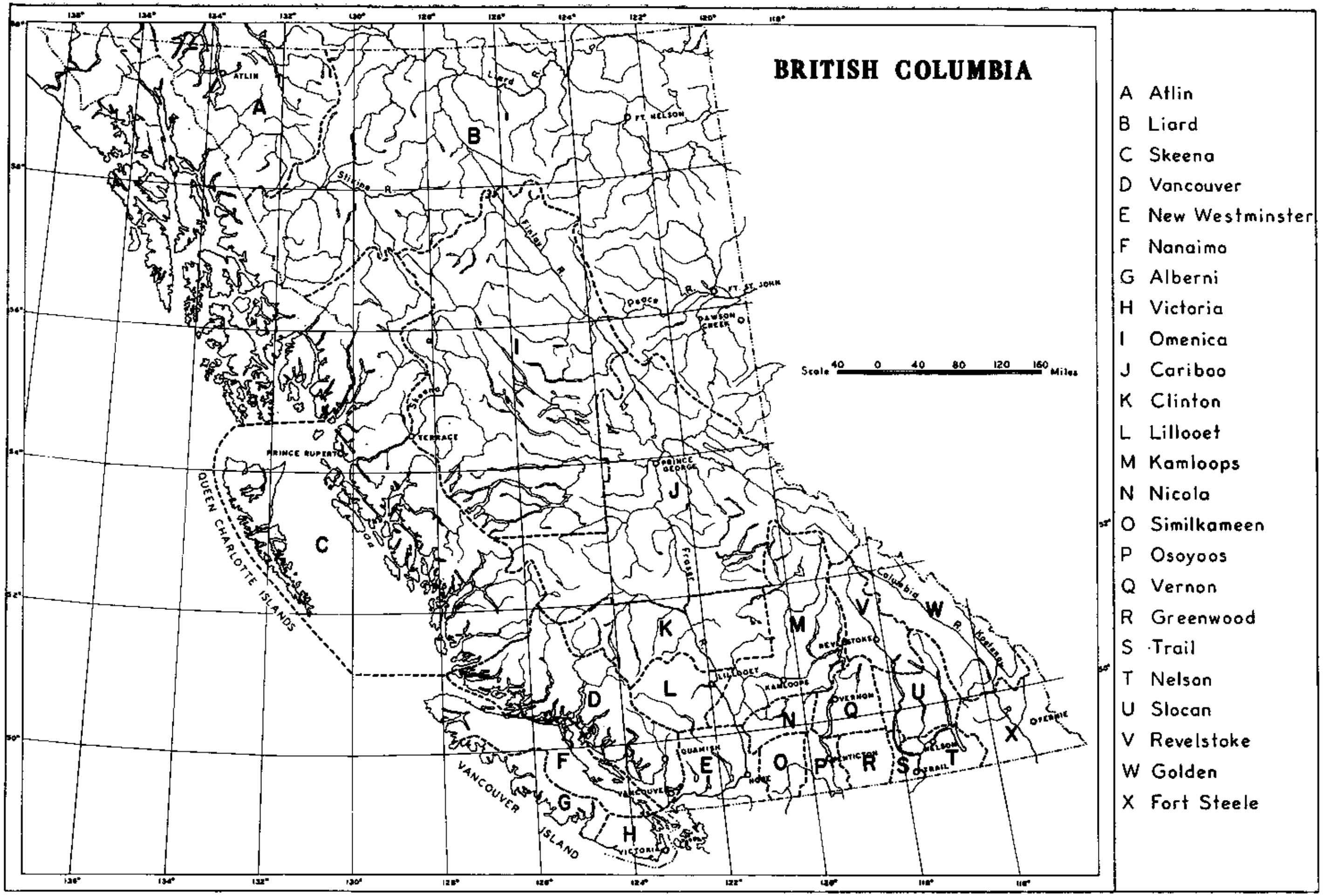



Figure 2. Index map showing mining divisions.

# NOTES ON METAL MINES

## ATLIN MINING DIVISION

*Copper*

### HAINES ROAD

**Sheep**
*Rogue Point Mines Ltd.*
By H. Bapty

(59° 137° N.E.) Company office, 409, 612 View Street, Victoria. The Sheep and other groups totalling 42 claims are on Squaw Creek 12 miles northwest of Mile 87 on the Haines road. They are between altitudes of 3,000 and 5,000 feet and can be reached by truck-road. They were held under option by Rogue Point Mines Ltd. Work was supervised by Harold Jones, exploration manager. A three-man crew spent five months on the property. Six holes totalling 650 feet were diamond drilled. Airborne magnetometer and electromagnetic surveys were made of the 42 claims by C. B. Selmser.

*Silver-Lead-Zinc-Copper*

### ATLIN

**Atlin-Ruffner, Silver, Barber, Big Canyon**
*Interprovincial Silver Mines Ltd.*
By H. Bapty

(59° 133° N.W.) Company office, 112A, 355 Burrard Street, Vancouver 1; mine office, Atlin. J. C. Snell, president; J. J. Oberbillig, operations manager; D. D. Campbell, consultant. Interprovincial Silver Mines Ltd. holds 147 recorded mineral claims covering and surrounding the old Atlin-Ruffner mine. Some of the claims have been recorded by Interprovincial Silver Mines Ltd.; others have been leased from the Ruffner mine and from Armore Mines Limited. Twenty-five Canuck claims, two Ed claims, four A claims, and two Big Canyon claims have been acquired from Eberhard Mueller, R. C. J. Newson, and J. C. Snell. The claims are on Fourth of July Creek between 3,500 and 6,000 feet elevation 10 miles northeast of Atlin. During the year four company employees and 10 contractors were at the property.

Surface and underground workings were mapped, 16 trenches totalling 16,000 lineal feet were bulldozed, 10 miles of road was built, an exploration camp was constructed, and 45 holes totalling 9,200 feet were diamond drilled. The property is accessible by 8 miles of mine road leading east from the Atlin road.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 17.]

*Uranium*

**Beaver, Loon**
*Jason Explorers Ltd.*
By H. Bapty

(59° 133° N.W.) Company office, 1170 Bentall Centre, 505 Burrard Street, Vancouver 1. The Beaver, Loon, and other groups, totalling 22 recorded claims, are on the west side of Atlin Lake on Deep Bay 12 miles north of Atlin. The claims cover the old Husselbee uranium prospect, referred to in the Annual Report of the Minister of Mines for 1953, page 79. Three or four men, under the supervision of Alex Smith, field engineer, spent three months on the property mapping the surface workings, running a scintillometer survey over the Beaver 1 to 4 mineral claims, and blasting a trench 30 feet long. The property may be reached by boat from Atlin.

*Copper*

**Kim, Alice, Nel, Kathy**
*O'Keefe Mountain Mines Ltd.*
By Stuart S. Holland

(59° 133° S.E.) Company office, 440, 890 West Pender Street, Vancouver 1. The Kim, Alice, Nel, and Kathy groups, totalling 34 claims, are on the north slope of O'Keefe Mountain, about 30 miles by helicopter southeast of Atlin.

In 1967 work under the supervision of MacDonald Consultants consisted of geological mapping and electromagnetic surveys of the claims, and soil and silt sampling for geochemical analysis.

*Antimony*

### TULSEQUAH

**Anty**
*New Taku Mines Limited*
By H. Bapty

(58° 133° N.E.) Company office, 401, 1033 Davie Street, Vancouver 5. L. G. White, director. The Anty group of 10 recorded mineral claims is on the south side of Stuhini Creek, 2 miles south of Tulsequah at elevation 1,200 to 1,250 feet. Two men were employed for a short time during the summer on geological mapping. Transportation is by float-plane from Juneau, Alaska.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1965, p. 9; Assessment Report No. 1165.]

*Molybdenum-Lead-Zinc-Copper*

**Pat**
*Mt. Ogden Mines Ltd.*
By H. Bapty

(58° 133° S.E.) Company office, 409, 612 View Street, Victoria. The Pat group of 156 mineral claims, held by record, are on Mount Ogden between elevations of 4,500 and 6,500 feet and are 16 miles from Tulsequah. Ten men spent four months on the property under the supervision of Carl Erickson. Three holes totalling 150 feet were diamond drilled. Airborne magnetometer and electromagnetic surveys were made of all the claims by C. B. Selmser. The property was serviced by air.

## LIARD MINING DIVISION

### ALASKA HIGHWAY

*Silver-Lead-Zinc*

#### Tootsee River

**Silvertip A, B, C, D, Rod, Ruby**
*Silverknife Mines Ltd.*
By W. G. Clarke

(59° 130° N.E.) Company office, 409, 612 View Street, Victoria. The Silvertip group of 112 claims, optioned by Silverknife Mines Ltd., is 2 miles northeast of Tootsee Lake and 17 miles south of Mile 701 on the Alaska highway. It is accessible by road suitable for four-wheel-drive vehicles. Four men spent five months on the property under the supervision of Harold James, exploration manager. Two holes totalling 600 feet were diamond drilled and airborne magnetic and electromagnetic surveys were made by C. B. Selmser.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 17.]

*Copper*

#### Delano Creek

**Magnum**
*Churchill Copper Corporation Ltd.*
By W. G. Clarke

(58° 125° N.E.) Company office, 401, 1111 West Hastings Street, Vancouver 1. The Magnum property numbers 71 claims comprising the Me, Don, Mac, and others and is at the headwaters of Delano Creek, between 6,200 and 6,500 feet elevation. It is a relocation of Al, Cariboo, and Canyon claims, originally held by Magnum Copper Limited. The property is accessible by 40 miles of truck-road from Mile 419 on the Alaska highway. Chalcopyrite occurs in fissure veins of quartz and calcite in slate and siltstone. The claims were surveyed in 1967, but the main work consisted of driving a crosscut, two drifts, and a raise totalling 1,885 feet. Thirty BX core-size holes were diamond drilled from the underground workings; the total footage was 1,681 feet. The access road was rebuilt at the beginning of the season and maintained throughout. Four frame buildings were erected at the camp and several bunkhouse trailers were used. Eighteen men worked for seven months under the direction of E. S. Holt, geologist for Chapman, Wood & Griswold Ltd.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1959, p. 21.]

## LITTLE RANCHERIA RIVER

*Copper*

**Ace**
*Cassiar Asbestos Corporation Limited*
By W. G. Clarke

(59° 129° N.W.) Company office, Cassiar. The Ace group of 104 claims, optioned from R. Clary, P.O. Box 43, Watson Lake, Yukon Territory, is on One Ace Mountain, 28 miles by tractor-trail from Mile 12 on the Cassiar road. Six men spent one month under the supervision of D. R. Budinski, geologist, improving and building access roads, bulldozing a trench 1,100 feet long, stripping a total of 67,000 square feet, and drilling and blasting nine pits.

## CASSIAR

*Silver-Lead-Zinc*

**Atan, Adair**
*Tournigan Mining Explorations Ltd.*
By W. G. Clarke

(59° 129° S.E.) Company office, 5, 2167 West 38th Avenue, Vancouver 13. The Atan and Adair groups consist of 47 claims 2 miles northeast of McDame Post. They are accessible from Good Hope Lake by a trail 10½ miles in length. The property was formerly known as the Carlick group. Three men spent two months on the property. An airborne electromagnetic survey of the property was made.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 71–72.]

*Silver-Lead-Zinc*

**Luna**
*Bartle Explorations Ltd.*
By W. G. Clarke

(59° 129° S.E.) Company office, 360 Raymond Avenue, Richmond. The Luna group of eight claims is on the southeast side of Mount Haskins. It is accessible by 4 miles of trail from Mile 69 on the Cassiar highway. John Bartle, president of Bartle Explorations Ltd., spent two months prospecting and hand trenching.

*Molybdenum*

**Hazel, Eloise, Rusty**
*Value Line Minerals Ltd.*
By W. G. Clarke

(59° 130° N.E.) Company office, 202, 509 Third Street Southwest, Calgary, Alta. S. M. Paulson, president and owner. The Hazel, Eloise, and Rusty groups of 99 claims are at the head of Lang Creek, 6 miles south-southwest of Cassiar, and are accessible by road suitable for four-wheel-drive vehicles. A crew of five to seven men spent two months prospecting and mapping the geology of the claim group. At the end of the year 10 men were employed collaring an adit and establishing a camp at 6,300 feet elevation. The camp consists of a 12-man bunkhouse, a compressor building, a sampling shack, and dynamite and cap magazines.

*Silver-Lead-Copper*

**Bass, Vines, Spring, Etc.**
*Crown Point Exploration Ltd.*
By W. G. Clarke

(59° 129° S.W.) Company office, 808 Bank of Montreal Building, Edmonton, Alta. This 82-claim group, consisting of the Fonda, Vines, Salvage, Crown Point, Eagle 51, Delrio, Golden, Northern Queen, Silver Queen, Clay, and Spring recorded mineral claims, is 1 mile by road from the town of Cassiar. Three men worked for five months geological mapping, making a magnetometer survey, and diamond drilling 11 holes totalling 2,149 feet.

## DEASE LAKE

*Molybdenum*

**Horn**
*United States Smelting, Refining and Mining Company*
By H. Bapty

(58° 129° S.W.) Company office, 935, 470 Granville Street, Vancouver 2. R. D. Westervelt, western manager; R. W. Woolverton, geologist. The Horn group of 45 recorded mineral claims is southeast of Dease Lake and south of Tanzilla Butte at elevations 3,800 to 4,900 feet. Electromagnetic, magnetometer, and induced polarization surveys were run over the north central quarter of the claims. The property is reached by helicopter and is 5 miles from the Stewart–Cassiar road.

[Reference: Assessment Report No. 1130.]

**AB**
*United States Smelting, Refining and Mining Company*
By H. Bapty

(58° 129° S.W.) Company office, 935, 470 Granville Street, Vancouver 2. R. D. Westervelt, western manager; R. W. Woolverton, geologist. The AB group of 30 recorded claims lies southeast of Dease Lake at elevation 4,000 feet between Gnat Lakes and Tanzilla River. The claims can be reached by a mile of trail from the Stewart–Cassiar road. Three employees spent a few weeks running a magnetometer survey and polarity determinations. Two trenches totalling 800 feet in length were bulldozed. A strong negative magnetic anomaly was found to be caused by diverse polarization in a flat-lying Tertiary volcanic flow.

*Copper*

**Moss**
*Lytton Minerals Limited*
By W. G. Clarke

(58° 129° S.W.) Company office, 519, 602 West Hastings Street, Vancouver 2. D. W. Asbury, chief geologist. The Moss group of 67 claims, owned by Lytton Minerals Limited, is 16 miles south of Dease Lake on the west side of Gnat Lake and is crossed by the Cassiar–Stewart road. Under the direction of J. Boyd and M. Bradford, geologists, geological, magnetometer, induced polarization, and geochemical surveys were carried out and two holes totalling 846 feet were diamond drilled.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 19; Assessment Report No. 1106.]

*Copper*

**June, Stikine, September, Etc.**
*Deas Lake Mines Ltd.*
By W. G. Clarke

(58° 129° S.W.) Company office, 915, 1030 West Georgia Street, Vancouver 5. D. W. Asbury, chief geologist. The June, Stikine, September, etc., groups, totalling 80 claims, owned by Deas Lake Mines Ltd., are 16 miles south of Dease Lake adjacent to the Cassiar–Stewart road. The property lies north and east of Gnat Lake at an elevation of 4,000 feet. A crew of 16 to 20 men spent seven months under the supervision of J. Boyd and M. Bradford, geologists, diamond drilling 41 holes totalling 22,036 feet and running induced polarization and magnetic surveys. The geology of the 35 September claims was mapped, and a geochemical survey was made of the September group.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 19–20.]

*Molybdenum*

**Joyce**
*United States Smelting, Refining and Mining Company*
By H. Bapty

(58° 129° S.W.) Company office, 935, 470 Granville Street, Vancouver 2. R. D. Westervelt, western manager, R. W. Woolverton, geologist. The Joyce group of 24 recorded mineral claims is at 5,500 feet elevation on Horn Mountain 10 miles east of the Stewart–Cassiar road. Six men and one contractor spent a month on the property. The geology was mapped, electromagnetic, magnetometer, and induced polarization surveys were run over the eastern half of the claims, and one 8-foot pit was dug. The property was serviced by helicopter.

*Copper*

**Mac**
By W. G. Clarke

(58° 129° N.W.) The Mac group of 20 claims, located by K. Willison, of Watson Lake, lies between the Eagle and Little Eagle Rivers 11 miles east of the south end of Dease Lake. It is accessible by 6 miles of trail from Fish Lake. M. A. Roed made a geological examination of the Mac 1 to 4 claims.

[Reference: Assessment Report No. 1105.]

## TURNAGAIN RIVER

*Copper-Nickel*

**Turn, Pyrrhotite, Cobalt**
*Falconbridge Nickel Mines Limited*
By W. G. Clarke

(58° 128° S.W.) Western office, 500, 1112 West Pender Street, Vancouver 1. The Pyrrhotite and Cobalt claims and the Turn group of 76 claims are on the Turnagain River south of Cry Lake 55 miles by air or by cat train from Dease Lake. Seventy-six Turn claims are owned by the company. The Pyrrhotite claim is optioned from W. Thompson and the Cobalt claim from E. Larsen. Five men spent four months diamond drilling 13 holes totalling 4,307 feet.

*Nickel-Copper*

**Flat**
*Cassiar Asbestos Corporation Limited*
By W. G. Clarke

(58° 128° S.W.) Company office, Cassiar. The Flat group of 46 claims, owned by Cassiar Asbestos Corporation Limited, is on the Turnagain River 1 mile below the mouths of Hard Creek and Flat Creek, and is 44 miles by air from Dease Lake. Six men spent two weeks under the direction of W. N. Plumb, chief geologist, making geological and airborne magnetic surveys.

[Reference: Assessment Report No. 1077.]

*Silver-Lead-Zinc*

**Ram, Sheep**
*Rip Van Mining Ltd.*
By W. G. Clarke

(58° 128° N.E.) Company office, 020, 640 Seventh Avenue Southwest, Calgary, Alta. The Ram and Sheep groups of 40 claims, owned by Rip Van Mining Ltd., are on the Turnagain River about 60 miles east of Dease Lake. The property is reached by helicopter from Watson Lake, 120 miles away. Two men spent two months under the direction of S. J. Hunter, consultant, digging three trenches totalling 225 lineal feet.

## STIKINE RIVER

*Copper*

### GALORE CREEK

**GC, HAB, BUY**
*Stikine Copper Ltd.*
By H. Bapty

(57° 131° S.E.) Company office, 730, 505 Burrard Street, Vancouver 1. J. H. McAusland, engineer. The Galore Creek copper property comprises a group of 300 recorded mineral claims lying between 1,800 and 4,500 feet elevation in the basin of Galore Creek. Three company employees and 30 contractors spent several months on the property. Seven diamond-drill holes totalling 534 feet were drilled and 280 feet of drift was driven.

There is an airstrip at the camp, at the mouth of Galore Creek, and at the mouth of the Scud River. The camp is serviced by Stikine River barge, helicopter, and fixed-wing aircraft.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 25.]

*Gold-Silver-Copper-Molybdenum*

### CHUTINE LAKE

**Tap, Gay**
*Coast Silver Mines Ltd.*
By Stuart S. Holland

(57° 132° N.E.) Company office, 660, 890 West Pender Street, Vancouver 1. The Tap group of 140 claims and the Gay group of 42 claims are in a block on the east side of Triumph Creek, 14 miles southeast of Chutine Lake. The claims are accessible by boat or float plane from Wrangell or Telegraph Creek to Chutine Lake thence by helicopter or trail to the property.

It is reported that gold, silver, and copper values occur in pyrrhotite zones at the contact of the Coast Intrusives with Permian limestone and that molybdenite occurs in fractures within the granitoid rocks.

In September, 1967, part of the claims was covered by a helicopter-borne electromagnetic survey.

*Copper*

### ANUK RIVER

**Devils Club**
*Anuk River Mines Ltd.*
By H. Bapty

(57° 131° S.W.) Company office, 709, 850 West Hastings Street, Vancouver 1. H. S. Lazenby, geologist in charge of work. The Devils Club group of 27 recorded mineral claims are 50 miles southwest of Telegraph Creek on the north side of Anuk River at 3,500 to 5,000 feet elevation. Four men worked for one month at the property. A topographic map was made and the surface workings surveyed; 10 of the claims were geologically mapped; and eight packsack diamond-drill holes totalling 694 feet were drilled. Transportation to the property is by river barge on the Stikine River or by float plane from Prince Rupert.

*Copper-Molybdenum*

### MESS CREEK

**Bird, Sno**
*Liard Copper Mines Ltd.*
By H. Bapty

(57° 130° S.W. and 57° 131° S.E.) Company office, 808, 602 West Hastings Street, Vancouver 2. W. St. C. Dunn, superintendent of exploration; T. C. Osborne, supervisor. The Bird, Sno, Bud, and other groups, totalling 141 recorded claims, are on Schaft Creek between 3,000 and 4,000 feet elevation. The claims are 36 miles south of Telegraph Creek. The property was under option to American Smelting and Refining Company, and work was being done by it until August, when the company announced the termination of the agreement. Two company employees and five contractors spent several months on the property. An induced polarization survey was run over 3 line miles on the Sno No. 10 and No. 12 claims, and two holes totalling 1,001 feet were diamond drilled. Transportation to the property was by Stewart-based aircraft.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 26–30.]

*Copper-Molybdenum*

**Nabs**
*Paramount Mining Ltd.*
By E. W. Grove

(57° 130° S.W.) Company office, 301, 470 Granville Street, Vancouver 2. W. H. Hudson, president. The property consists of a 34-claim group located 36 miles south of Telegraph Creek on the east side of Schaft Creek. Access to the property during 1967 was by fixed-wing aircraft from Stewart, about 120 miles to the south.

A crew of eight men supervised by R. H. Seraphim, consulting geological engineer, was employed for one month constructing a cat-road which extends the Liard Copper Mines Ltd. camp road, bulldozing 1,500 feet of trenches in overburden, and drilling one AX-size core hole to a depth of 501 feet.

A geologic map and descriptions of the property and adjoining ground are found in the Annual Report for 1966, pages 29 and 30.

[Reference: Assessment Report No. 900.]

*Copper-Silver*

**Bam**
*The Shawinigan Mining and Smelting Company Limited*
By E. W. Grove

(57° 130° S.W.) Exploration office, 1307, 1030 West Georgia Street, Vancouver 5. Douglas Parent, general manager. The property includes the Bam 15 and Bam 16 recorded claims, located west of Mess Creek about 2½ miles northwest of Arctic Lake.

Fifteen men supervised by Douglas Parent were engaged for a five-month period drilling 31 AXQ-size core holes totalling 11,589 feet. Work on the property was terminated in July, 1967. Local transportation was by contract helicopter and Bombardier. Access was from Stewart, 112 miles to the south.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1964, p. 18; 1966, p. 31; Assessment Report No. 695.]

### Iskut River

*Nickel-Copper*

**E and L**
*Nickel Mountain Mines Ltd.*
By E. W. Grove

(56° 130° N.W.) Company office, 808, 602 West Hastings Street, Vancouver 2. H. B. Gilleland, manager. Nickel Mountain Mines Ltd., controlled by Silver Standard Mines Limited, holds 41 claims at the head of Snippaker Creek, roughly on the divide between the Iskut and Unuk drainage. The property was serviced by fixed-wing aircraft from Stewart, about 65 miles to the southwest.

During 1967 a crew of five men worked five months improving the base camp at 2,800 feet elevation, landing-strip, and constructing 5 miles of cat-road upstream to the 5,000-foot elevation near the surface mineralization which outcrops at about 6,200 feet.

A geologic map and property description can be found in the Annual Report for 1966, pages 31 to 34.

[Reference: Assessment Report No. 741.]

## SKEENA MINING DIVISION

### UNUK RIVER

*Gold-Silver-Lead-Zinc*

**Kay**
*Stikine Silver Ltd.*
By E. W. Grove

(56° 130° N.E.) Company office, 4, 425 Howe Street, Vancouver 1. T. J. McQuillan, president. The company holds the Kay 1–36 claims, located on Prout Plateau about

3 miles east of Tom Mackay Lake near the head of the Unuk River. The claims are approximately 50 miles north-northwest of Stewart. Access to the area was by fixed-wing aircraft and helicopter.

In 1967 a six-man crew supervised by consulting geologist W. G. Stevenson completed geological and geophysical surveys of the claim group. They were compiled on a recent topographic map at the scale 1 inch to 500 feet.

The last previous work at the Kay group was in 1965, when the old workings were extended. The local geology and mineralization were described in the Annual Report of the Minister of Mines for 1953, pages 87 to 89.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1963, p. 10; 1964, p. 20; 1965, p. 44.]

*Copper-Molybdenum*

**Ted, Ray, Ran, Patty**
*Granduc Mines, Limited*
By E. W. Grove

(56° 130° S.E.) Company office, 1105, 900 West Hastings Street, Vancouver 1. The Sulphurets Creek property extends across the ridge separating Mitchell-Sulphurets Creeks, which flow westerly into the South Unuk River. The 85-claim group presently includes the Ted, Ray, Ran, and Patty claims. Sulphurets Creek is 20 miles north of the Granduc mine at South Leduc Glacier and about 13 miles north-northwest of Stewart.

E. Ostensoe, geologist, and one assistant spent two months at the property and were engaged in geologic mapping, stream silt-sampling, and trenching (14 trenches totalling 350 lineal feet). Access to the property was by helicopter from Stewart.

The mineralization presently under investigation was originally located and recorded as the Big Showing group by Bruce and Jack Johnstone, of Ketchikan, in 1935. Prospectors relocated the extensive mineralized zone again in 1955, but it was not recorded again until 1960 by Granduc Mines, Limited. Development work and exploration on this ground and adjacent properties have largely been summarized in the Annual Reports for 1960 to 1965.

## PORTLAND CANAL

*Copper*

### Tide Lake Flats

**Granduc Mine**
*Granduc Mines, Limited*
By H. Bapty

(56° 130° S.E.) Company office, 520, 890 West Pender Street, Vancouver 1; mine office, Stewart. M. A. Upham, president; N. Gritzuk, vice-president and general manager; D. E. Howard, resident manager. The Granduc mine is at the head of the Leduc River, 25 miles north-northwest of Stewart and between elevations of 2,500 and 4,000 feet. The property consists of 64 Crown-granted claims, 372 recorded claims, and two mineral leases. Granduc Operating Company leased the orebody of Granduc Mines Limited, effective October, 1965.

### *Leduc Camp*

The Leduc camp was operated from late March to early November.

The drainage adit, 9 by 11 feet, was driven 293 feet to a total distance of 6,993 feet from the portal and broke through to the 2475 level near the internal shaft at the mine.

On 2475 level a branch drift was completed to the future crushing-station and a raise driven from the crusher-station to the dump location at 2600 level. A ramp was driven 14 by 11 feet on a 20-per-cent grade to 2600 level, which is the break-through elevation of the Tide tunnel. Two short raises were driven to handle waste from the ramp. The bottom section of a main waste pass was driven to 2600 level elevation and a dump established for driving on 2600 level. A ventilation raise was driven from the crusher access drift to 2600 level.

On 2600 level the ramp was connected to the internal shaft and a shaft station established. Drives were started toward the Tide tunnel target, the orebodies, and to establish service areas in preparation for tunnel break-through. A start was made on continuation of the main waste pass above 2600 level using an electric Alimak.

On 3100 level the main adit was widened to accommodate rubber-mounted diesel mining equipment. Major development on this level included access to the main ramp area, starting to drive ramps both up and down from 3100 level, and starting the main intake airway drift, which will break through in a protected area of the mountainside, well in the footwall of the orebodies. The portal for this break-through was established from surface.

Total development for the year was 5,637 feet of advance and 78,380 cubic feet of slashing.

Major plant improvements during the year included re-establishing of the underground powerhouse on 3100 level, re-establishing service in the internal shaft, installing a main fan in the drainage tunnel, establishing maintenance facilities on both 2475 and 3100 levels, and establishment of a water-supply system for both mine and camp using mine water.

Major camp improvements included construction of a drill core storage building and geology office, a bunkhouse extension, a warehouse extension, a combined pumphouse and transformer building, and a cap magazine. The airstrip was lengthened to 1,400 feet. A new avalanche deflector mound was built above the airstrip. Eight new 17,500-gallon fuel tanks were erected. Camp water, sewer, fuel, and power services were completely rebuilt.

A total of 8,492 feet of diamond drilling was done, of which 5,107 feet was from surface and 3,385 feet was underground.

The crew at Leduc averaged 87 men, with a maximum of 129 men.

During March and April, 1,629 tons of freight was hauled by Nodwell carriers over the Salmon Glacier ice road from Troy camp to Leduc.

During the season 385 tons of freight was taken in by Otter and helicopter. All service was by Otter and helicopter.

*Tide Lake Camp*

This camp operated all year with no interruptions.

*Tunnel.*—The tunnel was advanced 16,310 feet to 34,296 feet from the portal. Slash for laybys and equipment amounted to 211,715 cubic feet. Total rock removed was 289,700 tons.

Diamond drilling to check ground conditions amounted to 638 feet.

Dual fans were installed at 18,500 feet, 28,500 feet, and 32,600 feet, each with a capacity of 16,000 cubic feet per minute and requiring 100 horsepower per set.

Sumps and pump-stations for supplying water for the face were excavated and installed at 18,200 and 27,750 feet from the portal.

The air-line was changed from 10 to 12 inches in diameter at 22,460 feet and a booster compressor installed at 27,825 feet from the portal.

The steel-shop was moved in 19,000 feet from the portal. The maintenance-shop was moved in 28,400 feet from the portal.

Additional rolling-stock put into use during the year included two 10-ton Goodman battery trolley locomotives, one 7-boom Jumbo, one 30-passenger man car, two 5-yard ballast cars, one powered reel car, one cable positioner car, two standard flat cars, and two lo-boy flat cars.

Major substations were installed at 18,000 and 28,000 feet in from the portal. A motor-generator set was installed at 28,000 feet in from the portal. Of particular interest was the installation, in from the portal for 28,000 feet, of individual conductors for permanent mine power.

A helium-neon gas laser was introduced to assist in tunnel survey control.

*Tail Track and Conveyor-way.*—A start was made on excavating the tail track, ore dump, storage bin, and conveyor-way. The conveyor-way will contain the conveyor leading from the underground bin to the surface crushing plant. A portal was established for this break-through during the summer season. At year's end 185 feet of access drift and 328 feet of tail track had been driven. A total of 7,400 tons of waste was trammed.

*Surface.*—New buildings added during the year included a mine-rescue and ambulance building, four 2-story 60-man bunkhouses, a recreation hall, the permanent powerhouse, a construction office, a carpenter-shop, and a second pump-house at the trailer park. Additions were made to the dry building and the old recreation building. A shelter was built to house portable compressors.

Two new diesel generators were installed, one in the old powerhouse and one in the new powerhouse. A 2,300-volt overhead power system was erected connecting the construction camp and the old and new powerhouses in a loop connection.

Site preparation for mill and service building, power house, and tank-sites was completed. Over 60 per cent of all concrete foundations was poured.

Preparations were made for control of the overflow of Summit Lake. These included construction of a reinforced-concrete control gate, a flume, a diversion wall, and abutments for two bridges. One of the bridges was completed and in use.

Drilling for permanent water supply continued, with eight wells being drilled in the Tide Lake Flats area, varying in size from 8 to 18 inches in diameter.

Total personnel in the mining camp averaged 188 men with a maximum of 211 men. Total personnel on construction reached a maximum of 400 men.

Tide Lake camp was serviced by road from Stewart. Total freight hauled excluding construction material was 8,400 tons.

The Stewart to Tide Lake road was relocated between Promontory and Troy, a distance of 5¼ miles, in order to eliminate a long snowslide area. Estimated rock-cut yardage is 408,400 cubic yards.

The road crew averaged 40 men and reached a peak of 60 men.

Stewart is serviced by weekly boat service from Vancouver and daily plane service from Prince Rupert.

*Summary of Work Accomplished*

| | Ft. |
|---|---|
| Tunnel— | |
| Leduc | 293 |
| Tide Lake | 16,310 |
| Total | 16,603 |

| | |
|---|---|
| Lateral development, including inclines— | Ft. |
| Leduc | 4,668 |
| Tide Lake | 513 |
| Total | 5,181 |
| Raising— | |
| Leduc | 676 |
| Tide Lake | *Nil* |
| Total | 676 |
| Slash— | Cu. Ft. |
| Leduc | 78,380 |
| Tide Lake | 217,385 |
| Total | 295,765 |
| Diamond drilling— | |
| Leduc— | Ft. |
| Surface | 5,107 |
| Underground | 3,385 |
| Tide Lake—Underground | 638 |
| Total | 9,130 |
| Road construction—Stewart–Tide Lake | 5.25 miles |

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 38–39.]

*Gold-Silver-Lead-Zinc*

STEWART

**Silbak Premier Mine**
*Silbak Premier Mines Limited*
By H. Bapty

(56° 130° S.E.) Company office, 355 Burrard Street, Vancouver 1. A. E. Bryant, president; Adam O. Krainec, mine manager; Robert J. Daley, mine superintendent. Bralorne Pioneer Mines Limited continued management of the property during 1967. Mining was confined to the south end of the glory-hole, where the sulphide-rich ore had been found. Production from the mine was 6,694 tons of ore. Several thousand tons of waste was also handled. The mill processed 6,694 tons of ore for the year and produced 276 tons of concentrate, which was shipped to the smelter. The property closed in November, when the present operating contract expired. Of the 15 men employed on the property, eight were employed in the mill.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 39.]

*Gold-Silver-Copper-Lead-Zinc*

**Roosevelt, Radio, Mayou**
*Crest Silver Company Limited*
By H. Bapty

(56° 129° S.W.) Company office, 10, 558 Howe Street, Vancouver 1. G. Charland, superintendent; A. C. A. Howe International Limited, consultants. The Roosevelt, Radio, and Mayou groups, formerly part of New Rufus-Argenta Mines Limited of Stewart, comprise 29 Crown-granted mineral claims and eight recorded claims on Bitter Creek, 12 miles northeast of Stewart. The claims are between 900 and 6,000 feet elevation on the west slope of Ore Mountain.

The property was held by New Rufus-Argenta Mines Limited, whose name in February, 1966, was changed to Crest Silver Company Limited. Further geological mapping was done during the summer by J. G. Willars in the Bitter Creek area and on Ore Mountain. Three trenches were drilled and blasted for a length of 30 feet, and the portals of three old adits were cleaned out for future examination.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 41.]

*Gold-Silver-Lead-Zinc*

**Prosperity, Porter Idaho**
*Cassiar Consolidated Mines Ltd.*
By H. Bapty

(55° 129° N.W.) Company office, 34, 610 Jervis Street, Vancouver 5. W. R. Wheeler, president and manager. The former Porter Idaho, Silverado, Prosperity, Portland Canal properties, and others are now held by Cassiar Consolidated Mines Ltd. All the 99 claims are Crown-granted, and of these eight are held under option. The property lies east of Stewart on Mount Rainey. During the spring three men were employed cleaning up and mucking out 1,700 feet of workings in the " I " tunnel of the Porter Idaho. All transportation was by Stewart-based helicopter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 41.]

*Copper-Iron*

**Crest Copper**
*Cominco Ltd.*
By E. W. Grove

(56° 129° S.W.) Company exploration office, 300, 890 West Pender Street, Vancouver 1. A total of 50 claims, including the old Atlas Gold and Copper Mining Co. Ltd. and Bear Pass Exploration and Mining Co. Ltd. properties, were examined in 1967 by Cominco Ltd. under agreement with Crest Copper Company Limited. The property is located 16 miles north of Stewart on the side of Mount Gladstone opposite Argyle Creek. The mineral showings are between 2,500 and 6,000 feet elevation. Under the supervision of D. W. Heddle, senior exploration geologist, geological mapping, a magnetometer survey conducted by Cominco geologists, and 11 EX-size core holes totalling 384 feet were accomplished in a 10-week period.

The known mineralization, consisting in part of massive chalcopyrite and pyrrhotite, was located in place in 1908. Abundant float at the base of the steep hillside led to its discovery by agile prospectors. The George Gold Copper Mining Co. Ltd. holdings to the east have been controlled by Cominco since 1925.

Significant mineralization has been found in Hazelton volcanic sandstones localized in breccias and sheared volcanic agglomerates.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1908, 1928, 1929; Assessment Report No. 1109.]

*Lead-Zinc-Gold-Silver*

**Silver Coin**
*Granduc Mines, Limited*
By E. W. Grove

(56° 130° S.E.) Company office, 1105, 900 West Hastings Street, Vancouver 1. The Silver Coin group comprises eight Crown-granted claims held by the E. A. Noble estate. The property was examined under agreement with Granduc Mines, Limited, by E. Ostensoe, geologist, and an assistant over a two-week period. Surface work was limited to reopening 50 feet of old trenches and sampling.

The property, located on Big Missouri Ridge, lies west of Silver Lakes at the south end of Noname Lake and is easily reached from Stewart by the old Big Missouri mine road, which was largely repaired during the summer of 1967 by the local British Columbia Highways Department.

*Gold-Silver-Lead-Zinc*

**Little Joe, Lucky Seven, Gypsy**
*Starbird Mines Ltd.*
By E. W. Grove

(56° 129° S.W.) Company office, 3505 West 30th Avenue, Vancouver 8. The property consists of 11 claims, including the key Little Joe, Lucky Seven, and Gypsy Crown grants formerly known as the Portland Canal Mining Co. The property is on the south side of Glacier Creek about 2½ miles from its junction with the Bear River, and is 4 miles northeast of Stewart. The claims, which are under option to the company from the owners, were examined by a geologist from A. C. A. Howe International Limited. Transport is by helicopter or road from Stewart.

The original company was organized in 1907 to develop the property, which later in 1911 produced 1,000 tons of ore. The mine, at 2,400 feet elevation, was connected by aerial tram to a concentrator located at the north of Glacier Creek. Two oreshoots were mined in an extensive quartz-sulphide vein which cuts Bowser-type dark siltstones. Sulphide minerals consisted predominantly of pyrite, sphalerite, and galena, with all containing variable gold-silver values.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1906–11; *Geol. Surv., Canada,* Mem. 175, 1935, p. 136.]

*Copper-Silver*

**Red Top**
*United Asbestos Corporation Limited*
By E. W. Grove

(56° 129° S.W.) Head office, 911, 1155 Dorchester Boulevard West, Montreal 2, P.Q. The Red Top is an old property located on the north side of Bear River Pass about 6 miles east of the confluence of American Creek and Bear River. The present group of 15 claims, including the key Red Top and Amazon Crown grants under examination by United Asbestos Corporation Limited, can be reached from Stewart, 12 miles to the southwest, either by vehicle along the gravel Cassiar–Stewart road or by helicopter. A trail from the road leads to the property.

During 1967 an average crew of seven men supervised by J. C. Shaw was engaged in trail work and camp construction, as well as retimbering 325 feet of the " copper adit " in order to diamond drill four AX-size core holes totalling 146 feet.

Sulphide-bearing quartz veins at about 3,500 and 3,900 feet elevation with erratic copper-silver values were explored in the early days by surface trenching and one crosscut adit. Replacement-type copper mineralization at about 2,900 feet elevation was also explored by an adit started in 1919. In 1967 the season's work entailed mucking out and retimbering 364 feet of the adit in order to explore the copper mineralization by underground diamond drilling.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1925, 1927–29; *Geol. Surv., Canada,* Mem. 175, 1935, pp. 141–142.]

*Molybdenum-Gold-Silver-Copper*

**$MoS_2$**
*Erin Explorations Ltd.*
By E. W. Grove

(56° 129° S.W.) Company office, 3, 425 Howe Street, Vancouver 1. Julian Berkosha, president. The $MoS_2$ group totals 50 claims located on the southwest slope of Red Mountain on the east side of Bromley Glacier.

Eight men directed by Julian Berkosha spent about five months on the property. Geological and geochemical surveys of the 50-claim group were compiled on 1-inch-to-400-foot scale topographic maps. Five BQ-size core holes with a total footage of 2,011 feet were drilled in the late autumn. Transportation was by helicopter from Stewart, about 10 miles to the west.

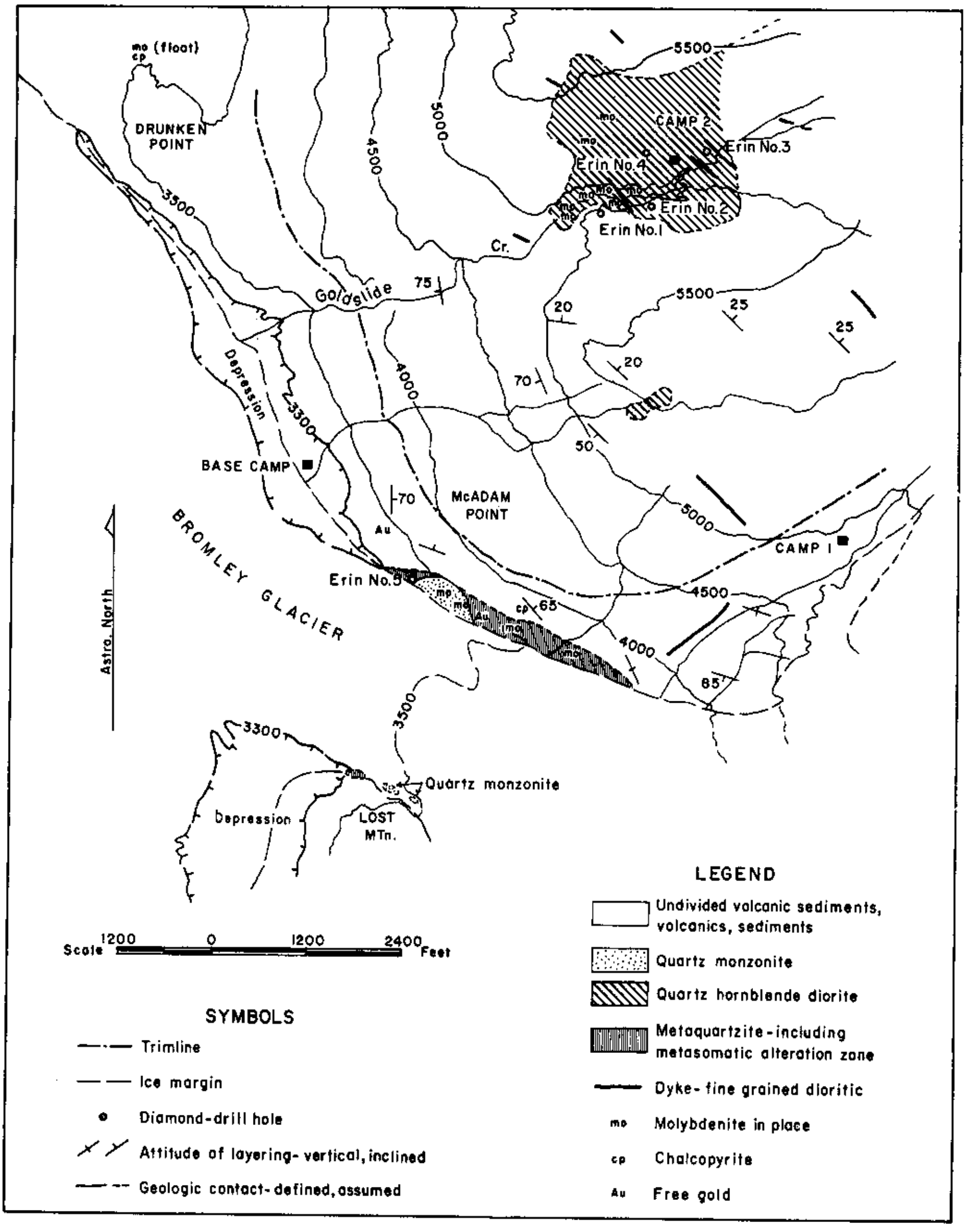



Figure 3. Erin Explorations Ltd. Geology of the $MoS_2$ group.

Previous exploration work on the property, which was located in 1965, was largely confined to an examination of molybdenite mineralization found in shears cutting the quartz monzonite stock showing at the edge of the glacier. Molybdenite mineralization was also located that year in the upper cirque area of Goldslide Creek where stream action has cut a deep gully through fragmental volcanics into underlying coarse-grained dioritic rock. The property was inactive in 1966.

In 1967 work was concentrated in the Goldslide Creek cirque area. Geologic mapping, soil-sampling, and prospecting were followed by a diamond-drill programme which commenced in August. The target was molybdenite mineralization found concentrated in the quartz hornblende diorite which underlies a large portion of the cirque. The intrusion has been variably fractured or crushed and mineralized by irregularly spaced quartz-sulphide veins and veinlets. The diorite appears to be commonly coarse-grained and porphyritic, and has a medium- to dark-grey aspect. Quartz phenocrysts up to one-quarter inch are typical and comprise about 5 to 12 per cent of the rock. Hornblende is typically brown, comprises up to 35 per cent of the mass, is commonly euhedral, and forms phenocrysts from one-eighth to one-quarter inch or more. The hornblende and feldspar matrices are generally altered to a mixture of chlorite, sericite, epidote, and carbonate. Apatite and pyrite are ubiquitous but are also concentrated in the darker mafic-rich phases. Quartz veining and replacement appear to be widespread. Pyrite, chalcopyrite, and molybdenite are common, but the extent and grade of molybdenite have not yet been determined.

Surface exposures in the cirque area suggest a single porphyry intrusive, but it was reported at the completion of the four core holes that a composite or layered structure was possible.

The fifth or final hole was drilled into the quartz monzonite stock previously located at the edge of Bromley Glacier. This occurrence was reported on in the 1965 Annual Report, pages 54 and 55.

Since the autumn of 1965 the tributary of Bromley Glacier between McAdam Point and Lost Mountain has continued to shrink. Vertical ablation has accounted for about a 50-foot drop in ice level, and as a result two new outcrops of quartz monzonite have appeared at the east ice margin of Lost Mountain. This encourages the impression that the quartz monzonite extends across under the ice. Molybdenite-chalcopyrite-pyrite bearing monzonite float as well as local mineralized talus extends from above McAdam Point to Drunken Point along the east ice margin, providing prospecting clues.

Ice movement on the McAdam Point tributary has changed recently. A wrist watch, camera, and rock hammer dropped into a crevasse late in 1965 in an accident were recovered in late 1967 by Julian Berkosha. He reported that the objects had moved only about 15 feet from the point marked in 1965. Stagnation of the ice because of low or negligible feed from the parent Cambria Snowfield is the probable reason.

A glance at the accompanying map, Figure 3, will show that the difference in thickness of the glacier at McAdam Point as measured between the trim-line and the 1967 margin is about 700 feet. The quartz monzonite stock was completely covered by ice in 1960, indicating the level has dropped 350 feet or about half the total in only the last seven years. This appears to be comparable to other glaciers in the general Stewart area where measurements have been made.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1965, pp. 52–55.]

## Periodic Drainage of Glacier-dammed Summit Lake

By E. W. Grove

On September 17, 1967, Summit Lake discharged under the Salmon Glacier into the Salmon River for the third time in its geologically short existence. The probability of such repeated occurrences was recognized by Granduc Mines, Limited, who in 1966 rerouted part of the Alaskan road section at Ninemile to circumvent the previous expensive washouts. This time only three-quarters of a mile of road below Ninemile was flooded and the unused Ninemile bridge made derelict.

Summit Lake lies at the head of Salmon Glacier, about elevation 2,700 feet, 18 miles north-northwest of Stewart. Overflow from the lake normally flows north across a rock " sill " and down past the present Granduc tunnel construction camp into the Bowser River system, which heads here at the toe of Berendon Glacier. Summit Lake water has followed the northerly path since its origin when the receding Salmon Glacier left a basin between the valley walls.

On December 26, 1961, the entire volume of Summit Lake coursed south under Salmon Glacier into the Salmon River and then into the head of Portland Canal at Hyder, Alaska. The dumping of the lake waters was not seen, but two watchmen on duty at the nearby Silbak Premier mine heard the roar of the escaping water and the crashing of ice blocks. Most of the Silbak Premier road from Thirteenmile to Riverside was washed out, leaving the watchmen stranded. Small Dolly Varden trout living in Summit Lake were dumped out, and a few were found in pools alongside the rearranged Salmon River. The lake began filling again the following May, and the lake remained more or less static until December 1, 1965, when the entire lake again discharged south under the ice down into the Salmon River, this time destroying 6 miles of the road just reconstructed by Granduc. The Granduc road which connects Hyder to Tide Lake Flats and follows along above the east side of the Salmon Glacier and Summit Lake was opened in August, 1965, providing easy access to the area. Drivers commuting regularly between Stewart and the Tide Lake camp reported that two to three days previous to the dumping of Summit Lake, the Salmon River turned almost black with silt.

Summit Lake again started to refill in late May, 1966, starting the cycle which was completed on September 17, 1967. This time the event was fairly well documented by company and ice research crews monitoring the happening.

The various mechanisms involved in the self-dumping process at Summit Lake may never be completely recorded. However, the position and height of the ice dam, recent weather conditions, and the level of the lake are known factors. Figure 4 shows several stages in the recent retreat of the ice barrier and the accompanying increase in size of Summit Lake. Stages of toe retreat of Salmon Glacier are also indicated. The 1961 front does not appear separately, but roughly corresponds to the 1957 line. The dam remained at approximately the position until 1964, when retreat accelerated. Crude measurements also suggested that increased vertical ablation in the barrier area accompanied the horizontal withdrawal. The 1965 and 1967 dumpings were both accompanied by extensive ice sloughing south into the glacier rather than the previous marginal breakage. As a result, simple water escape tunnels were not noted and, of course, may not have existed. During the 1964–67 period the writer observed surface ponding of water on the upper Salmon Glacier along the east ice margin. Farther south surface water escapes under the ice via channels at Big Missouri and Boundary Glaciers. The main stream escaping from the Salmon Glacier exists from one ice cave on the west side of the toe. Escaping lake waters from the 1961, 1965, and 1967 outflows all used the same tunnel-like exit. The above clues indicate that both the normal as well as flood drainage is largely subglacial.

Survey records on the size and movements of Salmon Glacier are sparse up until about 1957. However, 1910 maps show the elevation of the ice barrier at the south end of Summit Lake as about 3,400 feet. The present elevation is roughly 2,900 feet, indicating a thinning in this general area of about 500 feet in 57 years. The effect of thinning is clearly shown at the old Outland Silver Bar property on the west side of the glacier, where veins originally worked by adits from the ice are now stranded hundreds of feet above the present ice surface.

Ablation of Salmon Glacier is continuing, and the demise of Summit Lake to a hummocky clay-gravel flat is predictable for the near future.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1965, pp. 48–49.]

## OBSERVATORY INLET

### ANYOX

*Copper*

**CD, CU**
*Arcadia Explorations Ltd.*
By E. W. Grove

(55° 129° S.W.) Company office, 612 Stock Exchange Building, 475 Howe Street, Vancouver 1. The property, controlled by Arcadia Explorations Ltd., includes leases, Crown grants (Deadwood), and recorded claims totalling 129 claims. The group lies north of the Red Wing property and immediately west of the main Hidden Creek mine area. Access to Anyox and the general area is by air or boat from Prince Rupert, 90 miles to the south.

In 1967 three men supervised by J. T. Williamson spent seven months exploring and developing the property. Work included drilling and blasting 28 open cuts and pits, erecting camp, electromagnetic and magnetometer surveys of the CU 3, 4, and 27 claims, stream sediment sampling, as well as general prospecting and sampling.

Exploration during 1967 disclosed the presence of several extensive mineralized areas, only one of which was previously known. This is the original Hanna property—Deadwood, Emma claims—which lies less than a mile north of the main Hidden Creek orebodies and adjacent to the main volcanic-sediment contact. Other zones of mineralization were located and explored between Hidden Creek and Anyox Creek, also adjacent to the main contact.

Mineralization consists of fine-grained massive to disseminated pyrrhotite containing veinlets and dispersed blebs of chalcopyrite with minor pyrite and scant pyrite. All the Arcadia showings are found in altered pillow volcanics near the overlying sediments. Preliminary examination indicates a shear control and a general similarity to other major deposits in the area.

The general geology, mineralization, ore production, and ore controls were discussed briefly in the Annual Report for 1965, pages 57 to 61.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1923, pp. 51–52; 1927, p. 68.]

*Copper*

**Bonanza and Hidden Creek Mines**
*Cominco Ltd.*
By E. W. Grove

(55° 129° S.W.) Company exploration office, 300, 890 West Pender Street, Vancouver 1. A total of 65 Crown-granted and eight located claims owned by Cominco Ltd. cover the Hidden Creek and Bonanza properties. The area lies immediately west of Granby Bay and is almost 90 air miles north of Prince Rupert. Access to the area is by float plane, helicopter, or boat.

In the 1967 field season two geologists were occupied for 2½ months under the supervision of D. W. Heddle in the compilation of a geological map of the ground between Bonanza and Falls Creeks. The old Hidden Creek and Bonanza deposits are located, respectively, to the north and to the south of the current map-area. During the operation of the Anyox smelter, vein quartz deposits of significant size in the area were mined for flux and contained gold.

The Cominco ground is presently bounded to the south by Canusa Mines Limited Red Wing property and to the northwest by the recently located Arcadia Explorations Ltd. ground.

The various deposits and the general geological environments have been outlined in the Annual Report of the Minister of Mines and Petroleum Resources for 1965, pages 59 to 61.

*Copper*

**Red Wing**
*Anaconda American Brass Limited*
By E. W. Grove

(55° 129° S.W.) Company office, 116, 744 West Hastings Street, Vancouver 1. The property comprises 105 claims including the key Red Wing, Red Jacket, and Red Fraction Crown-granted claims. A crew of 14 men supervised by Paul A. Lindberg worked a five-month period on the property in 1967, during which time geological, geophysical, and geochemical surveys were conducted. Four BX wireline core holes totalling 3,463 feet were drilled.

The option agreement between Canusa Mines Limited and Anaconda American Brass Limited for the Red Wing property was terminated in November, 1967.

References to the development of the property are to be found in the Annual Reports dating back to 1909. For a condensed description of the property, *see* the Annual Report for 1965, pages 59 to 61.

*Silver-Lead-Zinc*

## Alice Arm

**Dolly Varden, Wolf, North Star, Toric**
*Newmont Mining Corporation of Canada Limited*
By H. Bapty

(55° 129° N.W.) Vancouver office, 604, 744 West Hastings Street, Vancouver 1. R. F. Sheldon, exploration manager. The Dolly Varden property, owned by Dolly Varden Mines Ltd., comprises 73 mineral claims, of which 21 are Crown granted, 21 claims are held under option, and the remainder are recorded. The claims are at 1,000 to 2,000 feet elevation in the Kitsault River valley 17 miles north of Alice Arm. Throughout most of the year the property was under option to Newmont Mining Corporation of Canada Limited, but at year's end the option was relinquished and the property reverted to Dolly Varden Mines Ltd.

Six men were employed for six months remapping and resampling the present workings. Some geological mapping was done on the Dolly Varden, North Star, and Toric mineral claims, and ground and airborne magnetic surveys and aero-electromagnetic surveys were made over the main claims. The property may be reached by a good gravel road from Alice Arm.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 42.]

*Silver*

**Moose, Climax**
*Silver Butte Mines Ltd.*
By N. C. Carter

(55° 129° N.W.) Company office, 705, 850 West Hastings Street, Vancouver 1. T. S. MacKay, president. This property of four Crown-granted claims is on the east slope of the Kitsault River valley immediately northwest of Trout Creek. Access is by helicopter from Alice Arm, 21 miles south. The property includes the Moose group of three claims (Lots 1241 to 1243), held directly by the company, and the Climax claim (Lot 941), which is held by agreement with Dolly Varden Mines Ltd.

Drilling carried out on the north part of the Climax claim established the continuity of the east-striking quartz-barite-jasper-pyrite replacement deposit between the boundary of the Moose claims and the old Climax adit 120 feet to the east. A trench was blasted across the zone 25 feet above and west of the adit portal. A chip sample across the 15-foot width of the trench assayed: Gold, trace; silver, 6.9 ounces per ton; copper, 0.03 per cent; lead, 4.93 per cent; zinc, 0.27 per cent.

Drilling of nine EX-size holes totalled 1,658 feet.

Six contractors and two company employees were at work for 1½ months under the supervision of G. B. Tribble.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1951, pp. 94–95; 1964, pp. 44–45.]

*Silver-Lead*

**Ace, Galena**
*Silver Butte Mines Ltd.*
By N. C. Carter

(55° 129° N.W.) Company office, 705, 850 West Hastings Street, Vancouver 1. T. S. MacKay, president. This property consists of the Ace group of 10 recorded claims and the Galena claim, which is held by option. The claims are 23 miles north of Alice Arm on the east side of the Kitsault River at an elevation of 2,500 feet. Prospecting and trenching on the Ace No. 2 claim was supervised by G. B. Tribble.

[References: *Minister of Mines, B.C.,* Ann Repts., 1951, pp. 91–93; 1964, p. 45.]

*Silver*

**Victory**
*Sirmac Mines Limited*
By N. C. Carter

(55° 129° N.W.) Company office, 1326, 76 Yonge Street, Toronto, Ont. D. H. Baird, president. This group, comprising 11 recorded claims and one mineral lease, is held by option from Arthur Smith and Myles B. Donald, of Alice Arm. The property is on the east side of the Kitsault River 22 miles north of Alice Arm.

Three mineralized zones occur in green to purple fragmental andesites. These replacement deposits are of quartz-barite-jasper-pyrite breccia and contain variable amounts of galena, sphalerite, tetrahedrite, and pyrargyrite.

Drilling was carried out on the westernmost zone on the Victory claim near the original adit and consisted of six holes totalling 1,420 feet. Six men were employed for one month under the supervision of G. B. Tribble.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1951, pp. 93–94; 1964, pp. 43–44.]

*Molybdenum*

**Ajax**
*Newmont Mining Corporation of Canada Limited*
By N. C. Carter

(55° 129° N.E.) Vancouver office, 604, 744 West Hastings Street, Vancouver 1. M. Guiget, project manager. This group of 101 claims is situated on the eastern slope of Mount McGuire, 8 miles northeast of Alice Arm. Access from Alice Arm is by helicopter or a 12-mile truck-road. The exploration camp was reopened early in March, and sections of the access road were relocated and improved. Diamond drilling commenced in May and continued to mid-September. Some geologic mapping was done by B. Lawrence. An average crew of six company and seven contractor employees was under the supervision of M. Guiget.

The drilling, totalling 7,800 feet, consisted of four holes, at minus 45 degrees, drilled in a westerly direction. Three holes were collared near the camp at elevations of between 2,400 and 2,600 feet, and the fourth hole was located some 2,500 feet northwest of the camp at an elevation of 2,500 feet. All holes flattened at depth and provided geological information of the 1,500-foot level. Contacts of the quartz monzonite porphyry stocks were noted dipping steeply east and north.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 44–46.]

*Copper-Zinc*

**Dak, Bel, Norm, Mac, Sun, Standard**
*Mayfair Moly Mines Ltd.*
By N. C. Carter

(55° 129° N.E.) Company office, 34, 845 Hornby Street, Vancouver 1. N. E. Jenkinson, president. This property is situated 4 miles northeast of Alice Arm and includes all of Wilauks Mountain. The property consists of 156 recorded claims, including the Bel group of 114 claims, the Dak group of 24 claims, and the Norm group comprising 14 claims. Optioned claims include the Mac and Sun groups of 10 claims each and the Standard mineral lease consisting of four previously Crown-granted claims (Lots 5501 to 5504).

The claim groups cover a number of old zinc prospects on the east and south slopes of Wilauks Mountain, including the old Standard, Sunrise, Highland, and Billy Mack properties. The Dak claim group on the north slope of the mountain probably includes the old San Diego copper prospect. On this group a trench situated on the south side of the Dak River 1,000 feet west of Washout Creek exposes intensely fractured microdiorite containing finely disseminated pyrite and some chalcopyrite over a length of 125 feet. Coarser sulphides occur in some fractures which strike east-northeast and north-northwest. Some malachite and azurite is present locally. The microdiorite, which may be an altered flow rock, consists essentially of sericitized and albitized plagioclase and lesser amounts of chloritized hornblende and minor quartz and pyroxene. On the west end of the trench this rock type is cut by a northwest-striking dark-green andesite dyke containing disseminated pyrrhotite.

Exploration work during 1967 included an examination of old showings, trenching, and 10 miles of line-cutting for a geochemical survey on the Dak group. Four men were employed for two months under the direction of A. P. Fawley, consulting geologist.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1949, pp. 76–80; 1966, pp. 47–48.]

*Molybdenum*

**Roundy Creek**
*Sileurian Chieftain Mining Company Limited*
By N. C. Carter

(55° 129° S.E.) Company office, 846 West Hastings Street, Vancouver 1. Walter Eilers, president. This group of 59 wholly owned recorded claims is situated east and west of Roundy Creek on the south side of Alice Arm, 1¼ miles from tidewater. Access is by truck from Kitsault, the company town of British Columbia Molybdenum Limited.

The property was optioned early in 1967 to Bethex Explorations Ltd., of 355 Burrard Street, Vancouver 1. Bethex performed exploration work on the property during the field season, and the agreement was terminated late in the year. Work done by Bethex included one-half mile of road construction, a survey of the key claims, geological mapping of the entire claim group, and an induced polarization survey of an area west of Roundy Creek. Twelve holes totalling 4,055 feet were drilled in the Sunshine Creek section of the property. Seven company and five contractor employees were employed for four months under the direction of R. E. Anderson, exploration manager of Bethex Explorations Ltd.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1964, pp. 36–39; 1965, pp. 62–63; 1966, p. 48.]

*Molybdenum*

**Moly**

*Bell Molybdenum Mines Limited*

By N. C. Carter

(55° 129° S.E.) Company office, 300, 999 West Pender Street, Vancouver 1. K. J. Springer, president. The Moly group of 40 recorded claims is near the headwaters of Clary Creek, 6 miles southeast of Alice Arm. Access to the property is by helicopter. One mile west of the exploration camp, a road joins Clary Lake with Kitsault, the townsite of British Columbia Molybdenum Limited. The central part of the claim group covers an area of gentle relief, with elevations ranging between 2,200 and 2,400 feet. Near the south boundary of the property, two mesas of Tertiary basalt, bounded by steep walls, rise 600 feet above the surrounding terrain (*see* Fig. 5).

The claims were located in 1965 following the discovery of molybdenite in hornfelsed sedimentary rocks adjacent to a small granitic stock. Initial exploration work was performed by Mastodon Highland Bell Mines Limited and Leitch Gold Mines Limited and consisted of geochemical silt and soil sampling. In 1966, 12 inclined drill-holes, totalling 3,169 feet, were drilled to outline the contacts of the granitic stock. The present company was incorporated in September, 1966. Early in the 1967 field season an exploration camp of 15 frame buildings was constructed and two drills began a programme of vertical holes at 400-foot spacings. Most of the holes were drilled to a depth of 500 feet, but some were extended to 1,000 feet. One drill-hole, near the central part of the stock was deepened to 1,400 feet, and in the same area an inclined hole was drilled in a southeast direction. Twenty-four holes were drilled, totalling 14,753 feet. Other work included topographic survey and geological mapping. Ten company and 13 contractor personnel were employed for five months under the supervision of R. W. Beaton.

The following account is based on a visit of one week examining drill core and outcrops on the claim group, and in part on information freely provided by the company.

Outcrops are mainly restricted to Clary Creek and its tributaries in the central part of the claim group where an elliptical stock of quartz monzonite porphyry intrudes a sequence of argillaceous sedimentary rocks (*see* Fig. 5). The stock, which is elongate in an east-northeast direction, measures 2,200 by 1,000 feet. North and south of the stock, flat-lying Tertiary basalts of variable thickness overlie the sedimentary sequence unconformably. Basic dykes, probably related to the Tertiary volcanics, cut both the sediments and quartz monzonite porphyries.

The sedimentary succession consists mainly of interbedded dark-grey to black argillites and argillaceous microgreywackes with lesser amounts of massive light-grey greywacke. Some small sections of quartzite and chert were noted. The argillaceous sediments consist mainly of very fine-grained quartz, feldspar, and clay, and fine-grained syngenetic pyrrhotite grains. Colour banding, usually in the form of ½- to 1-inch bands, is a feature of the argillaceous sediments, and individual beds range in thickness from 6 inches to a foot. More competent greywackes seldom display bedding.

The sedimentary rocks have been affected by two recognizable periods of folding. The earlier or first-phase folding took place about north to north-northwest axes and is represented by near isoclinal, partly overturned concentric folds. Slaty cleavage related to this first phase is locally well developed. Impressed on the earlier folds are broad open folds with east-northeast axes which plunge to the northeast. These folds, featured by gently dipping limbs, reflect the dominant structural grain of the area.

Quartz monzonite porphyries of the stock include three major types as distinguished by texture and degree of alteration. Small dykes of similar composition cut the porphyries in several areas of the stock. The main type, leucocratic quartz monzonite porphyry, occupies the central part of the stock. Two- to four-millimetre phenocrysts of quartz, plagioclase, and perthitic orthoclase make up 30 per cent of the rock, and are set in a fine-grained matrix of quartz and feldspar. Original biotite has been bleached to a mixture of chlorite and sericite. Phenocrysts of euhedral orthoclase may range in size up to 1 centimetre. Average composition of this type is quartz, 22 per cent; plagioclase ($An_{20-28}$), 35 per cent; perthitic orthoclase, 20 per cent; bleached biotite, 5 per cent; sericite, 7 per cent; carbonate, 5 per cent; and apatite, sphene, and opaque minerals, 5 per cent.

Near the stock contacts, and in dykes peripheral to the stock, the leucocratic quartz monzonite porphyry is gradational to a quartz monzonite or granodiorite porphyry of fresher appearance which contains a more calcic plagioclase, a lesser amount of orthoclase, and fresh biotite and hornblende.

The southwestern part of the stock is occupied by a crowded " quartz-eye " porphyry of distinctive appearance. Phenocrysts make up 50 per cent of the rock by volume, including 4-millimetre quartz anhedra, 2- to 4-millimetre euhedral plagioclase grains, and randomly distributed 1- to 2-centimetre euhedral crystals of perthitic orthoclase. Average rock composition, which is similar to the leucocratic quartz monzonite porphyry, is: Quartz, 27 per cent; plagioclase ($An_{20-28}$), 35 per cent; orthoclase, 25 per cent; biotite, 5 per cent; hornblende, 5 per cent; sphene, apatite, and opaques, 3 per cent. The distinguishing feature of this phase is its relative lack of alteration. A similar porphyry was encountered at depth in a drill-hole near the central part of the stock where it appeared to have a gradational contact with the leucocratic quartz monzonite porphyry. The relative lack of quartz veinlets and fractures and attendant mineralization suggests that the " quartz-eye " quartz monzonite porphyry represents a late, possibly post-mineral intrusive phase.

Narrow dykes cut the leucocratic quartz monzonites in the central part of the stock. One drill-hole intersected 1-foot-wide dykes of fine-grained alaskite, consisting of interlocking grains of quartz, perthitic orthoclase, sericite, and some granophyre. Near the stock contacts, short sections of grey-green fine-grained quartz monzonite porphyry breccias were noted. These are in intrusive contact with quartz monzonites and are distinguished by the presence of ½-inch angular hornfels fragments in a granulated matrix. Narrow dykes of fine-grained light-green quartz feldspar porphyry were noted in several drill-holes.

Flat-lying Tertiary basalts south of the stock form two mesas, each of 1 square mile extent. These are bounded by steep columnar-jointed walls, similar to Widdzech Mountain, a short distance west. The basalts which feature a trachytic texture are commonly porphyritic with 2- to 5-millimetre phenocrysts of plagioclase ($An_{50-60}$) set in a matrix of olivine, clinopyroxene, and magnetite. North of the stock, a thin cover of vesicular Tertiary volcanic rocks overlies sedimentary rocks. From drill-hole information, this cover is about 100 feet thick and consists of alternating 25- to 50-foot-thick flows exhibiting chilled contacts. The basalts, which are of variable composition, are dark to light grey in colour and plagioclase varies from $An_{40}$ to $An_{60}$. Near the lower contact of this basalt sheet an angular breccia features ½-inch fragments of hornfels and porphyry in a scoriaceous matrix.

Basic dykes, probably related to the basalt flows, cut both the sedimentary and plutonic rocks and are clearly of post-mineral age. The dykes, usually several feet wide, dip steeply and strike in a northeasterly direction. A wider dyke has been intersected in several drill-holes in the quartz monzonite porphyry stock. The basic dykes are of two varieties: a fine- to medium-grained porphyritic lamprophyre, consisting of plagioclase, hornblende, and clinopyroxene, and fine-grained basalt and andesite dykes, locally vesicular and which are usually only 1 or 2 feet wide. A medium-grained north-striking 25-foot-wide dyke of diorite was noted in Clary Creek about 1 mile east of the quartz monzonite porphyry stock.

Sedimentary rocks have been contact metamorphosed to brown biotite hornfels a distance of between 1,200 and 1,500 feet outward from the stock contact. Near the contact, the hornfels is a dense fine-grained rock exhibiting a granoblastic texture and consisting of interlocking grains of quartz and biotite. Alteration of the biotite hornfels includes pale-green chlorite-sericite bleaching marginal to fractures and quartz veinlets. Intensity of metamorphism decreases outward from the stock contact to colour-banded argillaceous sediments in which only certain beds contain secondary biotite.

Within the stock, the leucocratic quartz monzonite porphyry of the central part exhibits the greatest degree of alteration. Most prevalent is sericite-carbonate alteration of plagioclase. In addition, plagioclase is locally altered to potash feldspar, particularly along the margins of quartz veinlets. Secondary reddish-brown biotite was noted in both the " quartz-eye " quartz monzonite porphyry and the quartz monzonite-granodiorite porphyry in the marginal areas of the stock. In both rock types, the original biotite has been altered to a mixture of chlorite and sericite. Intense argillic and sericite alteration is common in fault zones, as are chlorite-coated slip surfaces.

The major structural trends in the area of the porphyry stock are east-northeast and north-northwest, as reflected by the elongation of the stock itself, the strike of fractures, joints, faults, and basic dykes, and by the trend of creeks and air-photo lineaments. The stock contact, which dips steeply outward, is not well defined, rather it consists of a transitional zone of hornfels cut by numerous porphyry dykes. The large horse of hornfelsed sedimentary rocks within the stock, measuring 1,000 by 200 feet, parallels the long direction of the stock and is cut by numerous porphyry dykes. Drilling information suggests that this block of country rock decreases in size with depth.

Major faults preceded the period of intrusion and intersections of east-northeast and north-northwest faults, and fractures were undoubtedly important in the localization of the stock. Later movement has occurred along these faults, particularly the north-northwest set, as evidenced by the apparent offsetting of the stock contacts along two major faults and by the presence of numerous post-mineral shears noted in drill cores.

Molybdenite mineralization occurs in both the quartz monzonite porphyry and biotite hornfels adjacent to the central and eastern parts of the stock. The company has stated that drilling has indicated 35.8 million tons having an average grade of 0.11 per cent molybdenite.

Molybdenite occurs mainly as selvages in ⅛- to ¼-inch steeply dipping quartz veinlets which follow major fracture directions. Three stages of quartz veining and mineralization have been noted. A first stage of barren quartz veinlets followed by the second, most important stage, quartz-molybdenite-pyrite veinlets which are steeply inclined and which are offset locally by flat quartz-molybdenite veins and hairline fractures. The third stage consists of 1-inch and larger veins of quartz and carbonate containing variable amounts of pyrite, pyrrhotite, galena, and sphalerite. In Clary Creek 1,500 feet east of the stock, a 10-inch-wide quartz-carbonate vein containing pyrite, pyrrhotite, galena, and sphalerite was noted in a shear zone in argillaceous sediments. The quartz monzonite porphyries and biotite hornfels contain abundant disseminated pyrite and pyrrhotite.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 48–49; Assessment Report No. 814.]

*Molybdenum*

**Wayne**
*Marshall Creek Copper Co. Ltd.*
By N. C. Carter

(55° 129° S.E.) Company office, 603, 1405 Douglas Street, Victoria. J. M. McNulty, president. The Wayne group of 18 recorded claims is situated on the eastern end of Dawson Ridge, 5 miles south of Alice Arm. Access is by helicopter.

Elevations range from 2,500 feet in Roundy Creek canyon to 4,500 feet near the central part of the claim group. The property is almost entirely underlain by Coast granitic rocks of several varieties and ages. The oldest of these are grey uniform quartz diorites which underlie the southern and eastern parts of the claim group, flanking a central area of younger quartz monzonite. The medium-grained quartz diorites consist mainly of plagioclase ($An_{40}$) with quartz and chloritized hornblende and biotite. Leucocratic quartz monzonites in the central part of the property differ from the quartz diorites by having a more sodic plagioclase ($An_{26-30}$) and fresh biotite as the dominant mafic mineral. These rocks are locally porphyritic, containing 5- to 10-millimetre euhedral phenocrysts of microcline and perthitic orthoclase. Several 1-foot-wide dykes of equigranular quartz monzonite were noted cutting quartz diorites on the east slope of the ridge. Narrow northeast-striking dykes of fine-grained andesite also cut the quartz diorites in this area. One of these is apparently terminated by a northwest-striking fine-grained plagioclase porphyry dyke which is approximately 60 feet wide and is exposed over a length of 2,000 feet.

Small discontinuous veins and dyke-like masses of alaskitic and pegmatitic type rocks were noted cutting both the quartz diorites and quartz monzonites. On the south-facing slope of Dawson Ridge, 2,000 feet southeast of a small lake, east-striking 5-inch stringers of alaskite and drusy quartz contain scattered rosettes of molybdenite. Four hundred feet west, a discontinuous 1-foot-wide lens of alaskite also contains some molybdenite.

Dykes of lamprophyre up to 2 feet wide, noted in several localities, represent the last period of the intrusive history. Northeast and northwest jointing and fracturing have affected all rocks, with some offsetting of basic dykes along northeast fractures.

Company personnel spent one month on the property in 1967. Silt-sampling and geological mapping were supervised by I. M. Watson, exploration manager.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 49–50.]

*Molybdenum*

**Alice**
*British Columbia Molybdenum Limited*
By H. Bapty

(55° 129° S.E.) Company office, 801, 402 West Pender Street, Vancouver 3. C. D. Michaelson, president; C. C. Kamm, project manager; J. H. Schissler, acting manager; A. C. E. Mitchell, mine superintendent; J. J. Ellis, mill superintendent; R. D. Cowper, general superintendent. The company owns a group of 143 recorded mineral claims 5 miles southeast of Alice Arm. The key claims are the Patricia 1 to 5.

Building construction and mine preparation were continuous throughout the year. A 93-mile British Columbia Hydro and Power Authority all-aluminum transmission-line was erected north from Terrace and was connected to the mine service in early October. At that time most of the concentrator was ready for initial trials. The mining crew commenced work in the pit in August, and through October and November the construction crews were exchanged for milling and general service crews.

*Work Accomplished in 1967*

| | | |
|---|---|---|
| Surface diamond drilling | ft. | 4,839 |
| Pit preparation | tons of ore | 137,000 |
| Ore milled | tons | 88,719 |
| Molybdenum shipped | lb. | 16,249 |

The pit is mined with 30-foot-high benches and the final slope of the wall will be 45 degrees. Drilling in the pit is done with a Drillmaster, a 40-R rotary drill, and by airtrac. Two 6-cubic-yard shovels load into 65-ton Haulpak rear-dump trucks and haul the ore 1 mile to the crushing plant. The primary crusher is a 42- by 65-inch gyrator. All the ore is crushed to ¾-inch size and stored in two fine-ore bins. The mill is designed to handle 6,000 tons per day and consists of two ball and one rod mill and a flotation circuit to make a molybdenite product. Water is piped 3.7 miles in a 14-inch-diameter pipe from Clary Lake.

During the year all plant buildings were completed and machinery installed. An office building was constructed near the mill-site. All single workmen are at present living in the construction trailers near the concentrator-site. The camp-site, on the waterfront of Alice Arm, will have the post-office address Kitsault. At the foreshore site 28 prefabricated dwellings have been moved in and placed on foundations to accommodate staff and staff families. A temporary one-room school has also been provided. Transportation of concentrate is by Vancouver barge from a foreshore barge grid. The camp is also served by Alice Arm coastal boat service and regular air service from Prince Rupert.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 49.]

*Molybdenum*

**Nimble**
*Amax Exploration, Inc.*
By H. Bapty

(55° 129° S.W.) Company office, 601, 535 Thurlow Street, Vancouver 5. P. W. Richardson, staff geologist. The Nimble group of 12 recorded mineral claims is at 2,500 feet elevation on Penny Creek, 15½ miles southwest of Alice Arm. Two men spent several weeks on geological mapping and soil-sampling. The property was served by Alice Arm-based helicopter.

*Copper*

**Red Bluff**
*Nadina Explorations Limited*
By N. C. Carter

(55° 129° N.E.) Company office, 1420, 789 West Pender Street, Vancouver 1. W. F. McGowan, president. This group of 37 optioned claims is situated 5 miles north-northeast of Alice Arm on the south end of Gravel Top Ridge. Elevations range from 2,500 feet in the valleys of Gumas and Washout Creeks to 3,700 feet in the northern part of the claim group. Exposures are scarce in the mainly tree-covered central part of the property, being confined to creek valleys and the steeper slopes on the north end of the claim group. Two short adits were driven prior to 1920 in the prominent iron oxide-stained bluffs above Gumas Creek.

The claim group is mainly underlain by light-grey dacite porphyry and light-green andesitic hornblende-feldspar porphyry. These rocks, of probable extrusive origin, are intensely fractured and are characterized by a relative abundance (up to 15 per cent) of finely disseminated pyrite. One- to four-millimetre phenocrysts of plagioclase and hornblende, amounting to 25 per cent by volume, are set in a fine-grained matrix of quartz, feldspar, and carbonate. The rocks commonly exhibit a high degree of sericite, clay mineral, and carbonate alteration. The porphyritic rocks are most intensely sheared and fractured adjacent to a prominent north-northeast topographic lineament extending across Gravel Top Ridge from the iron-stained bluffs above Gumas Creek to the headwaters of Washout Creek. Within this zone, numerous north-northeast-striking andesite dykes were noted cutting the porphyries. The massive nature of these andesites indicates that they post-date the shearing which affected the porphyries. The dykes are of variable width, in some cases exceeding 100 feet.

Chalcopyrite mineralization, as disseminations and in fractures in the porphyries, was noted in several localities along the major lineament. An old adit above Gumas Creek at an elevation of 2,825 feet was driven in a northeasterly direction for 30 feet in grey dacite porphyry. Pyrite and chalcopyrite coat numerous northeast and northwest fractures. A chip sample across a 6-foot length at the adit portal assayed: Gold, trace; silver, 0.8 ounce per ton; copper, 0.46 per cent. One thousand feet north-northeast of the adit, at an elevation of 3,025 feet, an old trench exposes extensively altered dacite porphyry containing coarse disseminations of pyrite and chalcopyrite. A grab sample from a small dump adjacent to the trench assayed: Gold, trace; silver, trace; copper, 0.72 per cent. On the Washout Creek side of the ridge, immediately north of the lineament at an elevation of 3,160 feet, a series of open cuts exposes highly fractured dacite porphyry containing finely disseminated pyrite and some chalcopyrite. The mineralized zone, exposed over a width of 25 feet, is bounded by north-northeast-striking andesite dykes. A chip sample across a 10-foot width assayed: Gold, trace; silver, *nil*; copper, 0.07 per cent. One-half mile northwest at an elevation of 3,700 feet, a breccia zone in interbedded tuffs and greywackes consists of barite, fragments of country rock, and sporadic amounts of sphalerite, galena, and minor chalcopyrite. A 10-foot chip sample from an open cut assayed: Gold, trace; silver, 0.9 ounce per ton; copper, 0.04 per cent; lead, 0.6 per cent; zinc, 2.9 per cent.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1916, 1922, 1929; Assessment Report No. 1194.]

*Silver-Lead-Zinc*

**Monarch, Silver Bar, Silver Bell, Silver, Etc.** *Ponder Oils Ltd.* By N. C. Carter

(55° 129° N.E.) Company office, 806 Lancaster Building, Calgary, Alta. W. L. Falconer, president; George R. Gibson, Midland, Texas, geological consultant. The Monarch, Silver Bar, Pork Chop, Grey Goose, Silver Bell, Silver, and Ponder groups, comprising 37 claims, are situated near the headwaters of the Illiance River, between elevations of 2,500 and 4,000 feet. Access to Alice Arm, 13 miles west, is by helicopter. With the exception of the three-claim Ponder group, all claims are held by option from Gunn Fiva and Stanley Uruski, of Alice Arm. Work began on the property in late July and continued for two months, and consisted of some plane-table surveying and diamond drilling of 17 holes totalling 4,200 feet. Two company and seven contractor employees were under the supervision of W. L. Falconer.

On the main Monarch showing, near the divide between the Illiance and Tchitin Rivers, two drill-holes intersected short sections of quartz-carbonate vein material containing pyrite, galena, sphalerite, tetrahedrite, and chalcopyrite. On the Silver Bar group, situated south of the Monarch group, a series of angle holes drilled west of the Illiance River encountered narrow quartz-carbonate veins and stringers, containing some galena, in schistose light green to red, hematitic andesite tuffs and breccias. Drilling was also carried out near the old United Metals open cut on the Silver Bell claim.

The Silver group of three claims is situated east of the Illiance River and is essentially a relocation of the old Silver Star group (*see* Annual Reports 1918, 1919, 1930). An old trail leads from the Silver Bell workings on the Illiance River to an old cabin and adit at an elevation of 3,300 feet. The adit was driven years ago in a northwesterly direction along a mineralized shear zone in green to red fragmental andesites. Within the shear zone, which ranges from a width of 8 feet at the adit portal to 3 feet in the bluff above the adit, the andesites have been converted to a grey sericite-carbonate schist. Mineralization includes massive stringers and disseminations of galena, sphalerite, and pyrrhotite. A chip sample across the shear zone at the adit portal assayed: Gold, trace; silver, 12.9 ounces per ton; lead, 1.31 per cent; zinc, 0.31 per cent; and copper, 0.05 per cent. One-foot-wide quartz-carbonate veins containing galena were noted in the creek below the adit. Above the adit, several small partly overgrown dumps of hand-sorted material, mined years ago, consist of nearly massive galena, sphalerite, and pyrrhotite. A grab sample from one of these dumps assayed: Gold, 0.01 ounce per ton; silver, 113.2 ounces per ton; lead 10.08 per cent; zinc, 14.4 per cent; copper, 0.92 per cent.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1965, pp. 66–68.]

## NASS RIVER

*Molybdenum*

**Snafu, Valley, Ridge, Kay, Guias** (55° 129° S.E.) Company office, 55 Yonge Street, Toronto 1. P. H. McCloskey, president.

*Nass River Mines Limited*

By N. C. Carter

These five groups, comprising 117 recorded claims, are on the south side of the Nass River, 70 miles by private logging-road from Terrace. The following description and the accompanying sketch-map (Fig. 6) are based on an examination of a few days' duration and on information kindly provided by the company. The Guias group of 10 claims, near Greenville on the Nass River road, was not visited.

Four small molybdenite-bearing quartz-feldspar-porphyry stocks intrude argillaceous sediments of the Bowser Group near their contact with Coast plutonic rocks (*see* Fig. 6). A basaltic lava flow of Recent age, which originated 12 miles to the southeast, covers a 10-square-mile area bordering the Nass River. The flow is in the form of a broad plain, broken by numerous areas of collapse. From the lava field at less than 100 feet above sea-level, the valley wall on the south side rises abruptly to around 5,000 feet.

The Snafu group of 40 claims is directly south of the lava field and is 8 miles southeast of Aiyansh. The claims were under option from H. Wylie and S. Davis, of Aiyansh. In the central part of the claim group, a subcircular stock of quartz-feldspar-porphyry, roughly 3,500 feet in diameter, intrudes northeast-striking banded argillaceous sediments. A smaller mass of similar intrusive rock outcrops northwest of the main stock. The porphyry is typically leucocratic and is of quartz monzonite composition. Phenocrysts constitute 40 per cent of the rock and include 1- to 2-centimetre euhedral crystals of perthitic orthoclase and 4-millimetre euhedral grains of plagioclase (oligoclase) and subhedral quartz crystals which are set in a very fine-grained matrix of quartz, feldspar, and biotite. The rock is essentially fresh, with only minor silicification and secondary potash feldspar adjacent to some quartz veinlets. Iron oxide staining is widespread, due to the presence of finely disseminated pyrite and pyrrhotite. Fine-grained dykes of alaskite, consisting of interlocking anhedral grains of quartz and microgranophyre, follow northeast and

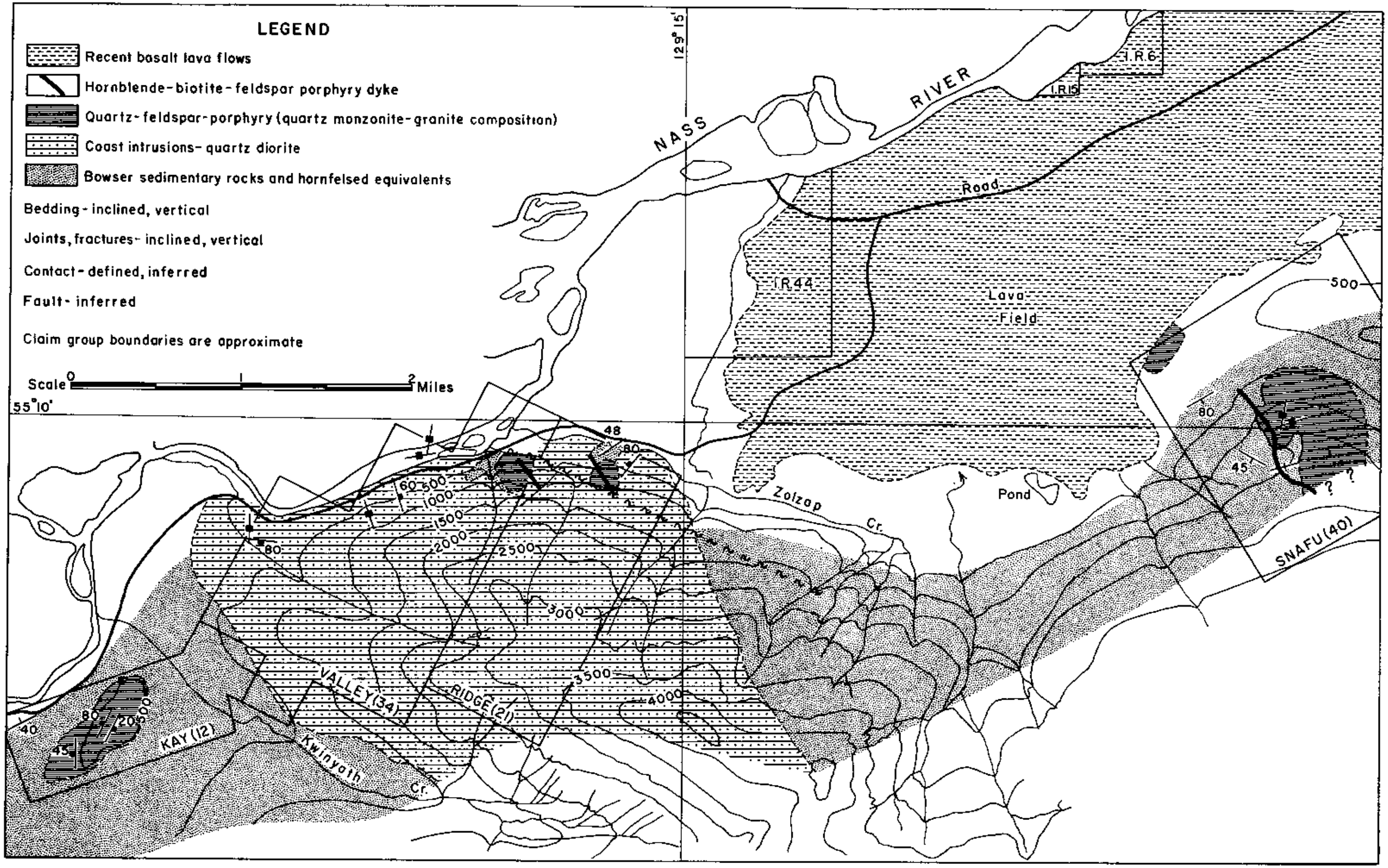



Figure 6. Nass River Mines Limited. Geology of the Kay, Valley, Ridge, and Snafu groups.

northwest fractures in the porphyry near the west contact of the stock. In the same area a 100-foot-wide northwest-striking dyke of grey hornblende-biotite-feldspar-porphyry of quartz-diorite composition cuts both the quartz feldspar porphyry and adjacent hornfelsed sediments. Numerous small screens of hornfels were noted within the stock near the irregular west central contact, and peripheral dykes of porphyry are locally abundant. Molybdenite occurs in northeast and northwest fractures and quartz veinlets in quartz feldspar porphyry, alaskite, and hornfelsed sediments along the western stock contact.

The Valley and Ridge groups of 34 and 21 claims respectively are directly south of Zolzap Creek (*see* Fig. 6). Near the north boundary of the claim groups, two small circular stocks of porphyritic granite 1,000 feet in diameter occur 2,000 feet apart on opposite sides of a west-northwest-trending topographic lineament which is probably a fault. The stocks mainly cut quartz diorites of the Coast Intrusions, except along their northern margins, where they are in contact with hornfelsed sediments. The granites have a seriate to porphyritic texture and consist essentially of quartz and microcline perthite with only minor plagioclase (oligoclase) and scattered flakes of biotite. Near the northwest contact of the stock on the Ridge group, the granite is gradational to quartz monzonite. Narrow dykes of fine-grained alaskite cut the Valley stock near its western contact. Dykes of hornblende-biotite-feldspar porphyry, 100 feet wide and striking northwest, cut the granites in both the Valley and Ridge stocks. These are post-mineral in age and are similar to the late dyke on the Snafu group. Coast quartz diorites adjacent to the stock contacts have been metamorphosed, and green hornblende is largely altered to fine, fresh biotite. Away from the metamorphic aureole, along the Greenville road, the quartz diorite is typically a grey medium-grained equigranular rock consisting mainly of fresh, zoned plagioclase (oligoclase-andesine) with lesser amounts of quartz, hornblende, and biotite.

Molybdenite mineralization is exposed in trenches near the central part of the Valley stock, where it occurs as fine disseminations, irregular coarse replacements, and in northwest fractures in porphyritic granites and alaskite dykes. Iron oxide staining is widespread.

The Kay group of 12 claims is 15 miles southwest of Aiyansh on the Greenville road. The claims cover an elliptical stock of quartz feldspar porphyry, elongate in a northeasterly direction and measuring 4,000 by 1,200 feet. The stock underlies a prominent ridge which is bounded by steep cliffs at its northern end. The leucocratic quartz feldspar porphyry is of quartz monzonite composition, and 0.4- to 2-centimetre phenocrysts make up between 20 and 50 per cent of the rock. These include euhedral perthitic orthoclase and microcline and quartz and plagioclase (oligoclase) which are set in a fine-grained quartzofeldspathic matrix containing some biotite. Prominent sheeting in the intrusive strikes north and dips moderately to the west. Contacts between the intrusive and adjacent biotite hornfels were observed only at the base of the steep cliff at the northeast end of the stock. Quartz feldspar porphyry containing coarse rosettes of molybdenite was observed in several trenches near the central part of the stock.

A warm sulphur spring occurs in a swampy area several hundred feet west of the stock.

Exploration work on the Snafu group during 1967 included the drilling of nine holes totalling 3,826 feet. Geological mapping was done on the Snafu, Kay, and Guias groups. An average crew of five men was employed for two months under the supervision of F. Charlton, geologist.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 51; Assessment Reports Nos. 794, 888, 913, and 914.]

## TERRACE

*Lead-Silver*

**Rex** (54° 128° N.W.) The Rex group of six recorded mineral claims,
By H. Bapty

owned by S. Piskulski, of Terrace, is on the north side of Mayo Creek (Mayou Creek or Little Beaver River), about 6 miles west of Kitsumgallum Lake, 30 miles northwest of Terrace. During the year S. Piskulski sank a shaft 10 feet deep on his No. 4 vein and drove 26 feet of crosscut adit.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1928, p. 71.]

*Molybdenum*

**Big, Joe**
*Silver Standard Mines Limited*
By H. Bapty

(54° 128° N.W.) Company office, 808, 602 West Hastings Street, Vancouver 2. N. W. Burmeister, geological engineer. The Big and Joe groups of 32 recorded mineral claims at 1,000 to 3,000 feet elevation near the head of Cedar River, 32 miles north of Terrace, are held under an agreement from E. R. Anderson and Louis Remillong. Six men and a contractor spent a month on the property mapping geology. A topographic map was prepared by Lockwood Survey, 24 claims were mapped geologically, and eight trenches totalling 8,000 feet were bulldozed. Access to the property is by means of the Columbia Cellulose private logging-road.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 51; Assessment Report No. 857.]

*Molybdenum*

**NAR**
*Amax Exploration, Inc.*
By H. Bapty

(54° 128° N.W. and N.E.) Company office, 601, 535 Thurlow Street, Vancouver 5. P. W. Richardson, staff geologist. The NAR group of 84 claims and one fraction is on Mount Vanarsdoll between 2,500 and 3,000 feet elevation 5 miles northeast of Terrace. The claims straddle the boundary of the Skeena and Omineca Mining Divisions. Four men spent a month on the property doing geological mapping and soil-sampling. One 43-foot packsack hole was drilled. The property was serviced by helicopter from Terrace.

## KITIMAT

*Copper*

**R & F**
*Kitimat Copper Co. Ltd.*
By H. Bapty

(54° 128° S.E. and S.W.) Company office, 1200 West Pender Street, Vancouver 1. Roger Seel, president. The R & F 55 recorded mineral claims are on the east side of Kitimat valley 18 miles north of Kitimat. The claims can be reached by car from Kitimat on Highway No. 25, and lie between 200 and 2,000 feet elevation. Two men hand-dug eight trenches for a total length of 100 feet and built 2 miles of trail.

## ECSTALL RIVER

*Pyrite*

**How**
*Quamco Limited*
By H. Bapty

(53° 129° N.E. and N.W.) Company office, P.O. Box 4183, Station D, Vancouver 9. Tom Rolston, work supervisor. The How group of 12 recorded claims is between 100 and 2,000 feet elevation on the west side of Ecstall River opposite the mouth of Johnson Creek. The claims adjoin the south side of the old Crown grants covering the Ecstall pyrite deposit. The claims have been optioned by Quamco Limited from R. Campbell. A month was spent on the property making a geochemical and electromagnetic survey. The property can be reached by boat and trail.

[Reference: Assessment Report No. 1113.]

## EUTSUK LAKE

**Red Bird (CAFB)** *Ashfork Mines Limited* (53° 127° S.E.) *See under* Omineca Mining Division, page 114.

## QUEEN CHARLOTTE ISLANDS

### Moresby Island

*Iron-Copper*

**Tasu** *Wesfrob Mines Limited* By H. Bapty (52° 132° N.E.) Wesfrob Mines Limited is a wholly owned subsidiary of Falconbridge Nickel Mines Limited, 7 King Street East, Toronto 1, Ont.; Vancouver office, 504, 1112 West Pender Street, Vancouver 1. W. J. Tough, president; F. A. Godfrey, mine manager; John Dodge, pit superintendent. The property consists of 21 Crown-granted mineral claims and 83 recorded claims.

Henry Moody and Albert Jones, of Skidegate, were two of the original stakers of the Tasoo mineral claim, which came into production in 1914. During 1914, 1,136 tons of ore grading 1.50 per cent copper, 0.02 ounce of gold, 0.42 ounce of silver, and 62 per cent iron was shipped to the Tacoma smelter. The property was then operated intermittently until 1917, by which time 5,180 tons of ore had been shipped directly to the smelter. As smelter payments did not meet the cost of operating the mine, it was closed and no further mining was done until 1964. In 1964, 2,000 tons was shipped for metallurgical testing, and on August 20, 1967, Wesfrob Mines Limited made its first iron-ore shipment of 54,190 tons to Japan.

Albert Jones, Cliff Jones, and George Brown returned to the property in 1952 and located six claims adjoining the two original Crown-granted claims, and in 1953 exploration work commenced which resulted in the Wesfrob mine coming into production in June, 1967. The official opening was celebrated on June 19th when the Lieutenant-Governor of British Columbia, Major-General the Honourable George R. Pearkes, declared the operation open.

During pit preparation 1,458,218 yards of waste rock was removed in 1965 and 2,492,909 yards in 1966.

Work accomplished in 1967 comprised 38,829 feet of surface diamond drilling. During pit preparation, in No. 1 zone 651,198 tons of ore and 292,232 cubic yards of waste were mined, and in No. 3 zone 326,683 tons of ore and 724,536 cubic yards of waste were mined. In 1967, 977,881 tons of ore was put through the underground crushing plant.

A serious fire occurring in the cobbing plant on December 21, 1967, interrupted production. Production is expected to be resumed by mid-March, 1968.

The orebody will be developed by three pits. The primary crusher (42- by 65-inch gyratory) is located underground. Ore passes above the crusher terminate in either No. 1 pit or No. 3 pit or at the collar of the haulage portal. Ore passes from the haulage portal terminate in No. 2 and No. 3 pits.

Pit drilling for production is done with two 9-inch rotary drills and several Airtrac drills. After blasting the muck is handled by one 3½-, two 5-, and one 7-cubic-yard shovels. The ore is then trucked a short distance from the shovel face to the ore-passes by twelve 30-ton diesel dump trucks. Pit walls are laid out at an over-all slope of 51 degrees in No. 3 zone and 53 degrees in No. 2 zone. Benches are designed 35 feet deep, and a 40-foot-wide safety berm has been made every second bench. The over-all ore-to-waste ratio is 1.08 to 1. Currently 8,500 tons of ore and 4,000 tons of waste are mined daily.

The beneficiation plant is designed to treat magnetite ores and produce high-grade sinter and pellet-feed concentrates. The plant incorporates instruments and

Plate I. View of the townsite of Tasu on Gowing Island, taken from the mine dump. Gowing Island is connected to Moresby Island by a causeway.

automation in process control. Remote control, steam-hooded filters, rubber-lined pebble mills, and rubber chutes assist in making the plant efficient.

The ore delivered to the primary crusher is stored in two ore-passes, one for each type of ore. Type one contains magnetite and is treated for magnetite recovery only. This material is crushed, cobbed, passed through a rod mill, and concentrated by magnetic separation. The concentrate is dewatered and then stockpiled for shipping.

The type two ore contains magnetite and some chalcopyrite. This ore is treated similarly to type one, but after passing through the rod mill is ground to 80 per cent minus 325 mesh in a pebble mill. The magnetite is removed by a triple-drum permanent magnet separator, and the non-magnetic material is pumped to the flotation circuit.

The fine magnetic concentrate is pellet feed; the copper concentrate from the float plant and the pellet feed go to the shipping stockpile.

Shipment consists of three separate concentrates—iron concentrate, copper concentrate, and pellet-feed concentrate. These are stockpiled separately and can be reclaimed by a tunnel and conveyor system to a travelling ship-loader. The reclaiming system can ship-load at the rate of 2,500 tons per hour.

All services are under one roof. This is a two-story building with the ground floor containing the vehicle garage, warehouse, machine-shop, mine dry, and supervisors' offices. The upper floor houses the administration offices.

Wesfrob Mines Limited has two powerful towboats, " Wesbridge One " and " Wesbridge Two," to assist in the docking of large ore-carriers. These ships are 80 feet long, sister ships of the latest design with 980-horsepower diesels.

Fresh-water supply is piped through a 16-inch line from Wright Lake, 6 miles distant.

The power plant contains five 2,760-kva. 4,160-volt diesel-driven generators fuelled on Bunker B oil.

Ninety living units have been constructed on Gowing Island. The townsite also includes a 6-bed hospital, a 3-room school, a community centre, a swimming-pool, a 60-room hotel, a general store, a laundromat, a bakery, and a cafeteria. The plant has a deep-sea loading-dock capable of accommodating a 50,000-ton vessel. The camp is served by barge transportation from Vancouver and a daily air service from Sandspit.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 52–53.]

*Copper-Iron-Molybdenum*

**Garnet, Ruby** (52° 132° N.E.) Company office, 908, 7 King Street East, Toronto, Ont. Raymond A. Dujardin, senior geologist.
*Canadian Superior Exploration Limited*
By H. Bapty

Sixty-one recorded claims are under option to Canadian Superior Exploration Limited from Moresby Mines Limited. The claims are on Botany Inlet, Moresby Island, 37 miles southwest of Sandspit and extend from sea-level to 1,500 feet. Four company employees and seven contractors worked for a period of 10 weeks under the supervision of R. A. Dujardin, senior geologist. Surface workings were mapped and an area 3,000 by 2,400 feet on the Ruby 1, 2, 4 and Garnet 15, 17, 19 was geologically mapped. An induced polarization survey covering 15 claims and a magnetometer survey covering six claims were run. Geochemical sampling on rock chip and soils were taken on six claims. The property was serviced by boat and float plane.

[Reference: *Minister of Mines, B.C.*, Ann Rept., 1966, p. 53.]

*Iron*

**Jessie, Adonis, Rose**
*Jedway Iron Ore Limited*
By H. Bapty

(52° 131° S.W.) Company office, 1111 West Georgia Street, Vancouver 5; mine office, Jedway. L. T. Postle, president; G. R. Rice, mine manager; C. E. Dopson, mine superintendent; L. McGinnis, mill superintendent. The mine is on Harriet Harbour, Skincuttle Inlet, southeastern coast of Moresby Island, 70 miles south of Sandspit. The property consists of 61 mineral claims held by record, 10 Crown-granted claims, and four mineral leases. Work was continuous throughout the year, and an average of 142 men were employed full time. The following work was done during the year:—

| | | |
|---|---|---|
| Drifting | ft. | 2,197 |
| Raising, underground | ft. | 1,639 |
| Slashing | cu. ft. | 29,000 |
| Blast-hole drilling— | | |
| Underground | ft. | 150,802 |
| Open pit | ft. | 133,778 |
| Waste stripping, open pit | tons | 1,060,745 |
| Ore mined— | | |
| Open pit | tons | 528,047 |
| Underground | tons | 343,301 |
| Ore milled | tons | 928,412 |
| Concentrate shipped | tons | 417,852 |

Jedway Iron Ore Limited is a subsidiary of The Granby Mining Company Limited and was formed in April, 1961, to take over and mine the Harriet Harbour property of Silver Standard Mines Limited. Jedway Iron Ore limited at that time had a contract with Sumitomo Shoji Kaisha Ltd., of Tokyo, to supply 2,000,000 tons of iron-ore concentrate over a five-year period. In five years of operation, mining has been carried out in three pits by conventional open-pit methods. During 1967 about 95 per cent of the open-pit ore was obtained from the Rose pit, where equipment in use included a down-the-hole percussion drill for 6½-inch blast-holes, two secondary drills, 4½- and 2½-yard shovels, and 35-ton rear-dump trucks. The haul road from Rose pit to primary crusher is about 3½ miles long. Additional production has been obtained by underground development below the Jessie pit. The underground ore is mined by long-hole drilling and blasting. The broken muck is then loaded from drawpoints by front-end loader into 20-ton rear-dump trucks for transportation to the primary crusher.

The 48- by 60-inch Traylor primary crusher is located near the lower limit of the Jessie pit. Until early 1967 the 6-inch crusher product was passed through a raise, from which it was loaded into a train for delivery to the mill. All crushed ore is now loaded at the crusher and hauled by truck to the mill. Diamond-drilling programmes were carried out on the surface and also from underground during the year.

Production from the commencement of milling in October, 1962, to the end of 1967 was: Ore and waste mined, 19,110,321 tons; ore milled, 4,224,406 tons; iron-ore concentrate shipped, 2,170,246 tons.

There is a deep-sea loading-dock at Jedway which receives trans-Pacific ore-carriers. The company is also served by the Northland Navigation Company from Vancouver and the B.C. Airlines from Sandspit.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 53–54.]

*Copper-Silver*

**D**
*Cosmic-Lode Mines Ltd.*
By H. Bapty

(52° 131° N.W.) Company office, 711, 543 Granville Street, Vancouver 2. E. A. Little, vice-president; F. L. C. Price, consulting geologist. The D group of recorded mineral claims is held by Cosmic-Lode Mines Ltd. under option from Fleetwood Resources. They are on the south side of Lockeport Inlet, 38 miles south of Sandspit, Moresby Island. The claims cover showings known as the Swede and Last Chance. The claims extend from the shoreline to 1,500 feet elevation. Four company employees spent eight months on the property, surveying, geological mapping, and trenching. Five trenches were blasted for a total length of 1,000 feet. Two contractors drilled 11 diamond-drill holes totalling 1,000 feet.

[Reference: *Minister of Mines, B.C.*, 1929, pp. 57–58.]

## VANCOUVER MINING DIVISION

*Copper*

### SOUTHGATE RIVER

**S.G.**
*Rio Tinto Canadian Exploration Limited*
By Stuart S. Holland

(51° 124° S.E.) Company office, 404, 1111 West Georgia Street, Vancouver 5. The S.G. group of 10 claims is on the Southgate River near its head, a distance of 29 miles by road from Bute Inlet. It is reported that chalcopyrite and bornite occur in narrow quartz veins in the granite.

In 1967 the geology of the claims was mapped and silt samples were taken from the streams draining the property. Four men spent two weeks on the ground. E. W. Johnson was in charge.

*Copper*

### BUTE INLET

**Colossus**
*Alquin Mines Ltd.*
By W. C. Robinson

(50° 125° N.E.) Company office, 11, 1100 Lonsdale Avenue, North Vancouver. The Colossus group comprises 33 mineral claims, including the Colossus (Lot 256), the Bluebell (Lot 1296), the Portage (Lot 259), and the Champness Fraction (Lot 260) Crown-granted claims. The property is near Buker Creek on the north side of Estero Basin of Frederick Arm, west of the south end of Bute Inlet, and is between 1,500 and 1,650 feet elevation. The claims are accessible by air from Campbell River. Chalcopyrite and molybdenite mineralization is reported to occur in the granodiorite. Two men were employed for two months under the direction of W. R. Quinn; five holes totalling 450 feet were diamond drilled.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1960, p. 90.]

*Copper-Molybdenum*

### POWELL RIVER

**OK, In**
*American Smelting and Refining Company*
By W. C. Robinson

(50° 124° S.W.) Company office, 504, 535 Thurlow Street, Vancouver 5. The OK and In groups consist of 171 recorded mineral claims, owned by R. E. Mickel and Mrs. M. V. Boylan. The claim groups are west of Okeover Inlet between elevations of 2,800 and 3,200 feet and are accessible by road from Powell River.

Noranda Exploration Company, Limited, optioned the property early in the year. Ten men spent two months, supervised by R. Heim, geologist, diamond drilling 12 holes totalling 6,897 feet. The option was dropped in March. Subsequently American Smelting and Refining Company optioned the property and employed seven men for three months, supervised by H. Neugebauer, geological mapping and running an induced polarization survey.

Chalcopyrite, molybdenite, and pyrite mineralization is reported in quartz veins and as fine disseminations near the contact between two granodiorite bodies.

*Copper-Molybdenum*

**LL**

*Anaconda American Brass Limited*

By W. C. Robinson

(49° 124° N.W. and 50° 124° S.W.) Company office, Britannia Beach. Anaconda American Brass Limited owns the LL group of 88 recorded claims, located 12 miles from Powell River west of Okeover Inlet between sea-level and 2,500 feet elevation. Access is by road from Powell River. Molybdenite and chalcopyrite are reported to occur in quartz veins and stringers in granodiorite. In 1967 six men under the supervision of J. M. McAndrew spent two months making geological and geochemical surveys of an area covered by 10 claims.

*Copper-Molybdenum*

**Mary V, Bruce**

*Falconbridge Nickel Mines Limited*

By W. C. Robinson

(49° 124° N.E.) Company office, 1112 West Pender Street, Vancouver 1. The Mary V and Bruce groups consist of 81 recorded mineral claims covering two separate showings which are 10 miles northeast of Powell River at elevations between 500 and 2,000 feet. The showings covered by the Mary V claims are between Haslam Lake and Dodd Lake, and those covered by the Bruce claims are south of Dodd Lake. The property is accessible by 18 miles of logging-road from a point 10 miles south of Westview on Highway No. 101. Chalcopyrite and molybdenite mineralization is reported to occur in the foliation of quartz diorite. Twelve men were employed for four months, under the direction of S. H. Pilcher, diamond drilling 14 holes totalling 5,368 feet, geological mapping, and geochemical surveying.

*Copper-Molybdenum*

**Blue Jay**

*Amax Exploration, Inc.*

By N. D. McKechnie

(49° 124° N.E.) The Blue Jay group of 39 recorded claims is held in the name of Frank Lehman, 1317 Cook Street, Victoria. It is 6 miles north and east of Powell River on the west side of Inland Lake. Access is by logging-roads from Powell River. During 1967 Amax Exploration, Inc., held an option agreement on the property.

The working area and principal showing is near the junctions of Blue Jay Nos. 1, 2, 3, and 4. The rock there is a grey medium-grained quartz diorite weakly foliated on a strike of north 65 degrees west and a dip of 75 degrees northeastward. Occasional threads and stringers of quartz, trending in the main about north 60 degrees east, carry molybdenite. The principal showing consists of a disturbed zone exposed for about one-quarter mile on a strike of north 60 degrees west. The rock within the zone is a green and grey cataclastic rock showing white and pink feldspathic shards in a streaky chloritic matrix. One thin-section of this rock type was examined and showed chlorite-filled crush zones in a feldspathic rock, probably quartz diorite, with epidote and some secondary albite in the chlorite. Locally the chlorite is largely replaced by epidote. Pyrite and chalcopyrite, with some molybdenite, lie in the crush zones. Evidence of alterations can be seen over a width of some 800 feet; the width of the mineralization appears to be less than this.

A number of trenches were excavated on and near the disturbed zone. Four men also were employed for one month, under the direction of F. E. Fox, on geochemical sampling, geological mapping, and trenching.

*Copper*

**TR**
*Rolling Hills Copper Mines Limited*
By V. A. G. Preto

(49° 124° N.E.) Company address, P.O. Box 4183, Station D, Vancouver 9. The company has 20 mineral claims held under option from T. McEwan. The group known as the TR is centred 6 miles north of Stillwater Bay and 5 miles west of Duck Lake. Ken Spraggs supervised the work done in 1967, which consisted of an induced polarization survey of claims TR Nos. 1 to 4. A crew of four men was employed by the company and by a contractor for a period of two weeks.

[Reference: Assessment Report No. 1170.]

## JERVIS INLET

*Molybdenum*

**Mo, SW, Kar**
*Hogan Mines Ltd.*
By W. C. Robinson

(49° 124° N.E.) Company office, 301, 550 Burrard Street, Vancouver 1. The Mo, SW, and Kar groups consist of 82 recorded claims situated at the head of St. Vincent Bay between sea-level and 1,200 feet elevation. Molybdenite mineralization is reported to occur in the quartz monzonite.

An average crew of seven men was employed for six months diamond drilling four holes totalling 1,700 feet, geological mapping, geochemical surveying, and bulldozing three trenches totalling 3,000 feet. The work was supervised by S. W. Wright.

## ALTA LAKE

*Copper*

**London, Axe**
*New Jersey Zinc Exploration Company (Canada) Ltd.*
By A. R. C. James

(50° 122° S.W.) Company office, 905, 525 Seymour Street, Vancouver 2. R. C. Macdonald, assistant to the president. The company holds Mineral Lease M9, comprising the London, Royal Edward, Hard Cash, Iron Hat, Albany, Tonopah, and Iron Wedge Fraction Crown grants, and also the eight-claim Axe group on the southwest side of Fitzsimmons Creek about 5 miles from Alta Lake. A jeep-road connects the property with the Squamish–Pemberton road.

The property was described in some detail in the 1963 Annual Report. In 1966 the company drove an adit at the 3950 level, below the surface showings, for a distance of 917 feet. In January, 1967, the adit was driven a further 21 feet to a total distance of 938 feet. No further work has been done.

*Copper*

**Elk**
*Noranda Exploration Company, Limited*
By K. E. Northcote

(50° 123° S.E.) Western office, 1050 Davie Street, Vancouver 5. G. C. Camsell, assistant manager. The Elk group of 48 claims, under agreement to Noranda Exploration Company, Limited, from Mining Corporation of Canada (1964) Ltd., is located at elevation 4,000 feet on the north side of Millar Creek, near Alta Lake, 4 miles northeast of McGuire Station. The property is accessible by logging-road.

Four men spent two weeks, under supervision of J. T. Walker, geophysicist, running induced polarization and resistivity surveys.

*Gold-Silver-Copper-Lead-Zinc*

## CHEAKAMUS RIVER

**Jo, Bru, Sunny Cave, Etc.**
*Van Silver Explorations Ltd.*
By Stuart S. Holland

(50° 123° S.E.) Company office, 1661 Victoria Drive, Vancouver 6. The Jo, Bru, Dou, Sunny Cave, Vern, Peter, and Van groups, totalling 148 claims, are on Brandywine Creek 26 miles by road north of Squamish. The property was formerly held by Blue Jack Mines Ltd.

In 1967 the geology was mapped of 15 square miles of the area surrounding the property, and magnetic and electromagnetic surveys were made on the Vern No. 8 and the Sunny Cave 1 to 4 claims at Snow (Swede) Creek.

Some bulldozer stripping was done, an adit was reopened, and three holes totalling 85 feet were diamond drilled. The work was supervised by Hugh Naylor, geologist.

*Gold-Silver-Copper-Lead-Zinc*

**Callaghan, Tarn**
*Barkley Valley Mines Ltd.*
By A. R. C. James

(50° 123° S.E.) Company office, 96—67th Street, Ladner. The property comprises 12 recorded claims, and is a restaking of the old Astra and Cambria property, which is described in some detail in the Annual Report for 1936 (pp. F 53–F 56). The property is at an elevation of 2,500 to 3,250 feet immediately south and southwest of Dority Creek, an easterly flowing tributary of Callaghan Creek, which in turn empties into Cheakamus River about 40 miles north of Squamish. The showings are reported to include widespread disseminated low-grade mineralization (pyrite, chalcopyrite, sphalerite, and galena) with some localized higher-grade concentrations. These occur in altered sedimentary and volcanic rocks which are surrounded by diorites and granodiorites of the Coast Range intrusives. Some work was done on the property in the 1930's, and some exploration companies have investigated it in more recent years. In 1967 a magnetic and electromagnetic survey was carried out over the Callaghan claim, 600 square feet of stripping was done by bulldozer, three holes were diamond drilled totalling 117 feet, and 2 miles of cat-road was repaired and reopened. A crew of five men was employed over a period of six months under the supervision of T. Rolston.

*Copper-Zinc*

## HOWE SOUND

**Britannia Mine**
*The Anaconda Company (Canada) Ltd.*
By A. R. C. James

(49° 123° N.E.) Registered office, 1600, 409 Granville Street, Vancouver 2; mine office, Britannia Beach. D. F. Cornish, president; J. B. Knaebel, vice-president, Western Division; D. B. Greenlee, manager, Britannia Operations; J. F. Anderson, mine superintendent; W. R. Stern, mill superintendent; R. N. Lovlin, maintenance superintendent.

The Britannia mine is on the east side of Howe Sound, 40 miles by road from Vancouver. The main haulage adit of the mine is on 4100 level, with the main portal at Britannia Beach. This now extends for approximately 4 miles along the Britannia shear structure. At present orebodies are being mined in the Victoria, Bluff, and No. 8 sections of the mine. The Victoria section is serviced by the Victoria shaft, which extends from the surface above 1800 level down to the main haulage at 4100 level, 3.8 miles from the portal. The Victoria workings extend from 2900 to 4100 levels and include stopes in the Beta vein and a large long-hole stope in the West Victoria or 188 orebody. The Bluff or No. 7 section is serviced by the No. 7 shaft, which extends from 2200 to 4100 levels and is 2.25 miles from the portal, and also by No. 4 incline shaft, which is in operation between 2700 and

3500 levels. The principal sources of production in the Bluff are now the orebodies adjacent to the No. 4 shaft. The No. 8 section is mined from No. 8 shaft, 1.8 miles from the 4100 portal. The present No. 8 workings extend from 4900 to 5400 levels. Substantial blocks of ore were developed and prepared for production on 5250 and 5400 levels. Exploration of a promising orebody some distance to the west of existing known orebodies was continued throughout the year from 5250 to 5700 levels. The method of mining at Britannia is mainly long-hole blasting, with a few square-set and shrinkage stopes. The following is a summary of development work done in 1967:—

| | Ft. |
|---|---|
| Drifting and crosscutting | 16,010 |
| Raising | 6,630 |
| Diamond drilling | 65,223 |

Open-pit mining in the Jane Basin was started at the beginning of the summer and continued to the end of October. A total of 85,272 tons of ore was transported to the mill, and a crew of 20 men was employed. The Jane Basin is approximately 3,000 feet above sea-level and covers part of the outcrop of the Bluff orebodies, which were originally mined many years ago. The present open-pit operations involve the mining of sections of ore left in the early workings and of material which was formerly too low grade to be regarded as ore.

The principal item of new construction in 1967 was a new change-house at 4100 level to replace the one destroyed by fire in October, 1966.

The Britannia Beach Centennial Committee sponsored the publication during the year of a history of the Britannia mine and camp entitled " Britannia—The Story of a Mine," by Bruce Ramsey.

The concentrator milled 627,868 tons of ore, from which 21,335 tons of copper concentrate and 757 tons of zinc concentrate were produced.

*Copper-Molybdenum*

**Zel**
*Grasset Lake Mines Limited*
By A. R. C. James

(49° 123° N.E.) Company office, 502, 19 Richmond Street West, Toronto, Ont. The Zel group comprises 24 claims under option to Grasset Lake Mines Limited from the Zel Syndicate. The claims are located at 4,100 to 5,500 feet elevation on Mount Donaldson, east of the head of Salmon Inlet. The property is accessible by helicopter from Vancouver.

Early shipments were made from the property prior to 1890. Bralorne Pioneer Mines Limited worked on the property in 1965. Quartz veins containing bornite, chalcopyrite, cuprite, and molybdenite mineralization with some values in silver are reported in the granite. During 1967 five men, under the supervision of R. Bruce Graham, diamond drilled five holes totalling 2,500 feet.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1965, p. 222.]

*Copper*

**Bald Eagle, Blue Grouse, Etc.**
*Giant Explorations Limited*
By V. A. G. Preto

(49° 123° N.E. and S.E.) Company office, 1825, 355 Burrard Street, Vancouver 1. W. C. Gibson, president. The company has 50 mineral claims (Bald Eagle, Blue Grouse, Sharks Bay, Jon, Dale, J.D., N & J, and Anvel) under option from the Gambier Syndicate. The claims are located in the north-eastern part of Gambier Island, to the north and to the south of Gambier Creek.

E. R. Gayfer supervised work in 1967, which included two diamond-drill holes totalling 121 feet. S. Terry mapped the shoreline geology at a scale of 1 inch equals 30 feet. Two men were employed by the company for one month.

*Copper*

**Lorraine, Linda, Nancy, Dee**
*Concorde Explorations Ltd.*
By A. R. C. James

(49° 123° S.E.) Company office, 779 Kingsway, Vancouver 10. The Linda and Lorraine claims and the Nancy and Dee groups, totalling 59 claims, are on the east side of Bowen Island, extending from sea-level to 1,500 feet. The principal work was done on the Lorraine and Nancy claims, on the east coast about 2 miles south of Snug Cove. Disseminated chalcopyrite and magnetite mineralization occurs in shear zones in interbedded chert, porphyry, quartzite, and agglomerate belonging to the Bowen Island Group.

In 1967 geological, geophysical (magnetometer), and geochemical surveys and some trenching were done.

[References: *Geol. Surv., Canada,* Mem. 335, Roddick, p. 188; Assessment Report No. 1175.]

## NEW WESTMINSTER MINING DIVISION

### HOPE

*Nickel-Copper*

**Pride of Emory**
*Giant Mascot Mines Limited*
By T. M. Waterland

(49° 121° S.W.) Administrative office, 1825, 355 Burrard Street, Vancouver 1; mine address, Box 1060, Hope. L. P. Starck, vice-president and general manager; F. Holland, resident manager; E. Lunther, mine superintendent; G. Bosnich, mill superintendent.

The mine is at the head of Stulkawhits (Texas) Creek, which flows eastward into the Fraser River 8 miles north of Hope. A gravel road about 5 miles long leads from the Trans-Canada Highway 8 miles north of Hope to the mine plant at the 2600 level portal.

The geology of the property has been described in the Annual Reports for 1954, 1964, 1965, and 1966.

The mine is developed from two adit levels at elevations of approximately 3,550 and 2,600 feet. The 2600 level is the main haulage level. The 2600 level, 3550 level, and three intermediate levels are joined and serviced by an internal inclined shaft. Workings not connected to the shaft levels are serviced by raises from the 2600 or 3550 level. An ore-pass near the shaft transfers ore from the 3550 level and intermediate levels to loading-chutes on 2600 level.

The ore is mined by horizontal and vertical blast-hole stoping methods with method and equipment being essentially unchanged from 1966 (Ann. Rept., 1966, p. 58).

Development and production during 1967 were as follows:—

Pride of Emory " C " zone and Hangingwall zone were developed from 3700 level and placed into production.

The 512 orebody mining was completed to 3,800 feet elevation and the stope drawn down.

An exploration raise was driven above the 3550 level in the Brunswick 8 orebody and ore was found to be continuous. This orebody was developed from 3500 and 3550 levels and at year-end was ready for long-holing.

The Brunswick 2A stope development was completed and the stope placed in production.

The Brunswick 10 was developed from 3480 to 3600 levels and placed in production.

Production continued from the Brunswick 5 stope.

The 1400 orebody was developed above 3250 level and placed into production.

The 600 stope and 3250 level pillar were developed and mined.

Minor production was obtained from the Brunswick 2 stope.

A crosscut to the east was started in September to provide access to the 1900, 1600, 1500, and 1400 orebodies between 2950 and 3250 levels and to explore areas between 600 and 1900 orebodies.

The development of the 1500 orebody between 2600 and 3250 levels was completed and the stopes were placed into production.

The 2200 stope was mined out to 2,740 feet elevation and development resumed above 2,740 feet elevation.

Development was started in the Brunswick 2G zone.

At year-end a ventilation raise was being driven above the 2900 scram to tie in with the main ventilation system.

Development and production work aggregated:—

| | Ft. |
|---|---|
| Drifting and crosscutting | 1,477 |
| Raising | 2,939 |
| Diamond drilling | 61,294 |
| Blast-hole drilling | 263,411 |

All of the above was done by the company.

Some minor changes were made in milling equipment during 1967, and changes will continue, with the objective of gradually replacing old equipment with more modern equivalents.

The mill operated a total of 6,083 hours and treated 338,912 tons of ore grading 0.74 per cent nickel and approximately 0.35 per cent copper. From this ore 22,777 short dry tons of concentrate was produced, containing 4,750,957 pounds of nickel and 1,974,527 pounds of copper.

All concentrates were trucked by company-owned trucks to North Vancouver for shipment to Sumitomo Shoji Kaisha Ltd. in Japan.

In addition to diamond drilling at the mine, the firm of Sumiko Consultants was retained for a three-month period to do detailed geological mapping and geochemical surveys over a portion of the property. This work was hampered by forest closures during the summer. This exploration work is to continue.

*Gold-Silver-Copper*

**Clover Leaf**
By A. R. C. James

(49° 121° S.W.) The Clover Leaf group of four recorded claims lies on both sides of Ruby Creek about 1½ miles upstream from its mouth. Ruby Creek flows southerly into Fraser River about 8 miles west of Hope. The claims are owned by Jack White, Conrad Genjack, and W. E. Harvey. In 1967 three holes totalling 400 feet are reported to have been diamond drilled.

*Copper*

**Mex, Audie, Pat, Dot, Lucky Four**
*Rico Copper (1966) Limited*
By A. R. C. James

(49° 121° S.W.) Company office, 821 West Pender Street, Vancouver 1. The company holds a total of 60 claims and fractions, including the old Lucky Four group, at the summit of the Cheam Range at the head of Wahleach Creek and extending across the middle section of Foley Creek. The Mex group of claims extends east from Foley Creek up the western slopes of Goetz Peak and Williams Peak from 2,500 to 5,000 feet elevation. Access is by 7 miles of road and trail from the Chilliwack Lake road.

The showings on the Lucky Four group include chalcopyrite mineralization in a zone of altered sediments adjacent to an intrusive contact between the sediments and a large body of granodiorite. The Mex group covers the extension of this contact, which was mapped for 2 miles east and south from the Lucky Four. In 1967 diamond drilling totalling 450 feet was done and 1½ miles of trail was cleared to diamond-drill sites. Two men were employed for four months under the supervision of H. D. Forman.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 214–216.]

*Silver-Gold-Tungsten*

**Harry, Murphy, Hope, Mc, Jan**
*Union Bar Mines Ltd.*
By T. M. Waterland

(49° 121° S.E.) Company address, 1322, 510 West Hastings Street, Vancouver 2. The Harry, Murphy, Hope, Jan, and Mc groups, totalling 21 recorded claims and Crown-grant Lot 27 in the vicinity of Schkam Lake, are owned by the company and are 3½ miles north of Hope between elevations of 900 and 1,400 feet. Access is via the Trans-Canada Highway for about 3 miles and thence about three-quarters of a mile north from the highway to the property. Work during 1967 was supervised by B. Mottershead and consisted of percussion drilling three 2-inch-diameter percussion-drill holes totalling 460 feet.

**T**
*Mt. Agnes Mines Ltd.*
By T. M. Waterland

(49° 121° S.E.) Company address, 401, 615 West Pender Street, Vancouver 2. The T group of 32 claims is 7 miles north of Hope. Seigel Associates, Limited, conducted an airborne magnetometer survey of the property for the company.

*Copper-Silver-Gold*

**Cam, Cam Ext, Ram, Tootsie, Al**
*Camrock Mines Ltd.*
By T. M. Waterland

(49° 121° S.E.) This 19-claim property 3 miles southwest of Hope is owned by Camrock Mines Ltd., 11944—92nd Avenue, North Surrey. The property was formerly known as the Aufeas mine, and a small amount of stoping was carried out in 1939 by Northwest Ventures Ltd. During 1967 six men were employed over a period of five months under the direction of A. Aulder. Seventy-five feet of an old adit was retimbered, four holes totalling 1,450 feet were diamond drilled, surface workings were mapped by Sulmac Exploration Services Limited, and some roads were constructed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1939, p. 86.]

*Copper-Lead-Zinc*

**Calico, Bear, King, Len, A.P.M.**
*Allison Pass Mining Ltd.*
By T. M. Waterland

(49° 121° S.E.) Company office, 7, 515 Granville Street, Vancouver 2. This property is in the Sumallo Basin 7 miles south of the Hope–Princeton highway. Access to the property is via a logging-road which leaves the Hope–Princeton road just east of the " Big Slide " area. Work during 1967 was supervised by the late D. Johnson and consisted of diamond drilling one hole to a depth of 500 feet. Two men worked for a period of two months.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 59.]

*Molybdenum*

**Barbara, Joan, Bab**
*American Smelting and Refining Company*
By T. M. Waterland

(49° 121° S.E.) Company address, 504, 535 Thurlow Street, Vancouver 5. The Barbara, Joan, and Bab claims are on Sowaqua Creek, some 15 miles from Hope. Access to the property is by helicopter from Hope. Work during 1967 consisted of topographical and geological mapping.

*Copper-Zinc*

**Hope**
*Bomarc Mining Co. Ltd.*
By T. M. Waterland

(49° 121° S.E.) Company address, 404, 510 West Hastings Street, Vancouver 2. The 35-claim Hope group is in the Skagit River valley some 29 miles southeast of Hope. Access to the property during 1967 was by helicopter from Hope.

A total of four men worked for three months under the direction of J. Sullivan, geological engineer. A topographic map was made, and magnetometer and geochemical surveys were run over the Hope Nos. 1 and 2 claims.

Chalcopyrite and sphalerite are disseminated in a lime-silicate skarn.

This property was formerly known as the Silent Friend and was reported in the Annual Reports of the Minister of Mines for 1929, page 242; 1930, page 205; 1938, page F 14.

[Reference: Assessment Report No. 1195.]

*Copper-Silver-Molybdenum*

**A.M.**
*G.M. Explorations Limited*
By T. M. Waterland

(49° 121° S.E.) Company address, Box 1060, Hope. F. Holland, manager; J. Hungle, project superintendent. The A.M. property, known as the Canam Copper, is near the western border of Manning Park. Access is via the Hope–Princeton highway, a distance of 31 miles from Hope and thence about 3 miles via mine road to the mine.

Work was resumed on the property on January 15, 1967, and has been continuous since then. The 15 level tunnel was rehabilitated, and a raise was driven through to the 10 level to provide through ventilation and secondary access. Drifting was carried out on 10 level with the purpose of exploring the potentially mineralized south end of the breccia. At year-end this heading was still being advanced and was in ore-grade mineralization. A raise was being driven above 10 level, two diamond drills were active between 10 and 15 levels, and 10 level was being mapped and sampled.

Total development footage during the year, including raising and drifting, was 1,075 feet; diamond drilling was 1,250 feet in 11 holes.

At the end of the year 16 men were employed at the property, with 14 of these working underground.

[Reference: *Minister of Mines, B.C.*, Ann Rept., 1965, pp. 206–213.]

## COQUIHALLA RIVER

*Copper*

**C.M.**
*Rayfield Mining Company Ltd.*
By V. A. G. Preto

(49° 121° S.E.) Company office, 650, 890 West Pender Street, Vancouver 1. The company owns 20 recorded mineral claims comprising the C.M. group and located on the north side of Peers River immediately east of its junction with the Coquihalla River.

G. E. A. Von Rosen supervised a geochemical survey of the entire claim block. Three men were employed by contract for one month.

[Reference: Assessment Report No. 1147.]

*Molybdenum*

## HARRISON LAKE

**Meg, Bailey, Sash**
*Utah Construction & Mining Co.*
By A. R. C. James

(49° 121° N.W.) Company office, 718, 510 West Hastings Street, Vancouver 2. The property comprises the Meg, Bailey, and Sash groups, totalling 100 recorded claims, near the crest of the Lillooet Range at the head of Clear Creek, a tributary of Big Silver Creek. A series of logging-roads on the east side of Harrison Lake gives access to the property for four-wheel-drive vehicles. The camp on Clear Creek is at about 2,500 feet elevation. Molybdenite occurs with quartz stringers in the rocks peripheral to a quartz monzonite breccia pipe and in the metamorphic rocks, which are intruded by the quartz monzonite and other intrusives.

The present company has been exploring the property since 1964 by agreement with Gem Explorations Limited. In 1967, 10 holes were diamond drilled, totalling 5,100 feet. A crew of nine men was employed for three months under the supervision of C. A. Aird and B. McHale.

*Gold-Silver-Copper*

**June, Tee Cee**
*Bobank Mines Ltd.*
By V. A. G. Preto

(49° 121° S.W.) Company address, 14957—60th Avenue, R.R. 14, North Surrey. F. B. Niven, president. The company owns the June 1 to 4 and the Tee Cee 1 and 2 recorded mineral claims, located at the southern end of Harrison Lake immediately to the south of Green Point Park.

Work done in 1967 was supervised by F. B. Niven and consisted of two bulldozer trenches totalling 90 lineal feet, and approximately 600 square feet of stripping. Two men were employed by the company for one month.

*Copper-Molybdenum*

## PITT LAKE

**Bounty, Expo**
*Kennedy Silver Mines Ltd.*
By A. R. C. James

(49° 122° N.W.) Company office, 826, 470 Granville Street, Vancouver 2. The Bounty and Expo groups of 27 recorded claims are at the mouth of Scott Creek, which flows southwestward into Pitt Lake about 4 miles from the head of the lake. Access is by boat up the lake. It is reported that chalcopyrite, pyrite, and molybdenite mineralization occurs in quartz veins in a quartz diorite host rock. The geology of the claims was mapped by W. M. Sharp, and a geochemical survey of the claims was also done. Three rock trenches totalling 100 feet were drilled and blasted.

*Molybdenum-Copper*

**Explorer, DD, SE, Pitt**
*Caribbean Exploration Corporation*
By A. R. C. James

(49° 122° N.W.) Company office, 510 West Hastings Street, Vancouver 2. The property, comprising 252 claims, includes the Explorer, DD, SE, and Pitt groups. The present work is being done under the terms of an option agreement with Flagstone Mines Limited. The claims are on and in the vicinity of Boise Creek, which flows easterly into Pitt River about 8 miles above the head of Pitt Lake. The principal showings occur close to the creek at an elevation of from 1,650 to 1,850 feet, where there are several short adits and a very pronounced gossan area. The mineralization is said to consist of molybdenite, pyrrhotite, and some chalcopyrite associated with a silicified zone in quartz diorite. There is at present no easy ground access to the property, and servicing has been done entirely by helicopter, either from a point near the head of Pitt Lake or from Vancouver.

Caribbean Exploration Corporation is a subsidiary of Cyprus Mines Corporation. Detailed supervision and execution of the exploration programme was delegated by Caribbean Exploration to the consulting company Chapman, Wood & Griswold Ltd. A camp was established at the property, and an average crew of 18 men was employed for five months under the supervision of V. W. Shuttleworth. Eleven holes were diamond drilled, totalling 7,432 feet. Induced polarization and aeromagnetic geophysical surveys, soil-sampling, and geological and topographical mapping were done.

[Reference: Assessment Report No. 1100.]

## NANAIMO MINING DIVISION

### Quatsino-Port Hardy

*Copper-Molybdenum*

**Hep**
*Utah Construction & Mining Co.*
By N. D. McKechnie

(50° 127° N.W.) Company exploration office, 718, 510 West Hastings Street, Vancouver 2; project office, Port Hardy Airport. A. G. Humphrey, geologist in charge. The property consists of 86 claims, Hep 1 to 85 and Hep No. 1 Fraction, located between 1,300 and 1,800 feet elevation west of Hepler Creek and southwest of Nahwitti Lake, 20 miles by logging-road west of Port Hardy.

Disseminated chalcopyrite and molybdenite occur in andesitic rocks of the Bonanza Formation and in intrusive diorite.

In 1967 a magnetometer survey was made and 1,100 feet of diamond drilling done in 13 holes. Three men were employed for six months.

[References: *Minister of Mines, B.C.,* Ann Rept., 1966, p. 64; Assessment Report No. 684.]

*Copper-Molybdenum*

**Bay**
*Utah Construction & Mining Co.*
By N. D. McKechnie

(50° 127° N.W.) Company exploration office, 718, 510 West Hastings Street, Vancouver 2; project office, Port Hardy Airport. A. G. Humphrey, geologist in charge. Utah Construction & Mining Co. holds by option and by record 162 mineral claims, in the Bay, Cove, Rupert, Jim, and Inlet groups, lying between sea-level and 500 feet elevation on the north side of Rupert Inlet 12 miles by road southwest of Port Hardy. The company in 1965 began investigating an area of complex faulting in volcanic rocks of the Bonanza Formation, and in 1966 low-grade copper mineralization, chalcopyrite and pyrite, was encountered in the course of the continuing investigation. The area of interest is almost entirely lacking in outcrops. In 1967 a crew of 40 men was employed for the full year, in the course of which electromagnetic and magnetometer surveys were made of 30 claims, 5,000 feet of road was constructed, and 20,000 feet of diamond drilling was done in 64 holes.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 65; Assessment Reports Nos. 710, 731, and 738.]

*Copper*

**Red Dog**
*West Coast Mining & Exploration*
By W. C. Robinson

(50° 127° N.W.) Company office, 1, 904 Helmcken Street, Vancouver 1. The Red Dog group consists of 14 recorded mineral claims owned by West Coast Mining & Exploration. The claims are located between 800 and 1,500 feet elevation about 4.5 miles north-northeast of Holberg and are accessible by road from Holberg. Three holes totalling 102 feet were diamond drilled. Work was supervised by H. Veerman.

*Copper*

**Aero, Beta**
*Western Canada Steel Limited*
By Stuart S. Holland

(50° 127° N.W.) Company office, 450 Southeast Marine Drive, Vancouver 15. J. M. Black, consultant. Six Aero and four Beta claims are located on Wanokana Creek, 2 miles by trail from the forest access road. In 1967 the geology of the claims was mapped and magnetic and electromagnetic surveys were made.

[References: Assessment Report Nos. 1033 and 1050.]

*Copper*

**Ace, Beta**
*Western Canada Steel Limited*
By Stuart S. Holland

(50° 127° N.W.) Company office, 450 Southeast Marine Drive, Vancouver 15. J. M. Black, consultant. Six Ace and Beta claims are located at the east end of Quatse Lake and 1½ to 2 miles from the Port Hardy–Coal Harbour road.

In 1967 the geology of the claims was mapped and magnetic and electromagnetic surveys were made.

[Reference: Assessment Report No. 1060.]

*Copper*

**Rick, Lucky, Rush, JB**
*Holberg Mines Ltd.*
By W. C. Robinson

(50° 128° N.E.) Company office, 103, 709 Dunsmuir Street, Vancouver 1. Holberg Mines Ltd. owns 100 recorded mineral claims of the Rick, Lucky, Rush, and JB groups, which are located between sea-level and 2,000 feet elevation at the head of Holberg Inlet. Access is by 4 miles of paved road from Holberg or by 25 miles of logging-road from Port Hardy. Bornite, chalcopyrite, and chalcocite mineralization is reported in the volcanics. In 1967 two men spent six months under the supervision of Moore Schram diamond drilling 11 holes totalling 1,347 feet, trenching 1,000 feet, and stripping 1,500 square feet.

[Reference: *Minister of Mines, B.C.,* Ann Rept., 1966, p. 65.]

*Copper*

**Kar**
By K. E. Northcote

(50° 127° N.E.) Gordon Milbourne, Box 69, Station A, Vancouver 1. The Kar group of 64 claims, owned by Gordon Milbourne, is located on Marble River, south of Rupert Inlet, and is accessible by 25 miles of road and trail from Port Hardy. Seven pits were dug totalling 2,400 cubic feet.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1930, pp. 295–296.]

*Copper-Zinc*

**Ori**
*Utah Construction & Mining Co.*
By K. E. Northcote

(50° 128° N.E.) Canadian office, 718, 510 West Hastings Street, Vancouver 2. The Ori group of six claims, owned by G. Milbourne, is located at the mouth of Stranby River and Irony Creek and is accessible by boat from Port Hardy, a distance of 30 miles. During 1967 geological mapping and magnetometer and geochemical surveys were carried out under supervision of M. J. Young and G. Milbourne.

*Copper*

**Sinker**
By K. E. Northcote

(50° 127° S.W.) The Sinker group of 10 claims, owned by E. R. Flesher *et al.*, is located on the north side of Klaskino Inlet, Brooks Bay, and is accessible from Port Hardy by plane, a distance of 35 miles. One man spent one week making a geochemical survey.

[Reference: Assessment Report No. 961.]

*Copper*

**Yreka Mine**
*Minoca Mines Ltd.*
By W. C. Robinson

(50° 127° S.W.) Company office, 404, 900 West Hastings Street, Vancouver 1. The company is 51 per cent owned by Mitsubishi Metal Mining Co. Ltd. and 49 per cent by Yreka Mines Limited, which in turn is controlled by Noranda Mines, Limited. J. R. Billingsley, general manager; George Dvorak, mine manager.

Drill-hole electromagnetic surveys and 2,000 feet of diamond drilling were done to check the extensions of known orebodies. Underground, 407 feet of drifting and crosscutting and 34 feet of raising were completed. During 1967, 73,247 tons of ore was mined and 73,279 tons of ore was milled, to produce 8,037 tons of copper concentrate.

Production from the mine ceased on September 27, 1967, and production from the mill ceased on October 1, 1967. Production between the commencement of milling in November, 1965, and the cessation of operations at the beginning of October, 1967, was: Ore milled, 156,586 tons; copper concentrate produced, 19,665 tons.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1953, p. 167; 1955, p. 76; 1965, p. 228; 1966, pp. 65–66; *Geol. Surv., Canada,* Sum. Rept., 1929, Pt. A, p. 124.]

*Iron*

**Merry Widow, Kingfisher**
*Empire Development Company Limited*
By W. C. Robinson

(50° 127° S.E.) Company office, 100, 545 West Tenth Avenue, Vancouver; mine office, Port McNeill. E. C. Oates, general manager; J. J. Hogan, mine manager. The Empire mine adit is at an elevation of 1,911 feet on Merry Widow Mountain, on the west side of the Benson River valley, approximately 2 miles south of Benson Lake. The camp and concentrator are at an elevation of 800 feet.

Underground development work, comprising 93 feet of crosscutting and 46 feet of raising, was completed in the Merry Widow ore zone. Blast-hole mining was used to produce 175,078 tons of ore, from which 90,407 tons of iron concentrate was produced. Production from the mine ceased on August 14, 1967.

Magnetite occurrences have been known in the area since 1897, but the initial development was of copper mineralization. Quatsino Copper-Gold Mines Limited was the original owner of the ground covered by the Empire mine. This company did some exploration work but suspended operations in 1931. Diamond drilling of the magnetite showings commenced in 1950. Further work in 1951 and 1952 proved the existence of magnetite orebodies on the Merry Widow No. 5 (Lot 1533) and the Kingfisher Fraction (Lot 1532) Crown-granted claims. Empire Development Company Limited was formed in 1956, and production commenced in 1957. Production has been as follows:—

| Year | Underground Ore (Tons) | Open-pit Ore (Tons) |
|---|---|---|
| 1957 | ———— | 123,631 |
| 1958 | ———— | 572,404 |
| 1959 | ———— | 863,176 |
| 1960 | ———— | 1,046,989 |
| 1961 | ———— | 535,833 |
| 1962 | 105,781 | 82,589 |
| 1963 | 50,224 | ———— |
| 1964 | ———— | ———— |
| 1965 | ———— | ———— |
| 1966 | 161,084 | ———— |
| 1967 | 175,078 | ———— |

In 1967 the average number of men employed, while operating, was 51, of whom 28 worked underground. At the end of the year one man was employed as caretaker.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1960, pp. 90–100; 1961, pp. 95–97.]

*Copper-Iron*

**Old Sport Mine**
*Coast Copper Company Limited*
By W. C. Robinson

(50° 127° S.E.) Company office, Trail; mine office, Port McNeill. Cominco Ltd. holds an 83-per-cent interest in Coast Copper Company Limited and manages the operation. H. G. Barker, property superintendent; R. T. Trenaman, mine superintendent; G. M. Dorland, mill superintendent. This property, comprising 48 Crown-granted claims, 16 recorded claims, and 1 mineral lease, extends southward from Benson Lake on the west side of Benson River. Access is by way of a 26-mile gravel road from Port McNeill, where an employee residence townsite is located.

Underground development work comprised 10,298 feet of drifting and crosscutting, 2,078 feet of subdrifting, and 5,282 feet of raising. In September work started on the driving of a decline at minus 14 degrees to develop the south area of the mine. It has been indicated that this 8- by 22-foot decline is to be equipped with a conveyor system. At the end of the year the decline had advanced a distance of 621 feet from the portal.

Ore mined and milled amounted to 290,524 tons and produced 11,626 tons of copper concentrate and 102,226 tons of iron concentrate.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 66–68.]

*Copper*

## BONANZA LAKE

**Bob**
*C. F. Millar Limited*
By W. C. Robinson

(50° 126° S.W.) Company office, c/o Box 4183, Station D, Vancouver 9. The Bob group, consisting of 34 recorded mineral claims, is under option to C. F. Millar Limited from R. A. McIver, of Kitimat. The group is about 1½ miles south of Bonanza Lake between elevations of 1,000 and 1,200 feet and is accessible by road from Beaver Cove. Four men worked for two months, under the direction of C. F. Millar, percussion drilling 36 holes totalling 1,414 feet.

[Reference: Assessment Report No. 953.]

*Copper*

## KELSEY BAY

**Boyes**
*Silver Standard Mines Limited*
By K. E. Northcote

(50° 126° S.E.) Company office, 808, 602 West Hastings Street, Vancouver 2. The Boyes group of 10 claims, optioned from W. R. Boyes, is located on the west side of Adam River 1 mile southwest of Keta Lake at 1,000 to 2,000 feet elevation and is accessible by road from Kelsey Bay, a distance of 10 miles.

Three men spent one month, supervised by W. St. C. Dunn, drilling and blasting 13 trenches totalling 250 feet and cutting 1 mile of trail.

*Copper*

## QUADRA ISLAND

**Copper Road Mine**
*Ribco Leasing Ltd.*
By W. C. Robinson

(50° 125° S.E.) Company office, Heriot Bay. R. I. Bennett, manager. This property, on the west side of Quadra Island about 2 miles north of Deepwater Bay, comprises 11 recorded mineral claims held by E. G., John, Blanche, and Antoinette Adams and leased to R. I. Bennett, who holds an additional eight recorded mineral claims in that area. The mine is connected by road to Deepwater Bay and the ferry terminus at Quathiaski Cove.

In 1967 a total of 275 feet of drifting and raising was completed and 563 tons of copper ore was shipped to the Britannia concentrator. A crew of four men was employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 71.]

*Copper*

## COURTENAY

**Mount Washington Mine (Domineer No. 22)**
*Mount Washington Milling Co. Ltd.*
By A. R. C. James

(49° 125° N.E.) The Mount Washington mine, situated on the Domineer No. 22 mineral claim near the summit of Mount Washington, 18 miles from Courtenay, has been described in Annual Reports for 1959, 1960, 1963, and 1964. Open-pit mining ceased at the end of November, 1966, but the mill continued to operate on stockpiled ore to the end of March, 1967. On April 3rd the company was placed in receivership and all operations closed.

The mine thus actually produced ore for only two full seasons plus the latter part of one season (1964). Total ore milled was 396,095 tons, producing 19,540 tons of copper concentrate. The average grade of ore was slightly more than 1 per cent. In 1967 ore milled was 10,665 tons, from which 1,568 tons of concentrate was produced.

*Iron-Copper*

## TEXADA ISLAND

**Texada Mine**
*Texada Mines Ltd.*
By W. C. Robinson

(49° 124° N.W.) Company and mine office, Box 10, Gillies Bay. R. E. Knight, president; A. M. Walker, general manager. The property comprises eight Crown-granted claims, 41 recorded claims, and one mineral lease. The mine and plant are at Welcome Bay on the southwest coast of Texada Island, 8 miles by road south of Vananda. The major portion of the ore was mined underground by long-hole stoping and room-and-pillar stoping. Some ore continued to be produced by open-pit mining at the bottom of the Paxton pit. Ore milled from underground and open pit was 1,380,000 tons, from which 762,102 tons of iron concentrate and 6,088 tons of copper concentrate were produced.

Development work completed underground included 9,720 feet of drifting, which comprised 8,406 feet of haulage drifting, 1,287 feet of subdrifting, and 27 feet of ventilation drifting. Other development work included 1,389 feet of raising, 554,898 feet of 2-inch-diameter long-hole drilling, and 36,015 feet of diamond drilling.

New plant construction included a 35- by 80-foot addition to the machine-shop.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 72.]

## ALBERNI MINING DIVISION

*Iron*

### ZEBALLOS

**F.L.**
*Zeballos Iron Mines Limited*
By A. R. C. James

(50° 126° S.W.) Company office, 504, 1112 West Pender Street, Vancouver 1. W. J. Tough, vice-president; C. E. Gordon Brown, manager. The property comprises 13 Crown-granted claims and 15 recorded claims and is 4 miles north of Zeballos. A high-grade magnetite orebody outcrops on the west side of Zeballos River valley at an elevation of approximately 2,600 feet. The outcrop of magnetite extends in a northerly direction for 1,500 feet, averaging 70 feet thick, and dips westward at about 40 degrees. The hangingwall is a complex of tuff, intrusive andesite, diorite, and granodiorite locally altered to skarn, and the footwall is composed of grey Quatsino Limestone.

The present company commenced work on the property in 1959. Open-pit mining began in 1962, but the property was closed on February 27, 1963. After a complete reorganization of the company and change of control, the property was reopened on November 1, 1963, and prepared for renewed production as an underground mine. Operations have been continuous since that time. The mine has been developed from a main haulage level at 2,280 feet elevation, and the method of mining is long-hole blasting with mucking-machine drawpoints. In 1967 the development work in " B " zone was completed, and the two stopes in this zone were mined. By the end of the year the long-hole blasting in the stopes was completed, and both stopes had broken through to surface. The ore from these stopes is loaded out at drawpoints on " B " level at 2,440 feet elevation and put through an ore-pass to the main haulage at 2,280 feet elevation. The following is a summary of underground development work completed in 1967:—

| | Ft. |
|---|---|
| Drifting | 1,238 |
| Raising | 341 |
| Diamond drilling | 4,468 |

The ore is trucked from the mine to the primary crusher at 2,100 feet elevation. It then passes through a secondary crusher and into a 100-ton surge bin. From there it is withdrawn in 9-ton steel skips which descend over a standard-gauge triple-track surface tram to the crude-ore stockpile just above the mill. At the mill the ore is beneficiated by magnetic separation. It is then trucked to a loading-dock at the head of Zeballos Inlet, where a stacker conveyor delivers the ore to a stockpile, which may contain up to 80,000 tons. An underground conveyor system removes ore from the stockpile and loads directly into the holds of ocean-going freighters at a rate of 900 tons an hour.

Total production of ore milled was 372,198 tons. Total iron concentrate produced was 245,806 tons.

*Copper*

**Privateer, Fernhill Fraction**
*Pyramid Mining Co. Ltd.*
By A. R. C. James

(49° 126° N.W. and 50° 126° S.W.) Company office, 600, 890 West Pender Street, Vancouver 1. The following claims—Privateer (Lot 1042), Garbo (Lot 1030), Garbo 2 (Lot 1861), Blackbird (Lot 1055), Scorpio (Lot 1703), Fernhill Fraction, Cedar Hill Fraction, and Trygg Fraction—are situated near the confluence of Spud Creek and Zeballos River. Access is from Zeballos by 3 miles of road. They are held by New Privateer Mine Limited but currently are under agreement with Pyramid Mining Co. Ltd. The last significant work was done in 1964 by New Privateer Mine Limited. The present company carried out a magnetometer survey, soil-sampling, and some geological mapping on the Garbo, Privateer, and Fern Hill Fraction claims. Three men were employed for two months under the supervision of C. Miller.

[Reference: *Minister of Mines, B.C.*, Ann Rept., 1964, p. 154.]

## HESQUIAT HARBOUR

*Gold-Silver-Zinc-Iron*

**Hesquiat, Satchie**
*Lindale Copper Mines Ltd.*
By V. A. G. Preto

(49° 126° S.E.) Company office, 803, 1636 Haro Street, Vancouver 5. Lorne Hansen, president. The company has approximately 24 mineral claims, held under option from Lorne Hansen and Sun-West Minerals, Limited. The claims, known as the Hesquiat group, are located immediately to the east of Hesquiat Lake, at the north end of Hesquiat Harbour. Lorne Hansen supervised work in 1967, which consisted of three hand trenches totalling 90 lineal feet and of three pits totalling 40 feet in depth.

## FLORES ISLAND

*Copper-Zinc*

**Ormond, Contact**
*Van-West Minerals Limited*
By A. R. C. James

(49° 126° S.E.) Company office, 803, 1636 Haro Street, Vancouver 5. The Ormond and Contact groups, comprising 37 claims, are in the southeast part of Flores Island near the village of Ahousat, ranging in elevation from sea-level to 1,150 feet. Access is by trail from Matilda Inlet. It is reported that chalcopyrite and sphalerite mineralization occurs in andesite volcanics and chert in several old adits. The property was under option to Falconbridge Nickel Mines Limited in 1966, and this company did some work but terminated the option before the end of the year.

In 1967 the company completed nine diamond-drill holes totalling 1,400 feet. The work was under the supervision of Lorne Hansen.

## TOFINO

*Copper*

**Catface**
*Catface Copper Mines Limited*
By A. R. C. James

(49° 125° S.W.) This company is wholly owned by Falconbridge Nickel Mines Limited (British Columbia office, 504, 1112 West Pender Street, Vancouver 1). The property, comprising 131 recorded claims on Catface Range, is on a peninsula between Bedwell Sound and Herbert Inlet and is about 8 miles north of Tofino.

The range rises rapidly to a maximum elevation of about 3,000 feet, and the principal showings occur on a southwestward-facing cliff which rises for many hundreds of feet above its base at about 1,600 feet elevation. The showings comprise disseminated chalcopyrite and bornite mineralization with extensive malachite staining in quartz monzonite. These showings, together with the local geology, were described in the 1963 Annual Report. The present company has held the property since 1960, and has done a total of 16,755 feet of diamond drilling (including packsack drilling) as well as geophysical and geological surveys.

In 1967 it is reported that a self-potential geophysical survey was done over an area of 4 square miles, soil-sampling over an area of approximately 5 square miles, and geological and topographical mapping carried out. An average crew of 10 men was employed for seven months under the supervision of R. N. Saukko.

*Copper-Nickel-Molybdenum*

**Moly, Tofino, Tofino Nickle, Etc.**
*Sun-West Minerals, Limited*
By A. R. C. James

(49° 125° S.W.) Company office, 803, 1636 Haro Street, Vancouver 5. Lorne Hansen, president. The company owns a total of 75 recorded claims, consisting of the Moly, Tofino, Tofino Nickle, Foremost, Clear Creek, and Copper Creek groups, at the head of Tofino Inlet, extending from an elevation near sea-level to 850 feet. Access to the property is by boat from Tofino, a distance of 18 miles.

A detailed description of the property was given in the Annual Report for 1963. The mineralization comprises irregular masses and disseminations of molybdenite, chalcopyrite, and magnetite associated with skarn alteration. The property has been explored intermittently since 1898, and by the present company since 1962. It is reported that in 1967 two holes were diamond drilled totalling 220 feet, and some 65 feet of trenching was done. The work was supervised by Lorne Hansen.

*Copper-Lead-Zinc-Manganese*

**MN**
By V. A. G. Preto

(49° 126° S.E.) The MN group comprises 68 recorded mineral claims owned by Lorne Hansen, of Tofino, and F. C. Buckland. The claims are located in the north central part of Vargas Island, and may be reached by boat from Tofino, 4 miles distant.

Work done in 1967 was supervised by L. Hansen and consisted of 4,000 lineal feet of bulldozer trenching, approximately 1,000 square feet of stripping, and several small open cuts. Four men were employed by the company for a period of four months.

## KENNEDY LAKE

*Iron*

**Brynnor Mine**
*Brynnor Mines Limited*
*(Kennedy Lake Division)*
By A. R. C. James

(49° 125° S.E.) British Columbia office, 1050 Davie Street, Vancouver 5; mine office, Ucluelet. A. M. Cormie, general superintendent. The company is a wholly owned subsidiary of Noranda Mines, Limited. The mine is situated about 2½ miles southeast of Kennedy Lake, near the headwaters of Draw Creek. Access is by the Alberni–Tofino road as far as Kennedy Lake and by a logging-road from there to the mine. Ore is trucked from the crushing plant to the mill and loading-dock at Toquart Bay, a distance of 8 miles. Here the magnetite is loaded from a large storage pile into ocean-going ore-carriers for shipment to Japan.

The geology of the mine and methods of mining have been described in previous Annual Reports. All production to date has been by open-pit mining, although extensive underground development was done from August, 1963, to July, 1966. In July, 1966, all operations were suspended as a result of a strike which continued until March 6, 1967. Production was then resumed in the open pit on a much reduced scale, and all underground development was abandoned and the pumps and equipment withdrawn.

The total amount of ore mined and milled in 1967 was 187,588 tons. This yielded 137,229 tons of concentrate.

*Copper*

## PORT ALBERNI

**Roseanne** (49° 125° S.E.) This group of 18 mineral claims is held by record in the names of Arthur Phillip Boulanger, 1563 Discovery Avenue, Nanaimo, and R. J. Reid. The claims are on the north side of Great Central Lake about 4 miles from the east end and are reached from the foot of the lake by the Thunder Bay road.

By N. D. McKechnie

The claims are underlain by massive and amygdaloidal basalts of Karmutsen age (*Geol. Surv., Canada,* Map 49-1963). Locally they are lightly fractured.

There are two mineral showings about 300 feet apart on the Thunder Bay road toward the northern boundary of the group. The most northerly one is a large outcrop some 100 feet long and 20 to 30 feet high on which a shearing bordered by an amygdaloidal zone, having a combined width of about 10 feet, is exposed just above road level. The shearing strikes north 62 degrees west and dips 70 degrees northeastward; in its hangingwall is the amygdaloidal zone, which contains scattered small quarts bodies mineralized with chalcopyrite and bornite. Some of the amygdules, also, contain chalcopyrite grains. The southerly of the two showings is a 1-foot-wide shear at the roadside striking north 50 degrees west and dipping 50 degrees northeastward. The hangingwall of the shear is coarsely brecciated to a width of 2 feet, and the breccia is sparsely mineralized with chalcopyrite. It is exposed for about 15 feet on strike.

Another mineral showing lies about 2 miles along the Thunder Bay road toward the lake, and about a quarter-mile uphill and east of the road. A basaltic rock heavily mineralized with chalcopyrite, pyrite, and magnetite is exposed for about 1 foot of width and 2 to 3 feet of depth. It is on the hangingwall side of an unmineralized fault striking north 70 degrees west and dipping 70 degrees southwestward. There are chunks of mineralized basalt in the fault to the southeast, so mineralization in its footwall should be sought in that direction.

*Copper-Molybdenum*

**Mary** (49° 124° S.W.) Company office, 300, 890 West Pender Street, Vancouver 1. The Mary group of 11 recorded claims is on the east side of Mount Spencer, 14 miles southeasterly from Port Alberni. The elevation of the showings ranges from 3,300 to 4,300 feet. Chalcopyrite, pyrite, pyrrhotite, molybdenite, and sphalerite mineralization is reported to occur in fracture zones in silicified Karmutsen volcanics. Previous exploration was carried out by Gunnex Limited from 1964 to 1966. In 1967 the present company carried out geological mapping and geophysical (electromagnetic and magnetometer) surveys. Five EX holes totalling 412 feet and four AX holes totalling 1,503 feet were diamond drilled. An average crew of 10 men was employed for 2½ months under the supervision of R. J. Nicholson.

*Cominco Ltd.*
By A. R. C. James

*Copper*

**Andy, Pak** (49° 124° S.W.) Company office, 1050 Davie Street, Vancouver 5. The Andy and Pak groups, totalling 50 recorded claims held by Noranda Exploration Company, Limited, are in the vicinity of the headwaters of Corrigan Creek, a tributary of Franklin River, which flows

*Noranda Exploration Company, Limited*
By A. R. C. James

into the east side of Alberni Inlet. The showings range in elevation from 1,200 to 1,800 feet and are reported to include chalcopyrite mineralization occurring as fracture fillings and disseminations in granodiorite.

Work done in 1967 included topographical mapping, an induced polarization survey over the central portion of the property, and diamond drilling six holes totalling 2,304 feet. An average crew of nine men was employed for two months under the supervision of D. Pegg.

*Molybdenum*

**Rex**
*Amax Exploration, Inc.*
By A. R. C. James

(49° 124° S.W.) Company office, 601, 535 Thurlow Street, Vancouver 2. The Rex group of 28 recorded claims is at an elevation of from 1,700 to 2,000 feet between Cous Creek and Macktush Creek, 5 miles east of Nahmint Lake and 7½ miles in a direct line from Port Alberni. Access is by logging-roads from Port Alberni. The showings are reported to consist of quartz-molybdenite stringers in altered volcanics of the Vancouver Group. In 1967 soil and stream sediment sampling was done over the claim group and a geological map of the property was also made. Four men were employed for one month under the supervision of P. E. Fox.

*Copper*

**Rainy Day, Ocean Wave**
*Mt. Agnes Mines Ltd.*
By A. R. C. James

(49° 125° S.E.) Company office, 401, 615 West Pender Street, Vancouver 2. The property comprises the Rainy Day (Lot 379) and Ocean Wave (Lot 303) Crown-granted claims and Mineral Leases M13 and M20, a total of 38 claims. It is at the southeast end of Henderson Lake, ranging from sea-level to 1,000 feet in elevation. The original claims date back to the early years of the century, when a little work was done. Some further work was done on the Rainy Day claim in 1928, and an account of this is given in the Annual Report for that year (p. 369). The showings are reported to include chalcopyrite, pyrite, and magnetite, associated with garnet, epidote, and skarn alteration of limestone, diorite, and volcanics.

In 1967 a preliminary magnetometer survey was done over an area of 1 square mile, and later a detailed magnetometer survey in four areas totalling 21,000 square feet. A 25-foot-long trench was cut and two holes were diamond drilled totalling 320 feet. Four men were employed over a period of seven months, the work being supervised by Seigel Associates, Limited.

## BUTTLE LAKE

*Copper-Zinc-Silver*

**Lynx Mine**
*Western Mines Limited*
By W. C. Robinson

(49° 125° N.W.) Company office, 1290 One Bentall Centre, Vancouver 1; mine office, P.O. Box 8000, Campbell River. W. G. Jewitt, president; J. B. Magee, general manager. The Lynx mine, owned and operated by Western Mines Limited, is at the south end of Buttle Lake, 55 miles by road from Campbell River.

Construction of a 750-tons-per-day crushing plant and concentrator, which had begun in 1965, was completed at the end of 1966. Continuous milling operations began in January, 1967, and continued throughout the year. In this period 310,604 tons of ore from the Lynx mine was milled to produce 18,683 tons of copper concentrate, 23,563 tons of zinc concentrate, and 1,815 tons of bulk lead-zinc concentrate. Except for ore obtained during underground development, the ore treated was mined from an open pit, which had been established during 1966. Underground development mining included the driving of 8,188 feet of drifts and crosscuts and 3,296 feet of raises. In addition, 42,911 feet of diamond drilling was completed.

New construction during 1967 included installation of the underground production hoist and installation of the tailings-disposal system. In addition, the 4,500-horsepower electrical generating plant was fully utilized.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1964, pp. 157–166; 1966, pp. 77–78.]

*Copper-Zinc-Silver*

**Paramount**
*Myra Falls Mines Ltd.*
By Stuart S. Holland

(49° 125° N.W.) Company office, 1290, 505 Burrard Street, Vancouver 1. Myra Falls Mines Ltd. is a wholly owned subsidiary of Western Mines Limited. The Paramount property consists of 69 claims, some Crown granted and some held by record, situated on the south side of Myra Creek. The portal of the Paramount adit is 4,400 feet south of the No. 10 adit of the Lynx mine. In 1967 two surface holes totalling 176 feet and 22 underground holes totalling 4,895 feet were diamond drilled.

*Gold-Silver-Copper-Lead-Zinc*

**Cream, Bear**
*Cream Silver Mines Ltd.*
By W. C. Robinson

(49° 125° S.W. and N.W.) Company office, 1045 West Pender Street, Vancouver 1. Cream Silver Mines Ltd. holds 75 recorded mineral claims, lying between 3,000 and 5,000 feet elevation approximately 5 miles south of Buttle Lake and east of Bedwell Lake. Access to the property is by 60 miles of road from Campbell River. In 1967 a crew of five men was employed for five months under the supervision of S. K. Lothrop. Work included geological mapping, geophysical surveying, and trenching. Tetrahedrite, pyrargyrite, galena, and sphalerite mineralization is reported to occur in veins in the volcanics.

## VICTORIA MINING DIVISION

### PORT ALBERNI

**Mary**
*Cominco Ltd.*

(49° 124° S.W.) *See under* Alberni Mining Division, page 76.

### JORDAN RIVER

*Copper*

**Sunloch and Gabbro**
*Cowichan Copper Co. Ltd.*
By W. C. Robinson

(48° 124° S.E.) Company office, 620 Howe Street, Vancouver 1; mine office, River Jordan. O. G. MacDonald, president; J. A. Coates, general superintendent. This property is on the Jordan River about 1 mile upstream from its mouth and is connected by road to the Victoria highway about one-half mile east of the River Jordan post office. Cowichan Copper Co. Ltd. has an operating lease from Sunro Mines Limited (controlled by Cominco Ltd.) to mine on 51 contiguous claims, within which are the Cave, Central, and River ore zones. The following work was done during the year: Drifting, 5,187 feet; raising, 2,066 feet; long-hole drilling, 48,356 feet. Total ore milled was 151,978 tons.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1950, pp. 180–193; 1962, pp. 127–129.]

*Copper*

## CHEMAINUS RIVER

**Yam, Ohm**
*Cominco Ltd.*
By Stuart S. Holland

(48° 124° N.E.) Cominco Ltd. owns the Yam and Ohm groups of 14 claims, which lie south of Coronation Mountain in the headwaters of Chipman (Boulder) Creek, a south-flowing tributary of Chemainus River. Access to the property from Duncan is by 25 miles of public road and logging-road. In 1967 the geology of the Ohm claims was mapped and a soil-sampling survey was made of an area 8,000 by 8,000 feet at the headwaters of Chipman (Boulder) Creek. Work was supervised by G. G. Booth, geologist.

[Reference: Assessment Report No. 935.]

*Copper*

## MOUNT BRENTON

**Tot, Rum**
*Cominco Ltd.*
By Stuart S. Holland

(48° 123° N.W.) Cominco Ltd. owns the Tot and Rum groups, totalling 14 recorded claims, lying south of Mount Brenton and west of the Chemainus River between Silver Creek and Holyoak Creek. Access to the property is from Duncan by way of 20 miles of public road and logging-road. The base-metal rights of the claims are under agreement from Canadian Pacific Oil and Gas Limited. In 1967 a soil-sampling survey was made of an area 4,000 by 8,000 feet on the Tot group. The work was supervised for the company by G. G. Booth, geologist.

[Reference: Assessment Report No. 936.]

*Copper*

## MOUNT SICKER

**Lenora, Tyee, Richard III**
*Mount Sicker Mines Ltd.*
By W. C. Robinson

(48° 123° N.W.) Company address, P.O. Box 576, Victoria. The Mount Sicker property consists of 55 mineral claims, including the Lenora (Lot 35G), the Tyee (Lot 36G), and the Richard III (Lot 39G) Crown-granted claims in the Mount Sicker area. Access is by road from Duncan.

Work on this property began as early as 1897, and early reports indicate that ore was shipped from the Lenora and Tyee claims in 1901. In 1902 shipments were made to a smelter at Ladysmith, and shipments continued until 1907, when operations ceased. The property was reopened in 1942 by Twin " J " Mines Limited, who erected a concentrator capable of treating approximately 125 tons of ore per day. Milling operations began in July, 1943, and continued until May, 1944. During this period concentrate shipments were made under contract with Wartime Metals Corporation.

Throughout 1967 an average crew of four men was employed doing geological mapping, geochemical surveying, and stripping a total of 15,000 feet.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1902, pp. 238–252; 1942, p. 69; 1964, pp. 168–169; Assessment Report No. 1104.]

# OMINECA MINING DIVISION

## TERRACE

**NAR**
*Amax Exploration, Inc.*

(54° 128° N.W. and N.E.) *See under* Skeena Mining Division, page 53.

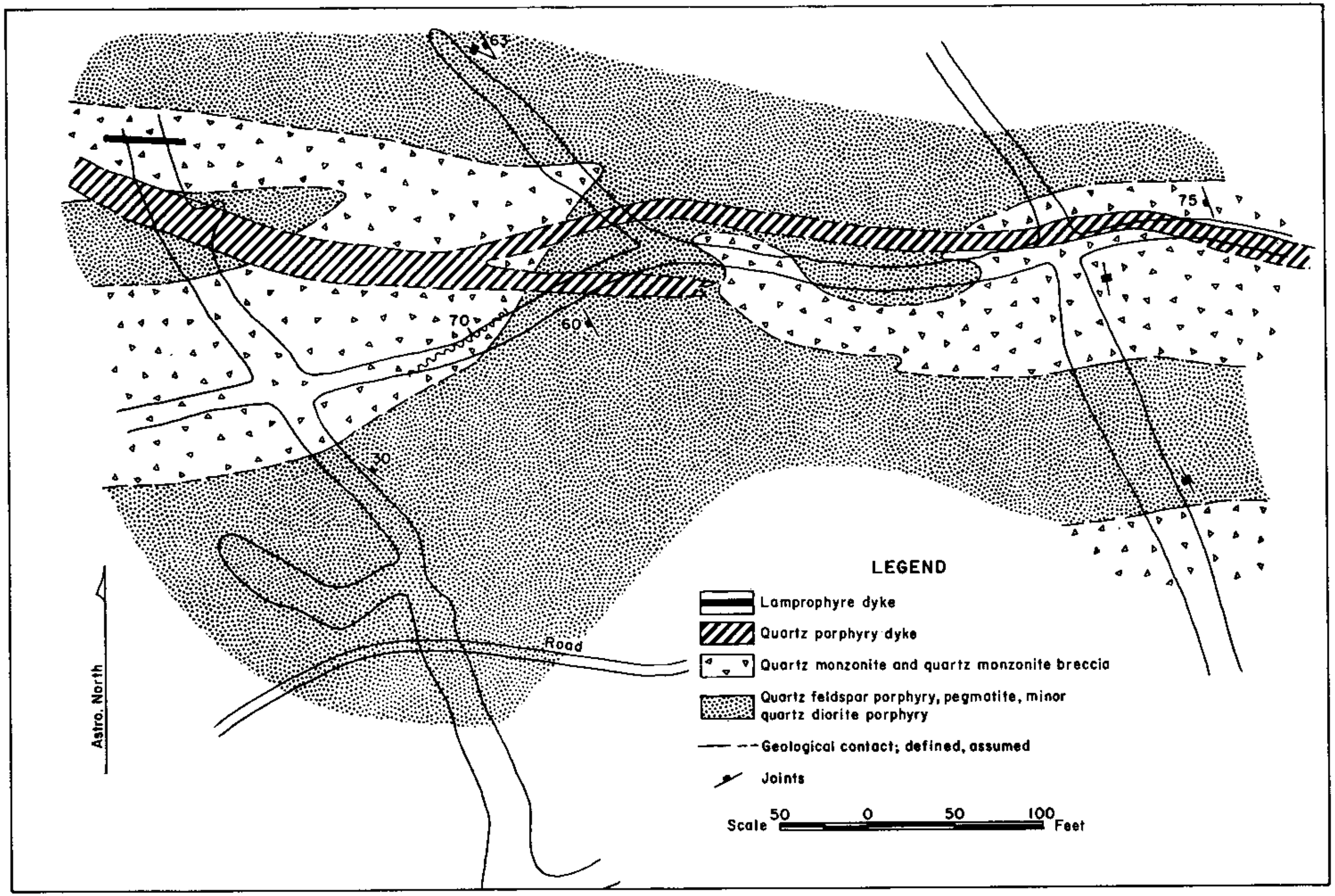



Figure 7. Kleanza Mines Ltd. Geology of the Croesus showings.

*Copper-Molybdenum*

**Gold Star, Eastern Star**
*New Gold Star Mines Ltd.*
By H. Bapty

(54° 128° N.E.) Company office, 789 West Pender Street, Vancouver 1. D. R. Cochrane, consulting geologist. The Gold Star and Eastern Star groups consist of 84 recorded claims at 1,200 to 3,800 feet elevation on Hankin (Phillips) Creek, a tributary of the Skeena River, 6 miles northeast of Terrace. The claims are accessible by 2 miles of foot-trail leading up Hankin Creek from the Canadian National Railway tracks, or by a 5-mile helicopter trip from Terrace. The claims cover showings formerly known as the Copper King and Nugget.

During the summer three men were employed by the company. Some surveying was done, seven claims were mapped geologically, and some magnetometer and geochemical sampling was done. Two trenches 50 feet long were blasted, and a number of shallow pits were sunk.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1928, pp. 145–146; Assessment Reports Nos. 999 and 1090.]

*Copper-Gold*

**Croesus**
*Kleanza Mines Ltd.*
By N. C. Carter

(54° 128° N.E.) Company office, 201, 535 Thurlow Street, Vancouver 5. R. H. Bates, president; W. M. Sharp, consulting geologist. This group of 121 recorded claims is on the west side of Kleanza Mountain 5 miles east of Terrace. Elevations range from 500 to 4,000 feet. The property is accessible by an old logging-road branching from the Zymoetz River road 1 mile south of Highway No. 16. The claims, which were located in 1966, cover a number of old gold-silver prospects including the Excelsior, Gem, Silver Bow, and Silver Cliff.

Plutonic rocks of the Coast Crystalline Belt underlie most of the property. The main Croesus showings occur in a granitic complex exposed in a number of trenches adjacent to the main access road between 800 and 1,100 feet elevation (*see* Fig. 7). The oldest phase within the granitic complex includes coarse pegmatite and related quartz feldspar porphyry. Pegmatite underlies a prominent east-trending ridge several hundred feet east of the old trenches and occurs as small lenses within leucocratic quartz feldspar porphyry exposed in the trenches. It consists mainly of subhedral 2-inch crystals of white to pink potash feldspar and lenses of grey to white quartz with subordinate grey sericite. The quartz feldspar porphyry is typically a crowded porphyry with 50 per cent of the rock consisting of 2- to 5-millimetre phenocrysts of anhedral quartz and euhedral orthoclase, microcline-perthite and oligoclase set in a fine-grained quartzofeldspathic matrix containing minor sericite and chlorite. With lessening potash feldspar content and an increase in biotite, the rock is gradational to quartz diorite porphyry.

Intrusive into these types is equigranular quartz monzonite featured in hand specimen by the presence of iron-stained quartz crystals. Plagioclase ($An_{25-30}$) is commonly sericitized, and perthitic potash feldspar may be in part secondary after plagioclase. Chlorite and epidote are the main mafic minerals. An igneous breccia phase of the quartz monzonite contains 2- to 6-inch fragments of older rocks including dark crystalline volcanic rocks and pegmatite. A small area of quartz diorite gneiss, noted in one locality, may be related to the quartz monzonite.

An east-striking 15-foot-wide branching dyke of light-grey quartz porphyry cuts all of the previously mentioned rock types. A narrow dark-green lamprophyre dyke was seen cutting quartz monzonite in one trench and may represent the last phase of intrusive activity.

Pyrite, in fractures and as disseminations, is widespread in all granitic rocks with the exception of the quartz porphyry. Chalcopyrite is largely confined to the quartz monzonite and related breccias in the easternmost trench, where it occurs in fractures and quartz lenses and to a lesser degree as fine disseminations intimately associated with mafic minerals. Northeast of the trenches, chalcopyrite was noted in similar quartz monzonite.

The Excelsior showings are 3,000 feet east of the Croesus trenches at an elevation of 1,300 feet. Several trenches expose intensely sheared diorites and recrystallized basic volcanic rocks. Stringers of quartz and iron carbonate, following the north to northeast shearing direction, contain coarse blebs of chalcopyrite and pyrite. Post-mineral shearing was also noted.

Exploration work to date on the property has included soil-sampling, an electromagnetic survey, and 4,000 feet of trenching.

## KLEANZA CREEK

*Copper-Silver*

**Alvija, Alpine**
*Alvija Mines Ltd.*
By H. Bapty

(54° 128° N.E.) Company office, 201, 846 West Hastings Street, Vancouver 2. Ivan Todd, president; Gordon E. P. White, consulting geologist. The Alvija and Alpine groups of 79 recorded mineral claims are under option from Messrs. McCulloch, Greer, Felber, Lever, and Todd. They are at the junction of Kleanza (Gold) and Kipulta Creeks, 17 miles east and slightly north of Terrace, 9 to 10 miles east of Highway No. 16 where the Kleanza (Gold) River flows into the Skeena River. The claims are at elevations from 1,500 to 2,400 feet. They can be reached by logging-road and mine road from Highway No. 16 or by Terrace-based helicopter.

These claims were originally located by Fred Forrest, of Usk, in 1908. A 35-foot adit was driven by Federal Mining and Smelting Co. in 1924, and in 1929 The Consolidated Mining and Smelting Company of Canada, Limited, drove a drift from the 2,080-foot elevation for approximately 155 feet. The two adits are on a claim previously known as the Lucky Jemil, and currently covered by Alvija Nos. 1 and 2. A 20- by 7-foot incline shaft on the Idaho (now Alvija No. 1) is 1,000 feet southeast of the two adits. In 1966 Union Carbide Exploration Limited mapped and sampled the showing.

Three employees spent eight months on the property. Seven miles of jeep-road and a heliport were built. Seven miles of grid line was run, and soil samples were taken every 200 feet. Some detailed and geological mapping was done, and geochemical sampling was done on the Alvija 1, 2, 5, and 6 claims. Alrae Explorations Ltd. drilled and blasted eight trenches totalling 120 feet in length and five pits. One EX diamond-drill hole was drilled to a depth of 87 feet.

[References: Duffell, S., and Souther, J. G., *Geol. Surv., Canada,* Mem. 329, 1964; Kindle, E. D., *Geol. Surv., Canada,* Mem. 212, 1937; *Minister of Mines, B.C.*, Ann. Rept., 1929, p. 152.]

## USK

*Copper*

**Golconda**
*Shasta Mines & Oils Ltd.*
By W. G. Clarke

(54° 128° N.E.) Company office, 1390 Pemberton Avenue, North Vancouver. The Golconda group of 40 claims, purchased by the company from J. Bell, is east of Usk and is accessible from Highway No. 16. The property was formerly known as the Toulon. Six men spent two months under the direction of J. A. McAskill, geologist, making a geochemical survey, trenching, test pitting, and packsack drilling four holes totalling 24 feet. An access road was constructed and a temporary building was erected. This property has been explored intermittently since 1890.

## LEGATE CREEK

*Copper-Lead-Silver*

**M&M, FM**
*Hub Mining & Exploration Ltd.*
By H. Bapty

(54° 128° N.E.) Company office, 85 Commercial Street, Nanaimo. H. Elgie, president; Allan P. Fawley, consulting geologist. The M & M and FM groups of 21 recorded claims cover ground held in 1966 as the HUB and FM. The claims are 25 miles northeast of Terrace between 2,700 and 4,500 feet elevation near the headwaters of Legate Creek. The old mining-road from Highway No. 16 is now impassable, so transportation is by helicopter from Terrace.

During the year a heliport was built, and some trenching and prospecting done. An induced polarization survey was made by Seigel Associates, Limited, over the FM 1 to 6 mineral claims.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1929, p. 153; 1966, p. 80.]

*Copper*

**NX**
*Glen Copper Mines Limited*
By H. Bapty

(54° 128° N.E.) Company office, 1403, 1030 West Georgia Street, Vancouver 5. Clifford H. Brett, director; Douglas Parent, general manager. The NX group of 18 recorded mineral claims is between elevations of 5,000 and 5,800 feet, and between Frisco Creek at the head of Legate Creek and Zymoetz River at Mile 24 on the Columbia Cellulose private logging-road. For one month four men prospected the property and blasted eight pits. The property was serviced by Terrace-based helicopter.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 80.]

## FIDDLER CREEK

*Molybdenum*

**Lynda, Sno, Help**
*Amax Exploration, Inc.*
By H. Bapty

(54° 128° N.E.) Company office, 601, 535 Thurlow Street, Vancouver 5. P. W. Richardson, staff geologist. The Lynda, Sno, and Help claims are on Fiddler Creek between 3,000 and 4,000 feet elevation. A topographic map was prepared by McLaren and Associates, an area 5,000 by 10,000 feet was mapped geologically, and two BQ wireline diamond-drill holes totalling 2,422 feet were drilled. The property was serviced by helicopter from Terrace, 18 miles distant.

[Reference: Assessment Report No. 866.]

*Gold*

**Brentford**
*Dorreen Mineral Developments Ltd.*
By H. Bapty

(54° 128° N.E.) Company office, P. O. Box 1143, Terrace. Bruce Webb, manager. The Brentford group of eight Crown-granted claims, comprising the Brentford, Hedley, Fiddler, Josie, Nelson, Albana, Royal Soverign, and Drumbo Fraction, is on the south side of Fiddler Creek 3½ miles north of Dorreen. The claims are between 900 and 1,300 feet elevation. Transportation is by a four-wheel-drive vehicle over a 3½-mile mine road north from Dorreen to the mine portal. During the summer four pits were sunk on quartz veins.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1914, pp. 138–139.]

## LORNE CREEK

*Molybdenum*

**Hart**
*Amax Explorations, Inc.*
By H. Bapty

(54° 128° N.W.) Company office, 601, 535 Thurlow Street, Vancouver 5. The Hart group of 46 recorded claims lies 23 miles north-northeast of Terrace between 3,500 and 4,000 feet elevation on south Lorne Creek. Four men spent a month on the claims doing geological mapping and taking soil samples. The exploration crew was serviced by Terrace-based helicopter.

*Copper-Molybdenum*

## KITSEGUECLA RIVER

**Jan**
*Mastodon-Highland Bell Mines Limited*
By R. V. Kirkham

(54° 127° N.W.) Company office, 300, 900 West Pender Street, Vancouver 1. The Jan group of 44 claims, owned by Mastodon-Highland Bell Mines Limited, is west of the head of Kitsuns Creek, about 30 miles north of west from Smithers.

A hornblende feldspar porphyry intrusion, elongated in an easterly direction, has been emplaced near the contact of Hazelton volcanic rocks and Bowser sediments. Between elevations of from 4,300 to 5,300 feet near the central part of the intrusion, the porphyry is altered and cut by quartz veinlets containing pyrite, chalcopyrite, and molybdenite. The central zone of copper and molybdenum mineralization is surrounded by an extensive pyritic halo.

In 1967 trenching and sampling were done and geochemical and geophysical surveys were made. E. Wozniak was in charge of the work.

*Gold-Silver-Lead-Zinc*

## HAZELTON

**Silver Standard Mine**
*Northwestern Midland Development Co. Ltd.*
By H. Bapty

(55° 127° S.W.) Company office, 1184 Harper Street, Prince George; mine office, P.O. Box 130, Hazelton. Joe Bryck, managing director; G. Braun, mine superintendent. The Silver Standard mine was a producing property from 1947 until 1957. The original property contained 35 Crown-granted and 12 recorded mineral claims on Mount Glen, 5½ miles north of Hazelton. The mine has been leased from Silver Standard Mines Limited, 602 West Hastings Street, Vancouver 2, by Northwestern Midland Development Co. Ltd.

This company proposes to mine some of the faulted ore sections remaining on the main haulage level. During the year 11 men were employed in the mine and the mill. A total of 406 tons of ore was trammed to a 12-ton mill. The mill operated 50 days processing the 406 tons and produced 37 tons of concentrate, which was shipped to the smelter. In addition, 197 tons of hand-cobbed ore was shipped. Production was: Gold, 32 ounces; silver, 16,415 ounces; lead, 36,903 pounds; and zinc, 30,855 pounds.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1958, pp. 9–10.]

*Silver-Lead-Zinc*

**American Boy**
By H. Bapty

(55° 127° S.W.) The American Boy group of six recorded mineral claims on the southwest slope of Nine Mile Mountain, northeast of Hazelton, is held by George Braun, of New Hazelton. The workings lie between 2,500 and 2,900 feet elevation. In 1955 J. Gallo, lessee, shipped 21 tons of sorted ore. In 1967 Northwestern Midland Development Co. Ltd., P.O. Box 130, Hazelton, shipped 10.35 tons of Wilfley table concentrate, which had been stockpiled on the property by the previous owners. The property can be reached by four-wheel-drive light truck.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1951, pp. 107–110.]

*Pyrite*

**MT**
*Amax Exploration, Inc.*
By H. Bapty

(55° 127° S.W.) Company office, 601, 535 Thurlow Street, Vancouver 5. H. W. Sellmer, staff geologist. The MT group of 42 recorded claims is at the head of Corya Creek on Rocher Déboulé Mountain, south of Hazelton. The claims lie between elevations 3,200 and 6,000 feet. Two men spent 10 days on the property; 133 soil samples were taken in an area of 2½ square miles and an area of 4½ square miles was geologically mapped. The property was serviced by helicopter from Smithers.

[Reference: Assessment Report No. 1134.]

*Gold-Silver-Molybdenum-Copper*

**Silver Tip (Sultana)**
*Sultana Silver Mines Limited*
By W. G. Clarke

(55° 127° S.W.) Company office, 219, 1705 Third Avenue, Prince George. C. E. Carlson, exploration manager. The Silver Tip group of 50 claims, owned by Sultana Silver Mines Limited, is at the headwaters of the south fork of Boulder Creek at an elevation of 5,200 feet. An access road 10 miles long was built on the south side of Boulder Creek from Highway No. 16, starting south of Boulder Creek bridge. Twenty trenches were made by bulldozer, and the claim location-lines were surveyed.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1921, pp. 100–101; 1922, pp. 99–100; 1923, p. 107.]

*Copper-Zinc-Lead*

**Orbi**
*Utah Construction & Mining Co.*
By H. Bapty

(55° 127° S.E.) Company office, 718, 510 West Hastings Street, Vancouver 2. B. McHale and C. A. Aird, geologists, in charge of work. Utah Construction & Mining Co. holds the Orbi group of 88 recorded mineral claims, located 12 miles south of New Hazelton between 350 and 1,300 feet elevation. For 3½ months six company employees and six contractors did geological mapping, geophysical surveying, and geochemical soil-sampling in an area 1 by 2 miles. An induced polarization survey was run on 13 miles of line, an electromagnetic 16 survey over 2 miles of line, and a magnetometer survey over 16 miles of line. Soil samples were taken over 19 line miles. Three AX diamond-drill holes totalling 1,959 feet were drilled. Access to the property is by 12 miles of truck-road from New Hazelton.

## SKEENA MOUNTAINS

*Molybdenum*

### Atna Range

**C.M., Jan, Cob, Sic, Atna**
*Canadian Superior Exploration Limited*
By W. G. Clarke

(55° 127° N.E.) Company office, 908, 7 King Street East, Toronto 1, Ont. The Atna and C.M. group of claims, under option to Canadian Superior Exploration Limited from Sicintine Mines Ltd., and the Jan, Pat, and Mad groups, located by Canadian Superior Exploration Limited, are at elevations of from 3,500 to 6,000 feet on the west side of Sicintine Lake in the Atna Range. The property is 80 miles from Smithers and is accessible by helicopter.

Eight men spent one month on the property under the direction of B. H. Kahlert and O. E. Leigh, geologists. The geology of the Atna and the Cob claims was mapped, some geochemical sampling was done, and 13 trenches in rock were drilled and blasted.

*Copper-Molybdenum*

**Cumo, Ike** (55° 127° N.E.) The Cumo and Ike groups, owned by D. J.
By R. V. Kirkham McDonald, G. F. Taylor, *et al.*, are in the Atna Range 5 miles south of Shedin Peak. Bowser Group sediments are intruded by a stock of granodiorite, which in turn is cut by dykes of fine-grained granite, pale aplite, and pegmatite. The mineralization, which occurs near the contact of the granodiorite, consists of pyrite, chalcopyrite, and molybdenite in widely scattered quartz veinlets and veins ranging from a fraction of an inch to more than 2 feet wide. The largest veins strike northeasterly and dip 15 to 20 degrees southeast.

The mineralization is observed to extend over an area a few hundred by 1,000 feet. Alteration is not extensive, and the average grade of exposed mineralization is low.

*Copper*

## Cariboo Heart Range

**Northstar** (56° 126° S.E.) The Northstar property con-
*Northstar Copper Mines Ltd.* sists of 114 mineral claims located as the Fred,
By A. Sutherland Brown Bob, Marg, and others and held by Northstar Copper Mines Ltd. (P.O. Box 937, Smithers; R. M. Tait, president). The claims cover a large part of the Cariboo Heart Range north of Kaza Lake, which is in the southeast corner of the McConnell Creek area, 95 miles north-northeast of Smithers. Access is by float plane. The initial discovery and main showing is on the eastern slope of the mountain at about 5,000 feet elevation a mile north of the lake and on the Fred No. 2 claim near the boundary of Fred No. 1. In 1966 preliminary exploration included geological mapping and some hand trenching in the vicinity of the main showing and further prospecting in the area. In 1967 a field laboratory and camp were established at Kaza Lake and an extensive grid was laid out preparatory to soil-sampling and geological mapping. In September, after the writer's visit, 2,091 feet of AQ core was drilled in nine holes. T. Cameron Scott was in charge of the work.

The Cariboo Heart Range is underlain principally by volcanic and sedimentary rocks that Lord (1948, *Geol. Surv., Canada,* Mem. 251) included in his upper division of the Takla Group, but would not be so included today. However, he made extensive fossil collections that enable one to re-interpret the geology in the light of recent work. The intermediate and basic volcanic rocks (Unit 4 on Lord's map) that underlie most of the range probably belong to the Hazelton Group, and these are overlain by argillite, greywacke, and conglomerate that probably belongs to the Bowser Group (Unit 5A). In addition, on Kaza Peak these rocks are truncated and thrown into recumbent folds by a flat thrust from the east that carries Sustut Group in the upper plate.

The main showing (A) is on the eastern slope of the mountain on the rim of a landslide scar around which exposure is good in contrast to the surrounding area. The rocks strike within 15 degrees of true north and dip 45 to 65 degrees eastward. They appear to belong to the Hazelton Group and are basic to intermediate pyroclastic and massive volcanic rocks intercalated with lesser sedimentary rocks. Some of the sedimentary rocks are copper-bearing siltstones that occur on the southeastern rim of the scar, and because these are possibly syngenetic, the stratigraphic section and petrography are described in some detail. The section revealed around the rim from the stratigraphic base at the top of the scar is as follows: Lathy porphyritic basalt, 52 feet; limestone, 5 feet; agglomeratic limestone, 10 feet; calcareous agglomerate, 19 feet; agglomerate, 4 feet; calcareous agglomerate, 28 feet; tuffaceous limestone, 10 feet; slightly tuffaceous limestone, 28 feet; agglomeratic limestone, 10 feet; calcareous blocky agglomerate, 5 feet; dark-green blocky agglomerate to lapilli tuff, 95 feet; interbedded copper-bearing black laminated siltstone, fine crystal tuff and lapilli lithic tuff, 17 feet; lapilli tuff, 5 feet; lathy porphyritic basalt, 55 feet. The 5-foot lapilli tuff bed is separated from the 55-foot exposure of lathy porphyry by a shear subparallel to bedding. Up the hill from the top of the scar, scattered outcrop indicates about an additional 100 stratigraphic feet of the lower lathy porphyry which is in bedded shear contact with a lapilli tuff similar to the main one in the section.

All the volcanic rocks are divisible into two types: the massive lathy porphyritic basalt, which are most likely flows but may be sills, and the pyroclastic rocks, which are porphyritic andesites. The porphyritic basalts are composed of about 20 per cent phenocrysts of bytownite ($An_{78}$), about 10 millimetres long in a fine trachytic matrix of small laths of labradorite ($An_{60}$), about 0.15 millimetre long, granular pyroxene, chlorite, calcite, and ores. The porphyritic andesites are slightly more variable but chiefly are fairly crowded porphyries with 20 to 50 per cent chunky phenocrysts about 0.7 millimetre long of andesine and 5 to 15 per cent hornblende phenocrysts in a very fine-grained matrix of plagioclase, chlorite, and ores.

Both rocks are normally dark grey-green with the basalt mottled by the prominent white plagioclase laths. The basalt may also be maroon from oxidation of disseminated ore minerals in the matrix. Normally both rocks are chloritized and slightly carbonatized, and the andesite may be intensely so. Prehnite may be present in minor amounts, and certain vein-like bands in the basalt are entirely altered to prehnite. Epidote may be present in minor amounts.

The limestones are bioclastic rocks composed mainly of fragments of fossils, pellets 0.1 to 0.5 millimetre in long dimension, and a variable proportion of volcanic fragments. Pelecypods, bryozoa, corals, and crinoid clasts are recognizable, but none are of any diagnostic value. Bioclastic matter is dominated by pellets of possible algæ origin. Ash, crystals, lapilli, and blocks of volcanic origin are present in widely varying proportion and maximum size. Most are porphyritic andesite identical to that of the overlying tuff and agglomerate, but some are fine-grained trachytic non-porphyritic andesite.

The copper-bearing fine-grained beds are composed of intercalated tuff similar to the finer beds of the underlying agglomerate and interlaminated black siltstone and grey plagioclase-rich crystal tuff or fine sandstone. The siltstones commonly are slightly graded and intercalated with crystal tuff in laminæ, mostly 2 to 5 millimetres thick. The tuff beds are formed chiefly of lath-shaped plagioclase clasts 0.1 to 0.7 millimetre in long dimension closely packed with very little matrix. The siltstones are also dominated by fine plagioclase debris up to 0.03 millimetre in diameter with some spherules of organic origin about 0.1 millimetre in diameter, in fairly abundant semi-opaque matrix. Veinlets of calcite, limonite, and malachite are common in the laminated siltstone and crystal tuff, and many are oriented parallel to bedding. Malachite also replaces feldspars adjacent to siltstones in crystal tuff and lapilli tuff. Rare aggregates of chalcocite, bornite, or rare native copper occur chiefly along contacts of very fine siltstone and tuff. Chalcocite of very fine grain may also occur in the opaque matrix of siltstone. Pyrite is rare and present only in volcanic fragments of tuff probably as an original mineral.

Chip samples taken by the writer across the fine beds and into the adjacent lapilli tuffs assayed as follows:—

| Sample No. | Stratigraphic Thickness | Lithology | Copper Assay |
|---|---|---|---|
| | Ft. | | Per Cent |
| 6968 | 3½ | Green lapilli tuff somewhat sheared | 0.48 |
| 6967 | 4 | Main beds—mostly laminated siltstone | 1.45 |
| 6966 | 4 | Main beds—mostly laminated siltstone | 2.79 |
| 6965 | 4 | Interlaminated siltstone and coarse tuff | 1.35 |
| 6964 | 3 | Laminated siltstone and sheared lapilli tuff | 1.01 |
| 6963 | 2 | Basal laminated siltstone and tuff | 0.65 |
| 6962 | 4 | Basal malachite—stained sheared lapilli tuff | 0.46 |

Gold and silver occur in trace amounts in each sample.

South of the rim of the scar on projected strike with the siltstones some small pits have been dug by hand. These show that the strike swings sharply to the west, but the amount and distribution of the pits is inadequate to judge the continuity of the fine beds. To the north the coarse landslide blocks of less friable agglomerate and basalt effectively obscure the rubble from the fine beds.

A number of other showings, mostly of small size, have been discovered both in the vicinity of the landslide scar and elsewhere. Many of these are minor veins of calcite with a central filling of native copper bordered by cuprite and malachite. Some are actually composed principally of prehnite yet have the same copper minerals. One plate of native copper about 10 by 6 inches was discovered in a streambed. All these appear to represent supergene accumulations.

Other showings have also been found, such as one called B showing that is about 2,000 feet southeast of the main showing (A). The B showing is exposed in a trench about 50 feet long at an elevation of about 4,635 feet. Here lathy basalt in the lower part of the trench is highly fractured with some small seams containing bornite, malachite, and covellite. A chip sample of the lower 20 feet of the exposure in the trench assayed: Copper, 1.98 per cent.

[References: Assessment Reports Nos. 833 and 1084.]

*Copper*

**Fire**
By A. Sutherland Brown

(55° 126° N.E.) The Fire group of 43 located claims is on a knoll overlooking Lion Creek, 4 miles south of Kaza Lake, which is 90 miles north-northeast of Smithers. It is held by R. M. Tait. Work done in 1967 included trenching and blasting small pits.

The region has not been mapped geologically but is close to the McConnell Creek area, which has. The area between Kaza Lake and the showings appears to be mostly underlain by porphyritic basalt pillow lavas that most likely belong to the Hazelton Group. Metamorphism does not seem important except near the showing.

The showings occur on a knob on the top of which rocks are well exposed in an elliptical area about 1,500 by 3,000 feet and are chiefly porphyritic basalts of varying phenocryst content. Rude pillows are evident in the east. On the western slope the knob is traversed by a gully oriented about north 40 degrees west that seems to be a shear. A lens of tuffaceous limestone 10 to 20 feet thick outcrops along the northern part of the gully for about 300 feet. The bedding of limestone and lavas appears to strike about north 25 degrees west and dip about 30 degrees eastward. These rocks are cut by white quartz feldspar porphyry dykes that trend northwestward and are probably related to the Kastberg Intrusions and part of the dyke swarm from Scallop Mountain.

Microscopically the flow rocks are seen to be composed of 20 to 30 per cent phenocrysts ranging from mostly agglomerated masses of plagioclase (now andesine) to dominantly chunky pyroxene. The matrix is composed of very fine plagioclase, pyroxene, chlorite, and ilmenite in an insertal fabric. Metamorphism is fairly intense but locally variable. Pyroxene is largely replaced either by actinolite or chlorite. Plagioclase is sericitized and slightly epidotized, but may also be slightly replaced by actinolite. The quartz feldspar porphyry and rhyolite are composed of a few large resorbed quartz crystals and kaolinized orthoclase and some smaller chloritized hornblende needles in a very fine aplitic quartzofeldspathic matrix.

Sulphide minerals occur in several manners: as an important accessory in highly amphibolitized volcanic rock along the main shear; as discrete vein-like masses composed of actinolite, quartz, sulphide, calcite, and chlorite; and as replacement in limestone. The main sulphides, in the rusty amphibolitized zone parallel to the shear, are pyrite and pyrrhotite with lesser chalcopyrite. In the limestone most of the sulphides are chalcopyrite. In the actinolitic vein-like masses, chalcopyrite may be the dominant mineral. These " veins " occur in a slightly irregular manner but also chiefly strike northwestward and may be 60 feet long and up to 20 feet wide, but are mostly much smaller. A grab sample from a freshly blasted pit in the limestone assayed: Copper, 1.20 per cent; silver, trace. A chip sample along an amphibolitized zone 40 by 20 feet assayed: Copper, 1.06 per cent; silver, trace.

[Reference: Assessment Report No. 1191.]

*Copper-Gold-Silver*

## McConnell Range

**Marmot**
*New Wellington Mines Limited*
By W. G. Clarke

(56° 126° N.W.) Head office, 607, 1405 Douglas Street, Victoria. W. D. Savage, field manager. The Marmot group of 141 claims, owned by the company, is on Menard Creek near the headwaters of the Ingenika River. It may be reached by flying from Fort St. James to Thorne Lake, a distance of approximately 200 miles; from there a tractor-road leads to the camp, which is approximately 10 miles southeast of the lake.

Five men worked for eight months building 20 miles of tractor-road and doing 1 mile of trenching; geological, geochemical, and induced polarization surveys were made. A cookhouse, two cabins, and a tent frame were erected. One hole was diamond drilled to a depth of 50 feet.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 82; Assessment Report No. 991.]

## SMITHERS

*Silver-Lead-Zinc*

**Cronin Mine**
*Kindrat Mines Ltd.*
By W. G. Clarke

(54° 126° N.W.) Company office, 610, 890 West Pender Street, Vancouver 1. Kindrat Mines Ltd. (owned by Paul Kindrat, P.O. Box 1057, Smithers) operates the Cronin mine under lease from New Cronin Babine Mines Limited. The Cronin property consists of the Sunrise No. 7 Crown-granted mineral claim and seven claims held under option and is located on the east slope of Mount Cronin, about 30 miles by road from Smithers.

During 1967 the mine was worked by two men from July until October. A total of 1,000 tons was mined, 800 tons from the pit and 200 tons from the upper levels underground. Production was largely from an open pit on the discovery outcrop, where ore was drawn into the upper adit through a glory-hole.

*Copper-Molybdenum*

**Big Onion**
*Texas Gulf Sulphur Company Inc.*
By W. G. Clarke

(54° 126° N.W.) Company office, 420, 1033 Davie Street, Vancouver 5. The Big Onion property of 99 claims, located as the Astlais, Ast, and Tie groups, is 11 miles east of Smithers and is accessible by road. In 1967 two BQ holes totalling 1,270 feet were drilled. A crew of seven men worked for two weeks under the supervision of A. L'Orsa, geologist.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 83.]

*Copper-Molybdenum*

**Cu, Bob, Mert**
*Tro-Buttle Exploration Limited*
By W. G. Clarke

(54° 126° N.W.) Company office, 118, 815 West Hastings Street, Vancouver 1. The Cu, Bob, and Mert claims, owned by Tro-Buttle Exploration Limited, are on the northeast side of Astlais (Big Onion) Mountain, 12 miles east of Smithers, and are accessible from the Babine Lake road. Six men spent two months under the supervision of Peter F. Bland making a geochemical survey of the entire group. An access road approximately 6 miles long was built, and three short trenches were made.

[References: Assessment Reports Nos. 1017, 1122, and 1143.]

*Gold-Copper-Lead-Zinc*

**SK**
*Dome Babine Mines Ltd.*
By W. G. Clarke

(54° 126° N.W.) Company office, 201, 535 Thurlow Street, Vancouver 5. The SK group of 64 optioned claims is on the east side of Dome Mountain and is accessible from Smithers by 35 miles of road suitable for four-wheel-drive vehicles. The property was formerly known as the Free Gold group and was extensively explored more than 30 years age. Five men spent two months surveying and doing geochemical work under the direction of R. McMichael, geologist. Thirteen miles of access road was built, and some trenching was done by bulldozer.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1938, pp. B 15–B 20.]

*Molybdenum*

**Glacier Gulch**
*Climax Molybdenum (B.C.) Ltd.*
By W. G. Clarke and R. V. Kirkham

(54° 127° N.E.) Company address, P.O. Box 696, Smithers. D. Davidson, resident geologist. The group of 347 claims is on the east slope of Hudson Bay Mountain. A crew of 19 men worked throughout the year. The 3500 level adit was driven an additional 200 feet to 6,200 feet. Four crosscuts totalling 3,000 feet were driven, and 27 holes totalling 34,146 feet were diamond drilled. All crosscuts were driven in the granodiorite sheet. Recent geological information indicates that at the level of the underground workings the shapes of zones of ore mineralization of varying grades are controlled by a prominent set of veins that dips gently to moderately eastward and southeastward.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1965, pp. 74–75; 1966, pp. 86–90.]

*Copper*

**NH**
*Canvan Investments Ltd.*
By W. G. Clarke

(54° 127° N.W.) Company office, 200, 535 Thurlow Street, Vancouver 5. The NH group of 76 claims, held by option, is on Caribou Mountain, 23 miles from Smithers. It is accessible by road and trail or by helicopter. Six men spent two weeks under the direction of M. J. Beley, geologist, making geological, geochemical, and magnetometer surveys and blasting 10 trenches totalling 175 feet.

*Copper-Molybdenum*

**Rock**
*Noranda Exploration Company, Limited*
By W. G. Clarke

(54° 127° S.E.) Company office, 1050 Davie Street, Vancouver 5. B. O. Brynelsen, western manager. The Rock group of 45 claims, owned by the company, is on Loljuh Creek, 28 miles from Smithers. Access is by helicopter. Three men spent two months under the direction of Gavin E. Dirom making geophysical and geochemical surveys and diamond drilling 296 feet in seven holes.

*Copper-Silver-Gold*

## TELKWA RANGE

**Meg, Web, Silver Hill**
*Canadian American Mining Company, Inc.*
By W. G. Clarke

(54° 127° N.E. and S.E.) Company office, 823 Northeast 190th Street, Seattle, Wash. 98155. The Meg, Web, and Silver Hill groups of 67 claims are owned by Canadian American Mining Company, Inc., and are in Hunter Basin in the Telkwa Range 16 miles by road from Telkwa. Two ment spent four months on the property under the direction of Otto E. Haaland. An airborne magnetometer survey and ground induced polarization survey were made. Trenching of an induced polarization anomaly was begun, and access roads were built to the open cuts and old portals.

[Reference: Assessment Report No. 1086.]

*Copper-Silver*

**Joker, PR, SQ**
*Norcan Mines Ltd.*
By V. A. G. Preto

(54° 127° S.E.) Company office, 411, 470 Granville Street, Vancouver 2. C. F. Anderson, president; S. J. Hunter, consulting mining engineer. The property is located at the head of Howson Creek, 22 miles south-southwest of Smithers. The present holdings consist of approximately 255 mineral claims held by record, and cover the area which is locally known as the Howson Basin. In November, 1967, Bethex Explorations Ltd. optioned the holdings from Norcan Mines Ltd. and undertook to carry out exploration work during 1968. Old Crown-granted claims around which the present claims are located were the Duchess, Santa Maria, War Eagle, Jefferson, Evening, etc. Figure 8 shows the approximate location of the claim block and of the more important mineral occurrences.

At the time of the writer's visit in early September, a crew of five men under the direction of D. K. Cutler was engaged in diamond drilling and trenching on the Duchess zone.

The earliest records of mining activity in the area date back to 1905. For a summary of the work done in the early stages of exploration and for a fairly comprehensive description of the Santa Maria zone, reference is invited to the Minister of Mines Annual Report for 1917, page 118. For a brief history of mining activity in the Howson Basin and for a summary of the work done recently by Norcan Mines Ltd., please refer to the Minister of Mines and Petroleum Resources Annual Report for 1966, page 92. A list of references is given at the end of the present report.

The country rocks in the area are flows and pyroclastic strata of the Hazelton Group, cut by numerous basic and acid dykes and locally strongly altered and mineralized. In the region north of Howson Creek, the strata dip to the south at moderate angles; to the south of Howson Creek, dips are easterly and generally some-

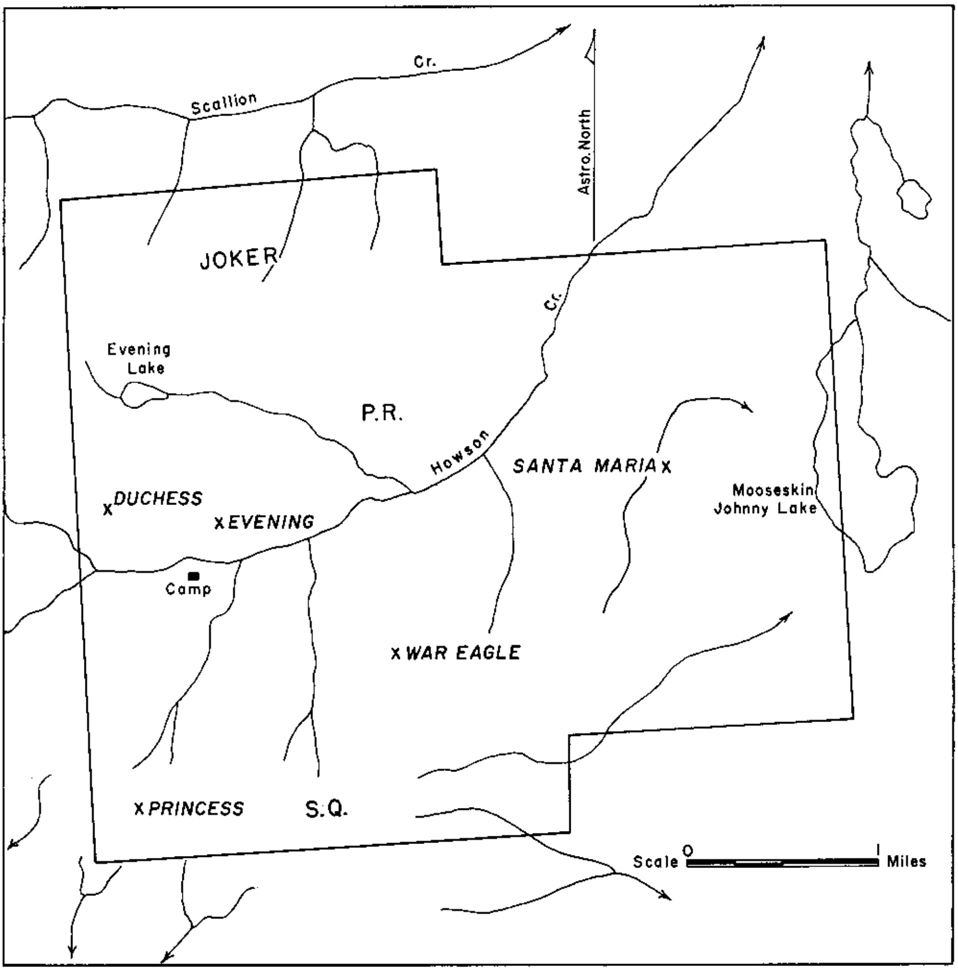



Figure 8. Norcan Mines Ltd. Sketch-map showing the location of the mineralized showings in Howson Basin.

what steeper. Since the early days of exploration, mining activity has been concentrated in three zones—the Duchess, the Evening, and the Santa Maria. Norcan Mines Ltd. has recently done work on two additional zones of mineralization—namely, the War Eagle and the Princess. A brief description of the geology and mineralization at these localities is given below.

*Duchess*.—The main Duchess workings consist of two adits and of several crosscuts. Recently Norcan Mines Ltd. has done a considerable amount of bulldozer trenching and, to the time of the writer's visit, had put down six diamond-drill holes using BQ wireline equipment.

The Duchess vein, a northerly trending shear zone mineralized with chalcopyrite, pyrite, hematite, and quartz, is exposed at the upper portal. Tetrahedrite is also reported from the vein. The shear is localized near the contact between a fine-grained green epidotized andesite to the west and fine-grained purplish-brown to olive-brown tuff to the east. The width of mineralization ranges up to 12 feet. Highly broken and sheared, buff-coloured feldspar porphyry dykes cut the volcanic rocks and carry only very minor amounts of sulphides. A few feet above the upper portal, a narrow vesicular basaltic dyke parallels the vein and cuts through the middle of the mineralized zone.

Faulting and shearing of pre- and post-mineral age is evident throughout the rock exposures created along the recent trenches and at the portals of the two adits. Approximately 180 feet east of the lower portal, along the bulldozer trail, a major shear zone trending north 30 degrees east and dipping very steeply is exposed. Low copper and silver values are reported from this zone by company officials. Approximately 500 feet west of the Duchess adits a major fault strikes north 10 to 15 degrees west and dips at approximately 70 degrees to the west. The fault is exposed along the bottom of a steep gully, where it is paralleled by a narrow basaltic dyke and is marked by discontinuous narrow zones of a bluish-grey breccia. A zone of quartz-garnet-epidote skarn extends from the west side of the gully eastward to the workings, and its easternmost exposures may be found at the west end of the upper bulldozer trench. From the Duchess area the fault may be traced northward to the northern rim of the cirque west of Evening Lake and southward at least as far as the Princess showings. Together with several other subparallel smaller faults and shears, this fault forms a well-marked fracture system which is prominent in the western portion of the claim block. Although the relationships between known occurrences of mineralization and these northerly trending faults are at the present time not fully understood, at least their spatial relation is evident on Figure 9. That the generation of this set of fractures pre-dates mineralization and that these fractures served as conduits for hydrothermal fluids is indicated by the formation of skarn along and near the main fault and by the concordance in attitude between the fault and the mineralized shears at the upper Duchess adit.

Evidence of post-mineral movement, possibly subsidiary to later movements along the northerly trending faults, is also found at the Duchess. Company officials report a fault which truncates the main lode 90 feet from the portal along the upper adit. This structure is reported to trend north 75 degrees west and to dip steeply south. Although company reports speak of solid sulphide mineralization between this fault and the portal, three inclined diamond-drill holes, driven in a northwesterly direction from points on the bulldozer trail a very short distance to the east of the portal and designed to intersect the vein a few feet below the floor of the adit, went well past the projected intersection and failed to encounter the lode. A sharp slip surface which trends north 50 degrees east and dips at approximately 45 degrees to the southwest is exposed a few feet west of the portal and probably represents a set of fractures which is responsible for some of the displacement of the mineralized veins. The mullion structure on this later fault pitches at a moderate angle to the southwest, but the sense of movement could not be determined. Another fact which remains as yet unexplained, but which is obviously of vital importance to further development of the Duchess vein, is that although the lower adit was driven on the supposed location of the vein as projected from above, it and several crosscuts apparently failed to intersect the lode.

*Evening*.—Only a very summary examination was made of the showings which are known as the Evening zone and which are located approximately 2,500 feet to the east of the Duchess adits at an elevation of 4,700 to 5,000 feet. Old records show that in 1907 an adit was driven for 70 feet in a direction of north 20 degrees east along a zone of low-grade mineralization. More recent workings done by Norcan Mines Ltd. consist of several narrow hand trenches which expose narrow irregular shears with veins of quartz replacement and sulphide mineralization in highly epidotized and chloritized buff, reddish, and green fine-grained andesitic tuffs and (or) flows of the Hazelton Group. The mineralized shears trend northeast to

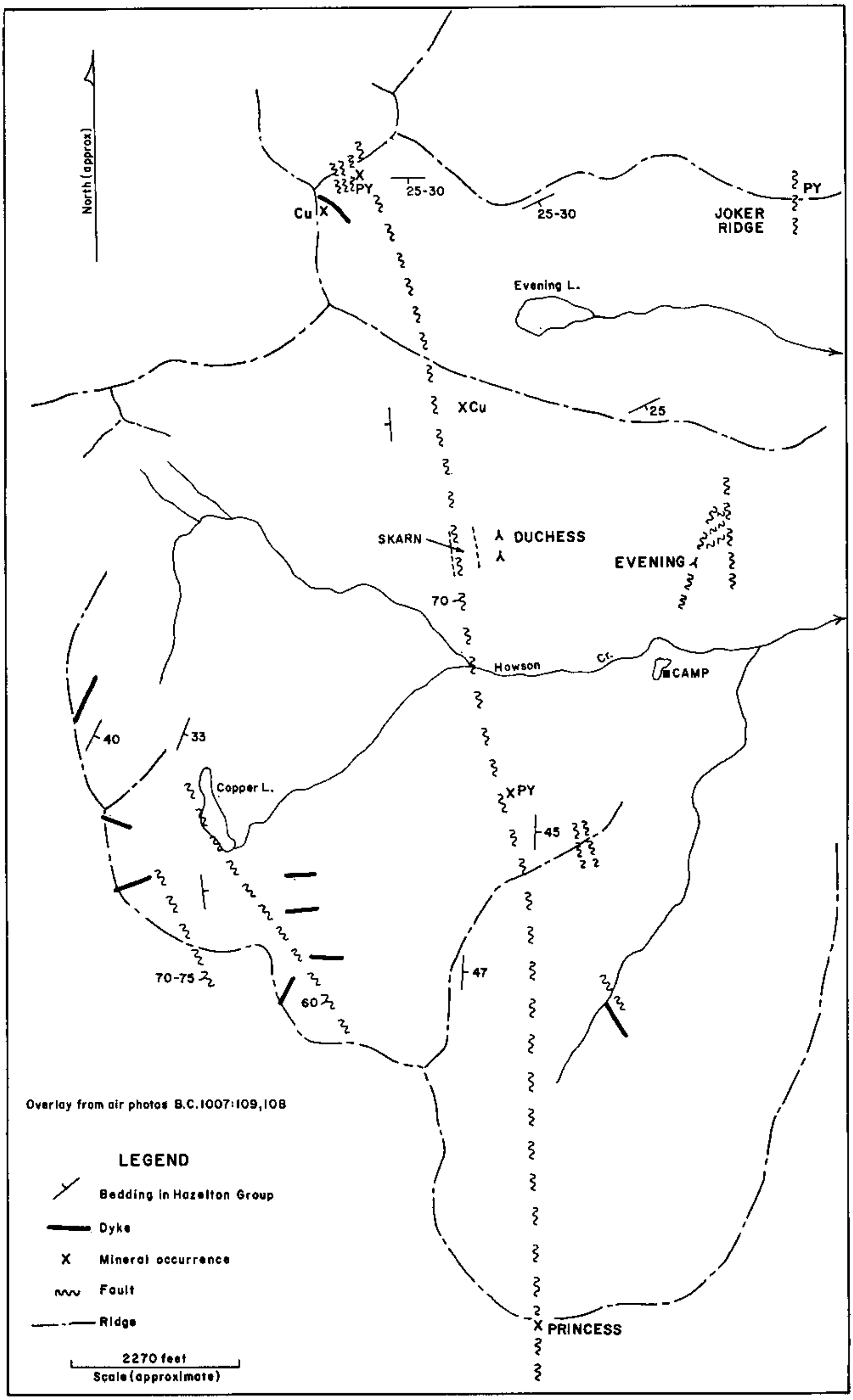



Figure 9. Norcan Mines Ltd. Sketch showing the relative positions of mineralized showings and northerly trending faults.

east and dip at moderate angles to the north. They are found between two precipitous narrow gullies and may represent fractures subsidiary to northerly trending faults which probably follow the gullies.

*Santa Maria.*—Work done on the Santa Maria zone during the early stages of exploration consists of an inclined shaft, which by 1917 had been sunk along the main vein to a depth of 120 feet, and of approximately 300 feet of drifting from two levels in the shaft. From these workings some stoping was done, and in 1917 a shipment of 239 tons of hand-sorted ore grading 17 per cent copper, 9.5 ounces per ton silver, and traces of gold was made to the Anyox smelter. In 1966 Norcan Mines Ltd. carried out approximately 5,300 feet of trenching and 3,742 feet of diamond drilling as well as geochemical and geophysical surveys.

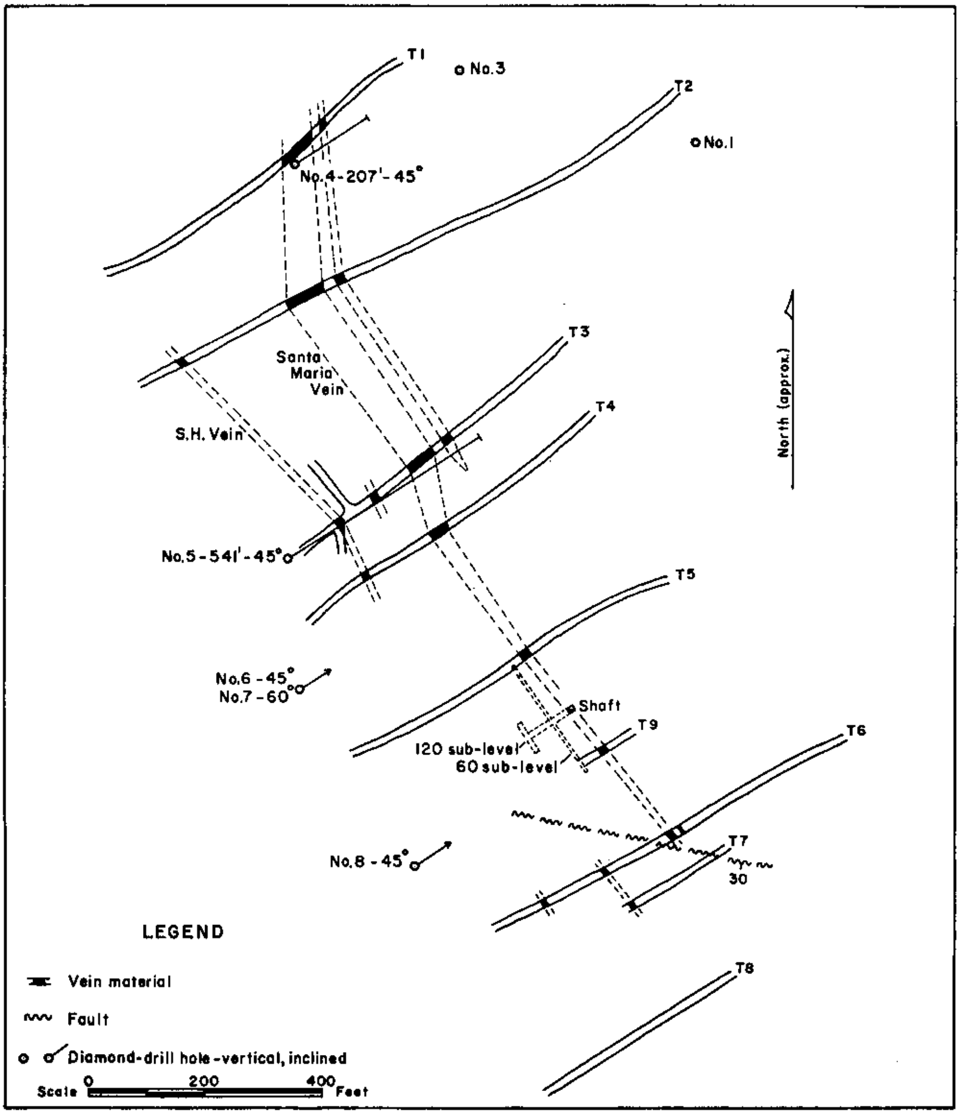



Figure 10. Norcan Mines Ltd. Sketch showing surface trenches and diamond-drill holes on the Santa Maria.

Mineralization at the Santa Maria consists of quartz veins, carrying chalcopyrite, pyrite, chalcocite, and bornite, which have been traced by trenching for a strike length of more than 1,700 feet. In addition to the long-known Santa Maria vein, a description of which may be found in the Minister of Mines Annual Report for 1917, page 118, another parallel vein, the S.H. vein, and other minor veins have been found through diamond drilling and recent trenching. The vein system strikes approximately north 30 degrees west and dips southwesterly at moderate to steep angles. The veins occur over a surface width of 250 to 300 feet and follow a zone of intensely altered and sheared pyroclastic rocks of the Hazelton Group. These comprise reddish lapilli tuff and volcanic breccia, and buff to greenish fine-grained highly altered andesitic lava or intrusive rock. In addition to these rocks, several dykes of buff, cream, and brick red rhyolite porphyry are found. The dykes are crudely parallel to the vein structure, are generally strongly altered, and may be sparsely mineralized with sulphides. In addition to the strong shearing and alteration within the vein zone, an extensive amount of saussurite alteration of the country rocks accompanied by sparsely distributed silicification and sulphide mineralization was noted on either side of the main zone of shearing.

Naturally occurring exposures at the Santa Maria are virtually non-existent, but from an examination of the trenches and of company maps (*see* Fig. 10) it is evident that here, as at the Duchess, faulting and shearing along a northerly trending zone have played an important role in displacing the mineralized veins, so as to greatly complicate the picture.

*War Eagle.*—At the time of the writer's visit, no work was being carried out on the War Eagle zone. Norcan Mines Ltd. has, however, done some trenching as well as geophysical and geochemical surveys on the property. Records of the latter may be found in Assessment Reports Nos. 917, 918, and 919. Assessment Report No. 929 carries a generalized geological map as well as a brief description of the geology by W. G. Stevenson, P.Eng. The writer examined briefly one of the bulldozer trenches recently dug in the northern part of the area, as well as the rock exposures on the wall of the cirque which bounds the War Eagle Plateau to the north. The country rocks belong to the Hazelton Group and include fine-grained green andesitic or basaltic lava, buff and purple tuff, and volcanic breccia. Rock fragments up to 12 inches in their greatest dimension were observed in the latter. Layering of these strata trends in several directions, from east-west to northerly. Dips are generally moderate to steep to the north, northeast, or east. Some southwesterly dips were observed locally. Numerous narrow feldspar porphyry dykes, some of which are intensely epidotized and sparsely mineralized with sulphides, cut the volcanic rocks in an easterly direction. What mineralization was seen in the ground that was examined consists of scattered narrow shears trending northeasterly and northwesterly and mineralized with pyrite, chalcopyrite, hematite, bornite, and, locally, low-iron sphalerite. A prominent shear trends north 50 to 60 degrees west across the cirque wall and is marked by a 50- to 75-foot zone of reddish tuff, abundantly stained by iron oxide and mineralized with pyrite and very minor chalcopyrite. Later narrow veins of coarse-grained calcite follow this zone.

*Princess.*—Development work done to date on the Princess zone is limited. Kennecott examined the showing in 1952, and several hand trenches, mostly badly caved, remain as a sign of their work. No work other than sampling and very minor trenching had been done by Norcan Mines Ltd. to the time of the writer's visit.

The showings are found on the rim of the cirque which is located at the head of a northerly flowing tributary of Howson Creek, in the southwestern corner of the claim block. Mineralization consists of several narrow shears and veinlets of hematite, iron-rich sphalerite, and chalcopyrite in a gangue of white calcite and quartz.

The host rock is highly sheared and thoroughly epidotized fine-grained greenish lava of the Hazelton Group. The mineralized zone occupies a width of approximately 200 feet along the rim of the cirque and marks a northerly trending shear zone which is the southern extension of the northerly fault found at the Duchess.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1905, p. 83; 1906, p. 99; 1907, p. 79; 1911, pp. 113, 114; 1916, p. 125; 1917, pp. 117, 118; 1918, p. 117; 1928, p. 168; 1929, p. 169; 1952, p. 95; 1966, p. 92; Assessment Reports Nos. 917, 918, 919, and 929.]

***Molybdenum-Copper***

**Fog, Fly**
*Noranda Mines, Limited*
By A. Sutherland Brown

(54° 127° S.E.) This property on Sunsets Creek consists of the Fog and Fly groups of 72 recorded mineral claims held by Noranda Mines, Limited. The property was located in 1966 as a result of reconnaissance geochemical surveys made the previous year. Work in 1966 included topographic mapping, geology, and trenching. In 1967 detailed soil-sampling for copper and molybdenum and two types of electromagnetic surveys were conducted with a total of 16 line miles. The claims cover a porphyry plug at the head of Sunsets Creek in the Telkwa Range 19 miles south of Smithers. Access is by helicopter, but a road to the Hunter Basin approaches to within 3 difficult miles of the property.

The Telkwa Range is underlain principally by pyroclastic rocks of the Hazelton Group, probably the upper volcanic division. These consist of a well-stratified sequence of intermediate pyroclastic and flow rocks, many of which are maroon coloured. There are also minor patches of sedimentary rocks of the Bowser Group and several small plutons. The Sunsets Creek body, which is the most important pluton, occurs in the centre of the range. It has domed the surrounding pyroclastic sequence, which dips away from the pluton in all directions. The relation of this doming to the regional northerly to northwesterly broad folding is not known. The description that follows is based almost entirely on study of the southern two-thirds of the Sunsets pluton.

Figure 11 shows the geology in the heart of the Telkwa Range centred on the Sunsets Creek pluton. The Hazelton rocks are predominantly pyroclastic rocks in the range of lapilli to fine tuffs. Locally most are dark greenish-grey but grade laterally into maroon rocks well outside the limits of hornfelsing. Many have foliated flow textures, and some accretionary lapilli tuffs are present. In close proximity to the pluton, some of these rocks have been changed to mosaics of new plagioclase, actinolite, quartz, opaque minerals, and garnet. In the lapilli tuff a palimpsest of original texture remains through variation in composition, especially in regard to opaque minerals. The hornfels grades outward in a concentric pattern through a biotite zone to a chlorite zone.

Intruding the Hazelton rocks, but not shown separately, are a group of dykes, sills, and some larger irregular bodies of porphyritic pyroxene andesite to diabase. These are most abundant on the ridge northwest of the pluton, where they are dominant, but are present everywhere.

The Sunsets pluton appears to be a steep-sided plug of subcircular section with some evidence that an irregular domal roof existed not far above the present peaks. Dykes of similar composition occur in the walls but are rare and are hornfelsed during the final emplacement of the plug. The pluton is a homogeneous body composed entirely of quartz monzonite of nearly constant composition and texture. This is a light-grey rock of granitoid aspect but with scattered 10- to 20-millimetre tabular to ovoid phenocrysts of feldspar. Actually it is composed of about 50 per cent phenocrysts 1 millimetre long or greater in an inconspicuous fine matrix. The composition based on a count of eight specimens is as follows:—

| | Average | Range |
|---|---|---|
| Plagioclase | 41.8 | 37–51 |
| Potash feldspar | 23.4 | 20–30 |
| Quartz | 20.1 | 17½–27 |
| Biotite | 8.0 | 5–10 |
| Hornblende | 5.1 | Tr.–7 |
| Opaque minerals | 1.4 | Tr.–4 |

All specimens have ratios of potash feldspar to total feldspar of about 1 to 3, but all are quartz monzonites rather than granodiorites.

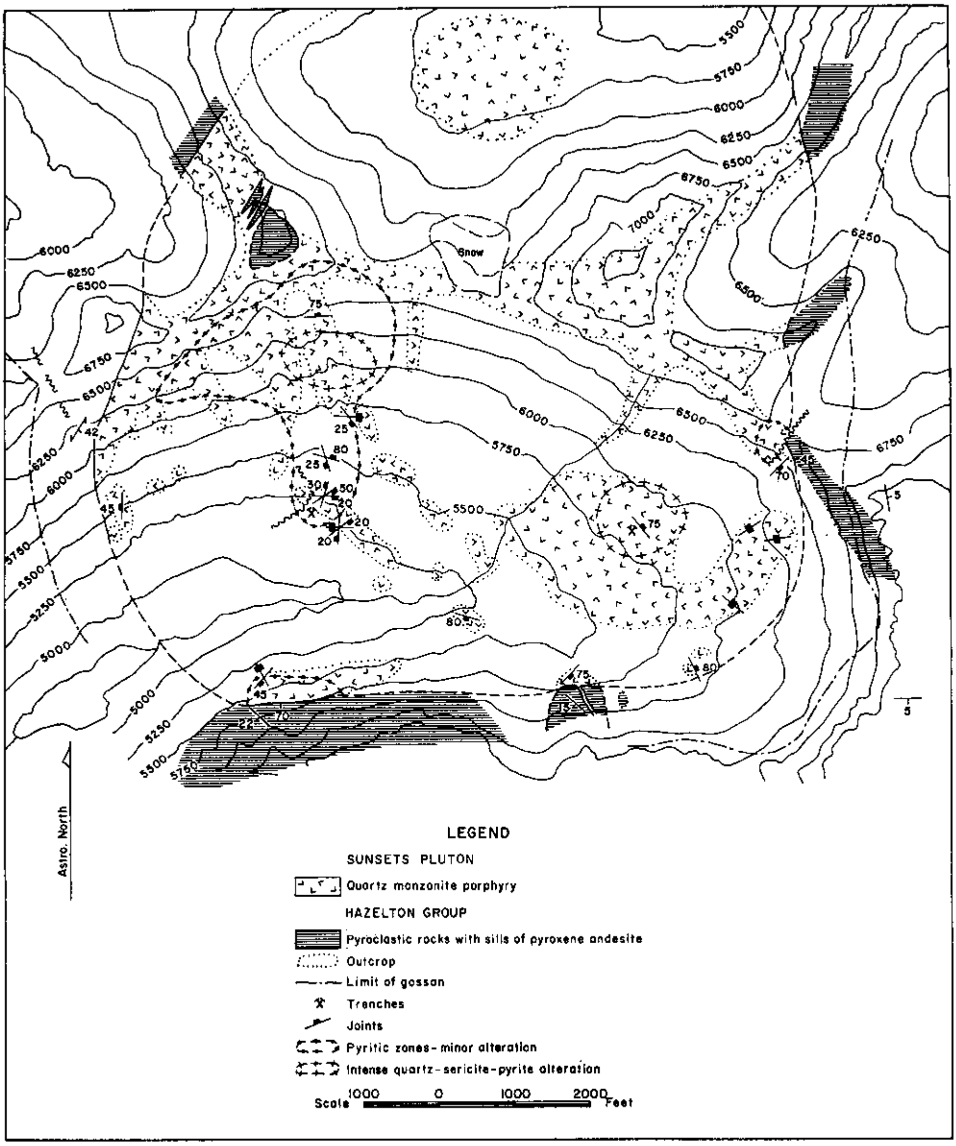



Figure 11. Noranda Mines, Limited. Geology in the vicinity of the Sunsets Creek pluton.

The phenocrystic component of the Sunsets pluton varies more than the total composition. Plagioclase invariably dominated the phenocrysts by an order of magnitude, and ranges from 13 to 42 per cent of the total rock. Three types of phenocrysts are included:—

(*a*) Simple laths of composition $An_{30}$ oscillatory zoned over a small interval in four to five cycles.

(*b*) Large agglomerated laths with three to four cycles wrapping around combined grains.

(*c*) Very large patchy poikilitic grains with very minor zoning.

Simple laths 1 to 6 millimetres long are the commonest phenocrysts. Agglomerated grains form a small but constant component, but it is the very large combined grains (*c*) that give the rock its distinctive appearance. The distribution of the very large grains is erratic, and they may form 10 per cent of the rock locally, but normally only 2 to 3 per cent. They may be quite tabular or more nearly ovoid. Their internal constitution varies, but generally includes a main mass of unzoned oligoclase (about $An_{20}$) with patchy twinning on an orthogonal grid parallel with the grain boundary. Embedded in this are disoriented and slightly zoned plagioclase and quartz, biotite, and rare orthoclase that combined form only 5 to 15 per cent of the total. In a few examples, albitic or potassic alteration has slightly affected part of the grains, mantling and transecting individual component parts.

Other felsic phenocrysts form only a few per cent of the rock and are erratically distributed considering the relatively uniform total composition. Resorbed quartz crystals usually form less than 5 per cent and slightly perthitic orthoclase less than 2 per cent if present at all. Rare specimens have a few large pale-pink perthitic orthoclase poikiloblasts.

Mafic phenocrysts are more constant in composition. They are sparingly present in the matrix. Normally they are fresh. Hornblende may show barely discernible zonal growth. Opaque minerals present are chiefly pyrite, rarely chalcopyrite.

Matrix forms approximately half the rock, somewhat more in specimens from dykes, and one specimen examined had in effect a granitoid texture devoid of real matrix. The texture of the matrix varies considerably. Some have a fine myrmekitic texture with grains 0.05 to 0.07 millimetre, others a slightly coarser aplitic or sugary texture with minimal grain surface areas. In general, dyke and peripheral specimens show the myrmekitic texture and interior specimens the aplitic. The composition of the latter is readily obtained, but the former only within wide limits. The composition on the whole is fairly uniform, with potash feldspar equal or greater than quartz and both much greater than plagioclase.

Accessory minerals are chiefly apatite and sphene, both commonly associated with biotite but also occurring rarely as phenocrysts.

An interpretation of the geology and petrology of the Sunsets pluton might be that it was emplaced with fairly forceful but uniform magma pressure, and that it was not a volcanic neck but may have been an upper magma chamber. Many of its features contrast with those of other small circular intrusive plugs in the Skeena Arch.

*Alteration and Mineralization*

Surrounding the stock is a gossan zone that roughly corresponds with intense hornfelsing. In this zone opaque iron minerals appear more abundant than in the original rocks but occur as magnetite in contrast to hematite. In general, pyrite is sparse and yet the rocks weather an intense rusty colour. The periphery of the stock contains minor sulphide mineralization in many places. Within the porphyry this occurs as a widely spaced set of quartz veins an inch or so wide, banded, and drusy. The veins contain pyrite, chalcopyrite, and minor molybdenite. This type of mineralization is not intense any place observed but is probably most strongly developed along the southwestern contact. In the hornfels in the same general area and close to the contact there are some garnet-epidote skarn bands, mostly parallel with bedding, and in some there are isolated blobs of chalcopyrite, pyrite, and specular hematite.

In the interior of the stock there are two altered zones that are associated with sulphide mineralization. The larger one in the west consists of a broad crescentic area about 2,000 by 3,000 feet in which all rocks are abnormally pyritic. This mineral is disseminated and occurs as coatings on joints and irregular fractures. Associated with this pyritization is a chloritization of biotite and, to a lesser extent, hornblende and a sericitization of feldspars. In the core of the crescent is a zone of much more intense alteration of similar type, with some rocks locally converted to aggregates of quartz, muscovite, and pyrite. Molybdenum mineralization occurs in part of the southern arm of the crescentic area. Here small faults and well-defined joints are common. Quartz veinlets in the joints are common and might be considered a wide-spaced stockwork. Veinlets and small faults and also dry fractures contain abundant pyrite and molybdenite. Many of the better-mineralized joints are fairly flat and gently dipping. The host rocks here are granitoid and show some evidence of recrystallization and later biotite and muscovite alteration of feldspars. Relatively little evidence of the molybdenum mineralization occurs on natural exposures, but only in blasted pits adjacent to the tributary creek where it debouches into the valley bottom.

Another smaller area of similar quartz-sericite-pyrite alteration occurs at the eastern head of the Sunsets Creek cirque. Associated with it is minor disseminated chalcopyrite. A couple of pits were dug in a weathered part of the more highly altered zone.

*Copper*

**Stock, Lorne, Etc.**
*Copper Queen Explorations Ltd.*
By R. V. Kirkham

(54° 127° N.E.) Company office, 1690 West Broadway, Vancouver 9. The Stock, Lorne, Saddle, Table, Premier, Don, and Ken groups, owned by Copper Queen Explorations Ltd., lie at elevations of 4,000 to 6,000 feet between the heads of Winfield Creek and Cumming Creek. The Stock and Lorne cover old copper occurrences originally known as the Copper Queen and from which, in 1917 to 1919, 12 tons of ore was shipped containing 1 ounce gold, 91 ounces silver, and 6,465 pounds copper.

The area is underlain by red, purple, and grey dacitic and andesitic flows and pyroclastic rocks striking north 35 degrees east and dipping 20 degrees southeast. The original showing was a chalcocite vein up to 12 inches wide.

In 1967 the company did some surface trenching and bulldozed a road 4 miles south from the microwave station to its camp on Winfield Creek.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1961, p. 18.]

*Copper*

**A**
*Phelps Dodge Corporation of Canada, Limited*
By W. G. Clarke

(54° 127° S.W.) Company office, 404, 1112 West Pender Street, Vancouver 1. The A group of 104 claims, owned by Phelps Dodge Corporation of Canada, Limited, is at the headwaters of the Telkwa River, 30 miles from Smithers. It is accessible by helicopter. Four men spent two months under the direction of L. M. Appelgate, geologist, making a geochemical survey and packsack diamond drilling eight holes totalling 103 feet.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 91; Assessment Report No. 1188.]

*Copper*

## BABINE LAKE

**Brian, Add**
*Hecla Mining Company of Canada Ltd. and Pacific Petroleums Ltd.*
By W. G. Clarke

(55° 126° N.W.) Company office, 1105, 900 West Hastings Street, Vancouver 1. The 40 Brian and Add claims are on Mount Horetzky, 40 miles northeast of Hazelton. Four men spent three months on the property. A topographic map was made by Lockwood Surveys Ltd., and geological and geochemical surveys were made under the direction of E. D. Dodson, consultant.

*Copper*

**Hudson**
*Babine Lake Mines Limited*
By N. C. Carter

(55° 126° S.E.) Company office, 602 West Hastings Street, Vancouver 2. K. J. Davidson, president. The Hudson 1 to 33 claims are situated east of Old Fort Mountain, paralleling the west shore of the northeast arm of Babine Lake. The claims cover a low-lying area largely devoid of outcrop. A soil geochemical survey was carried out on the property under the supervision of F. C. Tomlinson, P.Eng., consultant.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 92–93; Assessment Reports Nos. 1048 and 1127.]

*Copper*

**Mick, Zora**
*Grandora Explorations Ltd.*
By W. G. Clarke

(55° 126° S.E.) Company office, 511, 850 West Hastings Street, Vancouver 1. The Mick and Zora groups of 64 claims are north of Old Fort Mountain, 35 miles from Smithers, and are accessible by helicopter. Geological, geophysical, and geochemical surveys were made by Alrae Explorations Ltd., contractors. Two men spent four months on the programme.

[Reference: Assessment Report No. 998.]

*Copper*

**Yola**
*Mount Hyland Mines Ltd.*
By W. G. Clarke

(55° 126° S.E.) Company office, 314, 718 Granville Street, Vancouver 2. The Yola group of 27 claims, owned by Mount Hyland Mines Ltd., is on the northeast slope of Old Fort Mountain and is accessible by boat from Topley Landing or Smithers Landing. One month was spent line-cutting and soil-sampling under the supervision of J. D. Mason and W. R. Newman.

*Copper*

**Duke**
*Texas Gulf Sulphur Company Inc.*
By N. C. Carter

(54° 126° N.E.) Vancouver office, 420, 1033 Davie Street. J. R. Loudon, district geologist. This group of 362 recorded claims is 6 miles west of Babine Lake, where elevations range from 3,500 to more than 4,000 feet. Access is by helicopter or by a 6-mile four-wheel-drive road connecting the central part of the property to the Smithers Landing road near Doris Lake.

The claims include a large sheet-like body of hornblende feldspar porphyry roughly circular in plan and 3 miles in diameter. The porphyry body attains a maximum thickness of 500 feet and is bounded by steep cliffs exhibiting vertical to steeply inclined columnar jointing. The flat-lying mass unconformably overlies northwest-striking Hazelton-type volcanics and sediments. The rocks are similar to those porphyries exposed near the south end of Newman Peninsula. Both purple and grey-green varieties of the hornblende feldspar porphyry were noted, the former overlying the latter. One- to six-inch subrounded fragments of porphyry and exotic volcanic rocks were noted near the contacts between the two varieties. The distinctive green colour of some of the rocks is due to the presence of celadonite. The rocks in thin-section resemble crystal tuffs, with 25 to 40 per cent of the rock consisting of 1- to 2-millimetre angular grains of andesine and red oxyhornblende (lamprobolite) set in a very fine-grained matrix of plagioclase microlites and brown glass. Trachytic texture is imparted by parallel arrangement of amphibole and plagioclase microlites.

During 1967 silt-sampling and geologic mapping were carried out over the entire claim group. No mineralization of economic interest was encountered. An average crew of five men was at work on the property for 1½ months under the direction of G. R. Peatfield, geologist.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1965, pp. 90–93.]

*Copper*

**El, O, Pas**
*Rip Van Mining Ltd.*
By W. G. Clarke

(54° 126° N.E.) Company office, 020, 640 Seventh Avenue Southwest, Calgary, Alta. The El, O, and Pas groups of 137 claims, owned by Rip Van Mining Ltd., are on the west side of Babine Lake, 5 miles from Topley Landing, and are accessible by road and trail. Four men spent two months, supervised by S. J. Hunter, consultant, making geological, geophysical, and geochemical surveys.

[References: Assessment Reports Nos. 1160 and 1168.]

*Copper*

**Trek**
*Bethex Explorations Ltd.*
By N. C. Carter

(54° 126° N.E. and 55° 126° S.E.) Company office, 1818, 355 Burrard Street, Vancouver 1. R. E. Anderson, exploration manager. This group, consisting of 126 recorded claims, is situated north of Hawthorn Bay on the east side of Babine Lake. Access is by boat from Topley Landing and by a 2-mile logging-road leading to the central part of the property. Elevations range from 2,332 feet at lake-level to 3,500 feet near the north boundary of the property.

Glacial deposits of gravel and sand are extensive. Drilling near the central part of the property indicated depths of overburden exceeding 50 feet. Drill cores from this particular area showed it to be underlain by an interbedded sequence of moderately dipping fragmental andesites and black argillaceous, locally graphitic, sediments. Intersections of up to 5 feet of disseminated, stringer and massive banded pyrrhotite and lesser pyrite were noted within the graphitic zones. One basic dyke was seen to cut the sulphides in addition to the more common post-mineral shearing and narrow carbonate-filled fractures.

Two other areas were drilled. North of the previously mentioned area, medium-grained diorite and lesser hornblende feldspar porphyry were noted cutting interbedded andesite tuff and argillaceous siltstone with some banded greywacke.

Nine BQ-size holes were drilled, yielding a total of 3,178 feet. Some 4 miles of drill-site access roads was constructed. A magnetometer survey was carried out over a large portion of the claim group by company personnel, and an induced polarization survey was performed over a similar area by Sumitomo Metal Mining Co. of Canada Ltd. Six company and seven contractor employees were employed for four months under the supervision of J. Brooks, geologist.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 95; Assessment Report No. 893.]

*Copper*

**Stu, Al**
*Canex Aerial Exploration Ltd.*
By W. G. Clarke

(54° 126° N.E.) Company office, 800, 1030 West Georgia Street, Vancouver 5. The Stu and Al groups of 89 claims, owned by Canex Aerial Exploration Ltd., are on Babine Lake, 4 miles by boat from Topley Landing. Seven men spent two months making a magnetometer survey.

*Copper*

**DA, AX**
*Noranda Exploration Company, Limited*
By W. G. Clarke

(55° 126° S.E.) Company office, 1050 Davie Street, Vancouver 5. B. O. Brynelsen, president. The DA and AX groups, consisting of 54 recorded claims, are 2 miles east of Nakinilerak Lake. Access is by aircraft from Smithers or by a 15-mile tractor-road from Hatchery Arm on Babine Lake. Five men spent one month running 7.1 line miles of induced polarization survey on the DA claims. The work was under the direction of Gavin E. Dirom.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 95–96.]

*Copper*

**Kam**
*Kerr Addison Mines Limited*
By N. C. Carter

(55° 126° S.E.) Company office, 405, 1112 West Pender Street, Vancouver 1. W. M. Sirola, manager. This group of 56 claims is situated 4 miles east of the south end of Nakinilerak Lake. Access is by helicopter from Smithers, 50 miles to the southwest. Elevations range from 3,500 to 4,000 feet. Rock types on the claim group include interbedded tuffaceous volcanics and argillaceous sedimentary rocks intruded by diorites and gabbros.

The property was located in 1965, and a magnetic and electromagnetic geophysical survey was performed in addition to soil geochemistry. One company and two contractor employees spent one month in 1967 drilling two AX-size holes totalling 611 feet.

[Reference: Assessment Report No. 746.]

*Copper*

**Dot, Lory**
*Golden West Mines Ltd.*
By N. C. Carter

(55° 126° S.E.) Company office, 1211, 1030 West Georgia Street, Vancouver 5. J. S. Godfrey, president. The Dot and Lory contiguous groups, each comprising 48 claims, are situated near the head of the northeast arm of Babine Lake. Access is by boat from Smithers Landing, 15 miles to the west. Elevations on the property range from lake-level at 2,332 feet to about 3,500 feet near the east boundary of the claim groups.

Outcrops are sparse over much of the claim groups. Some 2 miles east of the lake, a prominent north-trending ridge is underlain by north- to northeast-striking green and purple andesite tuffs and breccias. These rocks are intruded by sill-like bodies of medium- to coarse-grained diorite and gabbro consisting essentially of actinolite, altering from clinopyroxene, plagioclase ($An_{35-50}$), epidote, and chlorite. Mafic-rich phases of these intrusive rocks locally contain between 5 and 10 per cent magnetite, both as disseminations and more commonly in fractures with chlorite and sericite. Minor pyrite and hematite were noted coating fractures.

Golden West Mines Ltd. carried out an airborne magnetic, electromagnetic, and neucleometer survey in the spring of 1967 and later undertook surface work including line-cutting, some surface geophysics, and the construction of several miles of drill roads. Drilling near the eastern boundary of the property consisted of three BQ-size holes totalling approximately 1,200 feet. Work was supervised by H. H. Cohen, P.Eng., consultant.

Canex Aerial Exploration Ltd., under an agreement with Golden West Mines Ltd., carried out geochemical and geophysical work on the property in the fall of 1967. This programme was under the supervision of D. C. Rotherham.

[Reference: Assessment Report No. 992.]

*Copper*

**Kare**
*Tro-Buttle Exploration Limited*
By W. G. Clarke

(54° 126° N.E.) Company office, 118, 815 West Hastings Street, Vancouver 1. The Kare group of 72 claims is on Hagan Arm, north of the Granisle mine, and may be reached by boat from Topley Landing, 12 miles away. Two men spent two months under the supervision of Peter F. Bland making magnetometer and geochemical surveys. A tractor-road 3 miles long was built. At the end of the year the property was under option to McIntyre Porcupine Mines Limited.

[Reference: Assessment Report No. 951.]

*Copper*

**Granisle Mine**
*Granisle Copper Limited*
By W. G. Clarke

(54° 126° N.E.) Head office, 1111 West Georgia Street, Vancouver 5; mine office, Granisle. L. T. Postle, president; A. J. McDougall, mine manager. The property consists of 31 Crown-granted mineral claims and 15 recorded claims. In addition, the company holds 44 recorded claims on Sterrett Island and on an adjoining island to the south. The mine is on McDonald (Copper) Island, 10 miles north of Topley Landing. Access to the property is by ferry from the townsite of Granisle, on the west side of Babine Lake, 7 miles by gravel road from Topley Landing.

The plant started production on November 16, 1966, and milled 205,630 tons of ore by the end of the year. During 1967 the first full year of operation, 1,979,-176 tons of ore was mined and milled and 399,886 tons of waste was removed. The grade of the ore was 0.78 per cent copper. Concentrate production amounted to 36,040 tons containing 33.75 per cent copper. During November, 1967, the mill rate was increased from 6,000 to 6,100 tons per day by increasing the rod-mill speed. The pit and the primary crusher operated two shifts a day, five days a week. The secondary and tertiary crushing circuit operated three shifts a day, five days a week. The concentrator operated continuously. Bench height was changed from 30 feet to 35 feet from bench 6 down. Blasting was done with a mixture of 70 per cent ammonium-nitrate and fuel oil and 30 per cent high explosive. During the year there was an average of 104 hourly rated employees and a staff of 28.

On November 7, 1967, British Columbia Hydro and Power Authority began supplying power for the plant and the townsite. The local powerhouse was shut down and 10 of the 11 generating units were removed. The remaining generator was retained for emergency power.

Granisle townsite was landscaped, and three detached houses, one six-unit row house, and a store, operated by Granisle, were constructed during the year. A school built by School District No. 55 was completed in the early spring.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 97–99.]

*Copper*

**Mag**
*The Granby Mining Company Limited*
By W. G. Clarke

(54° 126° N.E.) Company office, 1111 West Georgia Street, Vancouver 1. The 54 Mag and STHUF group of claims, owned by The Granby Mining Company Limited, adjoins Granisle Copper Limited. A crew of eight men spent five months making geological, magnetometer, and induced polarization surveys under the direction of D. H. James, geologist.

*Copper*

**Newman**
*Noranda Exploration Company, Limited*
By N. C. Carter

(54° 126° N.E.) Western office, 1050 Davie Street, Vancouver 5. G. C. Camsell, project supervisor. This group of 176 wholly owned claims is situated at the north end of Newman Peninsula. Access is by boat from Smithers Landing, which is 45 miles by road from Smithers. Exploration work in 1967 consisted of soil-sampling and an electromagnetic survey and 21,925 feet of diamond drilling in 27 holes. An average crew of three company and seven contractor employees worked for six months under the supervision of G. E. Dirom.

Exploration and development drilling during the past two years has established the persistence of chalcopyrite mineralization to depths of 2,000 feet in the central part of the ore zone, and the presence of similar mineralization north and east of the main zone beneath a 500-foot capping of relatively barren biotite-feldspar porphyry.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, pp. 99–102; 1966, p. 99.]

*Copper*

**Ketza, Jen, Rum**
*Bayland Mines Ltd.*
By N. C. Carter

(54° 126° N.E.) Company office, 1614, 1030 West Georgia Street, Vancouver 5. The Ketza and Jen groups, consisting of 28 and 13 claims respectively, are situated on the south end of Newman Peninsula. The Rum group of eight claims is located on an island near the north end of Hagan Arm. Electromagnetic and magnetic surveys were carried out on the three groups during August by Geo-X Surveys Ltd.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 103; Assessment Report No. 1072.]

*Copper*

**Kofit, Reg, ML, Marc, Cram**
*Texas Gulf Sulphur Company Inc.*
By N. C. Carter

(55° 126° S.E.) Western office, 420, 1033 Davie Street, Vancouver 5. J. R. Loudon, district geologist. These groups, consisting of 363 claims, are situated on Hearne Hill, east of the south end of Morrison Lake. Elevations range from 3,000 feet at the base of Hearne Hill to 4,500 feet at the top. The exploration camp at the north end of Hatchery Arm is accessible by road and boat from Smithers.

The Kofit claims, on which the principal showings are located, were optioned from Tro-Buttle Exploration Limited following the discovery of chalcopyrite in a breccia zone by that company in July. Texas Gulf Sulphur Company Inc. carried out exploration work during the late summer and autumn, consisting of road-building, geological mapping, geophysics, soil-sampling, and 6,370 feet of drilling in 12 holes. Eleven company and 22 contractor personnel were employed for a period of 2½ months under the supervision of J. M. Newell, geologist.

Hearne Hill is principally underlain by a northwest-striking sequence of light-green andesite tuffs and breccias with some interbedded argillaceous siltstones and hematitic felsite tuffs. The volcanic rocks are cut by two varieties of intrusive rocks, including equigranular diorites and monzonites and younger biotite-feldspar porphyries and related quartz diorites. The medium- to coarse-grained diorites and monzonites occur in three small stocks of roughly 3,000 feet diameter near the central part of Hearne Hill. A magnetite-bearing gabbroic border facies was noted in the easternmost stock, situated near a small lake at the top of Hearne Hill. Apparently younger fine-grained quartz diorites occur in a sill-like mass, 2,000 feet wide and 4,000 feet long, on the west-facing slope of the hill at an elevation of 3,500 feet. The quartz diorites are bluish-grey in colour and consist mainly of slightly saussuritized plagioclase ($An_{24-28}$) with subordinate quartz, biotite, and carbonate. The quartz diorites are altered to quartz monzonites near the central part of the intrusive mass. There rocks are light grey in colour and are distinctive in that they contain abundant finely disseminated specular hematite. Original mafic minerals have been completely altered to chlorite and carbonate, and potash feldspar, mainly orthoclase with some granophyre, is largely secondary. Both the quartz diorites and quartz monzonites commonly contain partly replaced half-inch fragments of volcanic country rock. The quartz diorites and related rocks are cut by a small stock-like body of biotite-feldspar porphyry, elongate in a northeasterly direction and measuring 1,200 by 800 feet. Projecting from and marginal to this stock are dykes of similar trend and composition. These porphyritic rocks, typical of the Babine Lake area, are of quartz diorite composition and contain 2- to 4-millimetre phenocrysts of plagioclase and 1- to 2-millimetre books and plates of fresh biotite in a fine-grained matrix of quartz, feldspar, and finely shredded biotite. The fresh porphyries are both light and dark grey in appearance, depending on the grain size of the matrix. Feldspar porphyries, containing chalky feldspar phenocrysts, represent intense sericitization and kaolinization of the biotite-feldspar porphyries.

Pyrite and chalcopyrite occur in fractures in the biotite-feldspar porphyries and as fine disseminations in adjacent quartz diorites. The original mineral showing on the property is in a northwest-striking tectonic breccia zone which is exposed in an open cut over a length of 200 feet. Coarse blebs of chalcopyrite occur in a limonitic matrix containing irregular-sized fragments of feldspar porphyry.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 99–101; Assessment Report No. 1102.]

***Copper***

**Morrison**
*Noranda Exploration Company, Limited*
By W. G. Clarke

(55° 126° S.E.) Company office, 1050 Davie Street, Vancouver 5. B. O. Brynelsen, president. The Ellen 1 to 16 and the Alva 1 and 2 claims, owned by the company, are at the southeast end of Morrison Lake. Access to the property is by aircraft or a 5-mile tractor-road from Babine Lake to Morrison Lake. Ten men spent eight months on the property under the direction of Gavin E. Dirom making geological, geophysical, and geochemical surveys. Four buildings were constructed. There was 16,960 feet of diamond drilling done in 38 holes.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1965, p. 104; 1966, pp. 101–102.]

*Copper-Molybdenum*

**Wolf**
*Tro-Buttle Exploration Limited*
By W. G. Clarke

(55° 126° S.E.) Company office, 118, 815 West Hastings Street, Vancouver 1. The Wolf group of 36 claims is on the west side of Morrison Lake, 65 miles from Smithers, and is accessible by road, boat, and trail or by air. Six men spent six months under the supervision of Peter F. Bland making geochemical surveys, bulldozing five trenches totalling 400 feet, and building access roads.

*Copper*

**Sam**
*Rolling Hills Copper Mines Limited*
By W. G. Clarke

(55° 126° S.E.) Company address, P.O. Box 4183, Station D, Vancouver 9. The Sam group of 38 claims, in the Morrison Lake area, is 50 miles from Smithers and accessible by air. D. Nickerson, engineer, and one man spent two weeks making a geochemical survey of all the claims and digging eight small trenches.

*Copper*

**J, T**
*Tapin Copper Mines Limited*
By W. G. Clarke

(54° 125° S.E.) Company office, 115, 815 West Hastings Street, Vancouver 1. The 80 J and T claims, owned by the company, are on the south side of Babine Lake, 35 miles from Burns Lake by road and trail. Three men spent six weeks making magnetometer surveys under the direction of E. D. Dodson, consulting geologist.

[Reference: Assessment Report No. 1111.]

## HOUSTON

*Copper-Silver*

**Lucky, Lady, Pehu**
*Noranda Exploration Company, Limited*
By W. G. Clarke

(54° 126° N.W. and N.E.) Company office, 1050 Davie Street, Vancouver 5. B. O. Brynelsen, president. Noranda Exploration Company, Limited, holds 226 claims comprising the Lucky, Lady, Pehu, Pat, Py, and others under option from Normont Copper Ltd. The claims are 14 miles north-northeast of Houston and are accessible by 6 miles of road from Perow. Four men spent one month under the supervision of Gavin E. Dirom making a geochemical survey of the north showing. In addition to this, Normont Copper Ltd. did some trenching, mapping, and road construction.

*Molybdenum*

**Huber (Mineral Hill)**
*Molymine Explorations Ltd.*
By W. G. Clarke

(54° 126° N.W. and S.W.) Company office, 200, 535 Thurlow Street, Vancouver 5. The Huber group of 135 claims, owned and optioned by Molymine Explorations Ltd., is 8 miles north of Houston and 1 mile east of Highway No. 16. Seven men spent five months under the direction of M. Wetherley, geologist, diamond drilling 13 holes totalling 4,291 feet, rotary drilling 102 holes totalling 9,456 feet, blasting a trench 30 feet long, stripping 600 square feet, and making a geochemical survey of 10 claims.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1965, pp. 75–76; 1966, p. 102.]

*Copper*

**Lakeview**
*Rolling Hills Copper Mines Limited*
By W. G. Clarke

(54° 126° N.W.) Company address, P.O. Box 4183, Station D, Vancouver 9. The property, comprising 42 claims located as the Lakeview 1 to 6 and others, is 8 miles northeast of Houston and is accessible by 5 miles of mine road from Highway No. 16. The deposit has been known for some time and was formerly called the Three Lake group. Three men spent one week on the property under the direction of C. F. Millar, consulting engineer. Four trenches totalling 1,400 lineal feet were bulldozed.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1917, p. 112 (Three Lake group); 1966, p. 102.]

*Silver-Lead-Zinc-Copper*

**Cup, Ed, Delta**
*Molymine Explorations Ltd.*
By W. G. Clarke

(54° 126° S.W.) Company office, 200, 535 Thurlow Street, Vancouver 5. The Cup, Ed, and Delta groups of 54 claims, held by option, are 3 miles north of Houston and are accessible by road. Seven men spent four months under the supervision of T. Kellner, geologist, making geological and geochemical surveys, blasting 13 trenches totalling 1,446 feet, and stripping 38 trenches totalling 5,700 lineal feet.

*Molybdenum*

**Barr**
*Amax Exploration, Inc.*
By W. G. Clarke

(54° 126° S.W.) Western office, 535 Thurlow Street, Vancouver 5. R. A. Barker, manager. The Barr group of 42 claims and one fraction is 4 miles west of Barrett station and is accessible by 14 miles of logging-road from Quick. Three of the claims are held by option; the remainder are held by record. W. Lodder and two men spent two months making chain and compass surveys and doing geological, geophysical, and geochemical mapping. Twenty-four trenches totalling 4,000 lineal feet were excavated.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 103; Assessment Reports Nos. 869 and 1139.]

*Copper*

**Copper No. 2, Walcott**
*Molymine Explorations Ltd.*
By W. G. Clarke

(54° 126° S.W.) Company office, 200, 535 Thurlow Street, Vancouver 5. The Copper No. 2 and the Walcott group of claims, owned by Molymine Explorations Ltd., are on Sunset Creek, 8 miles west of Houston. The property is accessible from Quick by 18 miles of road on the south side of Bulkley River. Five men spent six weeks under the direction of J. Irvine, geologist, making geological and magnetometer surveys, blasting 12 trenches totalling 316 feet, and stripping a total of 1,400 lineal feet.

## OWEN LAKE

*Silver-Lead-Zinc*

**Silver Queen**
*Nadina Explorations Limited*
By W. G. Clarke

(54° 126° S.W.) Head office, 1003, 789 West Pender Street, Vancouver 1; field office, Owen Lake. Nadina Explorations Limited holds 17

Crown-granted mineral claims and fractions under agreement with Canadian Explorations Limited and 33 recorded mineral claims in the Big Moose, Owl, Nadina, and Angus groups. The property is on the east side of Owen Lake between elevations of 2,500 and 3,500 feet. The property is accessible by a 27-mile gravel road leading south from Highway No. 16 at a point 2 miles west of Houston.

The underground exploration programme initiated in 1966 was continued through the spring of 1967 and consisted of drifting and crosscutting a total of 1,324 feet on the No. 1 level and diamond drilling 16 holes totalling 1,559 feet. Approximately 1 mile of access road was built. The underground work was discontinued in May, when the property was optioned by Kennco Explorations, (Western) Limited. This company employed five men for four months under the supervision of G. O. M. Stewart, geologist, making topographic, geological, induced polarization, and geochemical surveys, diamond drilling five holes totalling 1,511 feet, trenching a total of 2,000 feet, stripping 10,000 square feet, and test pitting.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, pp. 81–84; 1966, p. 104; Assessment Reports Nos. 1133 and 1184.]

*Silver-Lead-Zinc-Copper*

**Diamond Belle, Black Bear, Bell, Van**
*Frontier Exploration Limited*
By W. G. Clarke

(54° 126° S.W.) Company office, 642 Clark Drive, Vancouver 6. A group of 22 recorded claims comprising the Diamond Belle, Black Bear, Bell 1 to 5, and Van 1 to 9, optioned from J. Goold and W. Henderson, is on the east side of Owen Lake, 27 miles south of Houston. The property has been explored by various companies since the discovery of the Cole silver-lead-zinc vein in 1915. Formerly it was called the Diamond Belle property. In 1928 a shaft was sunk 90 feet on the vein and about 150 feet of drifting was done on one level.

In 1967 four men worked for three months under the direction of J. Tutton, field manager. The underground workings were reopened and the overburden over the vein on surface was stripped. Additional stripping was done on other veins, using a bulldozer and a ripper. Topographical, geological, and geochemical surveys were made. There was 250 feet of diamond drilling done in three holes.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1916, pp. 144, 159; 1923, pp. 114, 116; 1925, p. 142; 1927, p. 139; 1928, p. 170; 1966, p. 104.]

*Lead-Zinc*

**Code**
*Anaconda American Brass Limited*
By W. G. Clarke

(54° 126° S.W.) Company office, Britannia Beach. The Code group of 13 claims, owned by Anaconda American Brass Limited, is near Owen Lake, 26 miles by road from Houston. Six men spent three weeks under the supervision of G. D. Bysouth, geologist, making induced polarization and seismic surveys.

## MORICE LAKE

*Molybdenum*

**Lucky Ship, Sam**
*Amax Exploration, Inc.*
By W. G. Clarke and A. Sutherland Brown

(54° 127° S.E.) Western office, 535 Thurlow Street, Vancouver 5. R. A. Barker, manager. The Lucky Ship property, comprising 105 claims optioned from Plateau Metals Limited, is south of the east end of Morice Lake. Access is by road from Houston, a distance of 59 miles. Eleven men spent 3½ months working under T. J. R. Godfrey, geologist. The main work done by

Amax Exploration, Inc., was one BQ hole drilled to a depth of 3,284 feet near the centre of the stock (*see* Ann. Rept., 1965, Fig. 13). In addition, some surface trenching and blasting was done on the hillside below the site of diamond-drill hole 65-5.

E. Hornbrook, of the Geological Survey of Canada, conducted an extensive geochemical and biogeochemical orientation survey over the property during the summer.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1965, pp. 84–87; 1966, pp. 104–109.]

## TAHTSA LAKE

*Lead-Zinc-Silver*

**Emerald Glacier Mine**
*Emerald Glacier Mines Ltd.*
By A. Sutherland Brown

(53° 127° N.E.) The Emerald Glacier mine is on Mount Sweeney in the Sibola Range near Tahtsa Lake and is 75 miles due south of Smithers. The mill and camp are about 3 miles from Tahtsa Landing on the road from Houston. A steep road about 6 miles long connects the mill and camp at about 3,200 feet with the mine at about 6,500 feet.

The property consists of nine Emerald and Glacier Crown-granted claims consolidated as Mineral Lease No. 15 and 27 recorded claims. It is held by Emerald Glacier Mines Ltd. (head office, 4635 Lazelle Avenue, Terrace; W. H. McCrae, president; Darrell Foote, mine manager). The mine consists of four adit levels at elevations of approximately 5,400, 6,000, 6,250, and 6,400 feet. The portals of the three upper adits are on the old Emerald claim (Lot 2762) and the workings extend into the Emerald No. 1 claim (Lot 2761). The lower adit is caved at the portal, and little work was done at the 6000 level. The 6250 level was started in June, 1967, and advanced 452 feet. The upper adit was the source of all ore so far produced, including 1,000 tons in 1967, mostly from the main vein, but 100 tons came from a parallel vein. The mill was run intermittently in July processing old stockpiles. From then to the beginning of October 2,001 tons was milled, producing 356 tons of zinc concentrate and 129 tons of lead concentrate. Exploration included five underground diamond-drill holes totalling 250 feet and six surface trenches totalling 450 lineal feet.

The Sibola Range is underlain by the Hazelton Group, which is intruded by one large granitoid stock and several small porphyry bodies and related dyke swarms. The Hazelton Group here includes parts of two members: a sedimentary member from which Calovian (early Upper Jurassic) ammonites were collected and an overlying volcanic member. The sedimentary member consists largely of fairly coarse green and grey feldspathic sandstones with minor grey siltstone, and silty and tuffaceous shale. The finer rocks are commonest toward the top. About 1,500 feet of strata are fairly well exposed on the mine road. The volcanic member is dominated by purple and green andesitic and dacitic breccias, but includes green fine tuffs and accretionary tuff, feldspathic crystal tuffs, and some massive volcanic rocks. Transition between the two members occurs within several hundred feet of strata that includes coarse volcanic sandstone, purple and green tuffs, and tuffaceous shales.

The sedimentary member is warped into a west-trending anticline with a broad flat gently south-dipping crest. A sharp discordance in strike and dip occurs in the vicinity of the adits, where strikes are northerly and dips average 65 degrees east. Attitudes in the overlying breccias are not readily determined but appear to return to westerly strike with southerly dip. Three steep faults striking about north 20 degrees east are judged by evidence of varying nature to be present in the mine area. The block between the two western faults is the area of discordant attitudes and contains the four adits. Other faults are oriented northwesterly, some of which are

Plate IIA. Quartz-filled stockwork and associated silicification at the Lucky Ship. Mineralized stockworks such as this are typical of many molybdenum and copper-molybdenum deposits in the Central Interior.

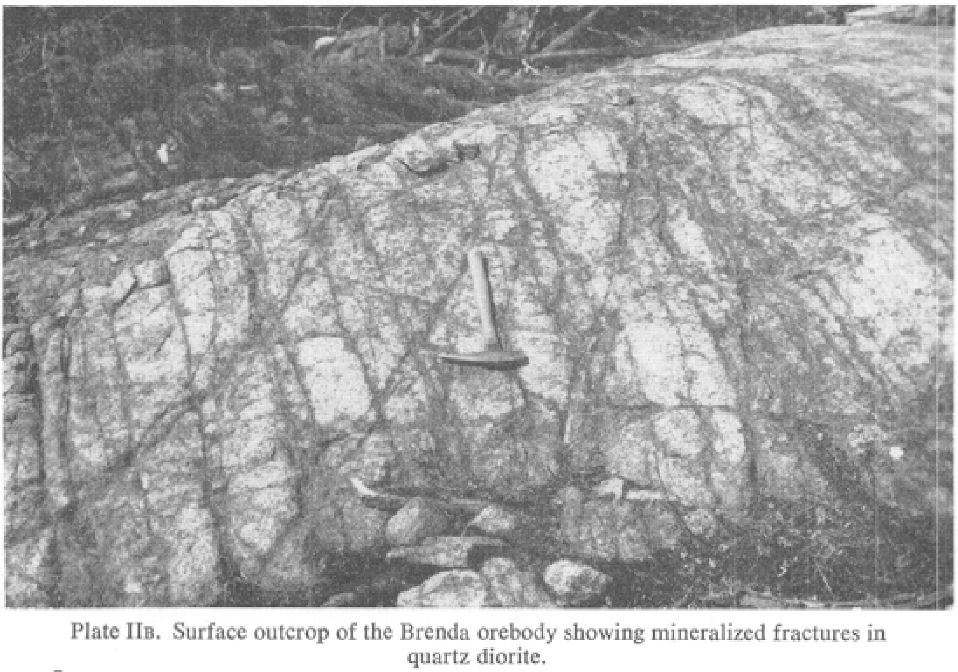


Plate IIB. Surface outcrop of the Brenda orebody showing mineralized fractures in quartz diorite.

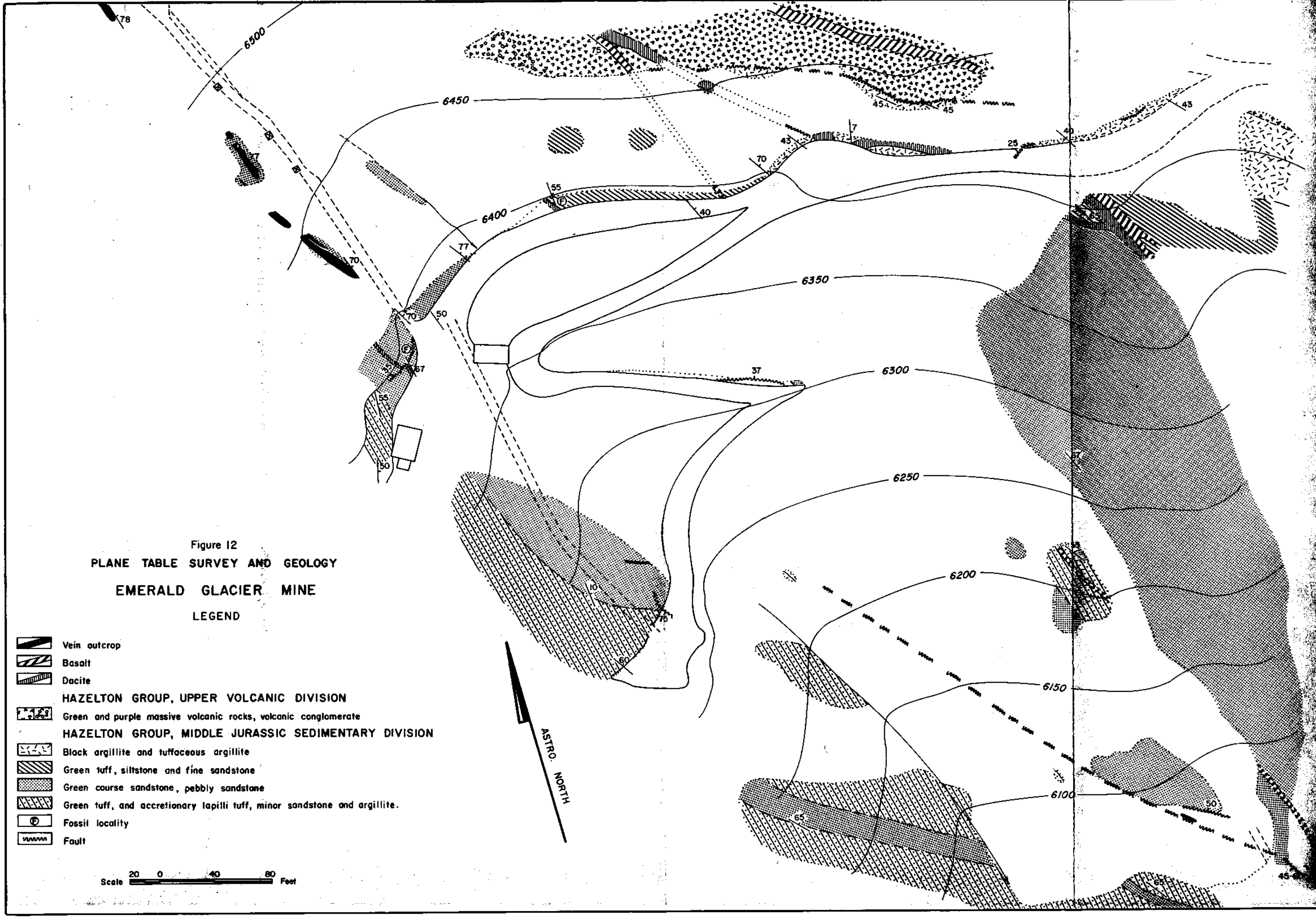



Figure 12
PLANE TABLE SURVEY AND GEOLOGY
EMERALD GLACIER MINE

steep and of small separation, but others dip northeast roughly parallel with bedding and separation is unknown. A third set of fractures with some shearing strikes north 10 degrees west and dips about 70 degrees eastward. The main vein fillings are found in these shears. The westernmost northeast fault is observed by offset of beds and structural discordance. The position of this presumed fault is now occupied by a wide pyroclastic dyke of material virtually identical with overlying purple and green breccias of the volcanic member. Hence the northeast fault, the structural disruption, and the renewed volcanism of the upper volcanic member may all be penecontemporaneous. The vein shears, on the other hand, are clearly younger.

Geology in the vicinity of the three upper adits is shown on Figure 12. The rocks are those of the transition zone between the two members but are primarily sedimentary. They include coarse green sandstone and pebbly sandstone, fine green lithic tuff, tuffaceous siltstone and sandstone, green tuff with angular and wispy compressed pumiceous lapilli, fine green tuff with accretionary lapilli, and black shale and tuffaceous shale. The sedimentary and pyroclastic rocks are intercalated on fine and coarse scale and appear to be interfingering. In a gross way the section starts with a unit that is mostly green tuffs of several varieties but includes minor volcanic sandstone and argillite. This is overlain by a green coarse sandstone unit; a mixed green siltstone, fine sandstone, and tuff unit; and finally a thin black shale or argillite and tuffaceous argillite. All these rocks are included in the sedimentary member of the Hazelton Group. They are overlain in the figure by the basal part of the volcanic unit, green and purple massive flow rocks of dacitic to andesitic composition with minor volcanic conglomerate. The contact is faulted subparallel with bedding. The whole stratified panel strikes about north 10 degrees west and dips on the average 60 degrees east. Minor folding is slight, except in the black shale. The stratified rocks are cut by three groups of dykes, the oldest of which is a grey-green dacite with salmon-coloured oligoclase phenocrysts. Younger dykes include basalt and biscuit-coloured rhyolite. Dykes follow the strike of the strata but dip at various steep angles. The vein shears are a closely aligned in echelon group extending for 4,000 feet or more. They also strike about 10 degrees west and dip 60 to 75 degrees eastward. The shear in which the main oreshoot is located has a proven length of 400 feet. Some mineralization is known on the surface in other shears of the set remote from the vein, and other thinner veins exist underground. Nevertheless all the ore produced on the Emerald has come from one oreshoot in the upper adit (6400 level). The 6250 level was driven to intersect the expected downward continuation of this shoot, but at the time of the writer's visit the vein shear was just encountered and was not strong.

The 6400 level consists of a drift 460 feet long on the vein and a crosscut extending 150 feet northeastward and at 280 feet from the portal. From the crosscut a slightly curving drift 330 feet long starts 95 feet from the main drift. The vein system is a stringer lode system occupying a braided shear. Orientation of slickensides on individual shears indicates predominantly horizontal movement. The vein includes ramifying stockwork, massive, banded, brecciated, and drusy vein in various parts. The walls are quite highly kaolinized and may be silicified and pyritized. The mined oreshoot starts about 150 feet from the portal and is about 250 feet long. Its width is up to 10 feet. The shoot rakes northward, possibly at a small angle. Most of the shoot is contained in altered volcanic sandstone, but the northern end may be in altered volcanic rocks. Several stringers occur in the crosscut close to the vein system, and two parallel veins occur in the parallel drift. One of these is 60 feet long and up to 2½ feet wide, the other is up to 3 feet wide and exposed over

30 feet. Both strike parallel to the main vein but dip nearly vertically. Sulphide minerals in the main vein include galena, sphalerite, chalcopyrite, pyrite in order of decreasing abundance. Gangue is mainly quartz and altered rock but includes calcite and a little rhodochrosite. The minor veins are dominated by sphalerite. In the period 1951–53 the mine shipped 4,631 tons of ore, from which 1,121,951 pounds of lead, 1,061,393 pounds of zinc, 55,364 ounces of silver, and 38 ounces of gold were recovered. In 1966 about 400 tons was mined, which produced 117 tons of concentrate containing 93,325 pounds of zinc, 41,208 pounds of lead, and 2,238 ounces of silver.

[References: Duffell, S., 1959, *Geol. Surv., Canada,* Mem. 299, pp. 84–87; *Minister of Mines, B.C.,* Ann. Repts., 1916, pp. 164–165; 1929, pp. 183–184; 1951, p. 117; 1952, p. 97; 1966, p. 105.]

*Copper-Molybdenum*

**Berg**
*Kennco Explorations, (Western) Limited*
By W. G. Clarke

(53° 127° N.E.) Company office, One Bentall Centre, 505 Burrard Street, Vancouver 1. The Berg property consists of 98 claims 6 miles south of Kidprice Lake. It is accessible by road from Houston to Twinkle Lake, a distance of 57 miles, and thence by tractor-trail, a distance of 25 miles. A crew of 32 men worked for two months under the direction of C. S. Ney, geologist; 23 holes totalling 11,357 feet were diamond drilled, an area 4 by 4 miles was mapped geologically, and two small buildings were constructed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 105–111.]

*Copper*

## TROITSA LAKE

**OVP, MK, FAG**
*Silver Standard Mines Limited*
By W. G. Clarke

(53° 127° N.E.) Company office, 808, 602 West Hastings Street, Vancouver 2. The OVP, MK, and FAG groups, comprising 160 claims, are on the south shore of Troitsa Lake, 75 miles from Burns Lake or Terrace. The property is held under agreement from George Bleiler. Low-grade copper mineralization occurs in granodiorite. A crew of eight men spent three months making topographic, geological, and geophysical surveys. In addition, three trenches, total length 300 feet, were made in rock and 1,215 feet of diamond drilling was done in three holes. N. W. Burmeister, geologist, was in charge.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 112; Assessment Report No. 1091.]

*Copper-Molybdenum*

**Troitsa**
*Kennco Explorations, (Western) Limited*
By W. G. Clarke

(53° 127° N.E.) Company office, One Bentall Centre, 505 Burrard Street, Vancouver 1. The Troitsa group of 18 claims is south of Troitsa Lake. It is accessible by helicopter from Twinkle Lake, 21 miles distant. A crew of nine men spent six weeks under the direction of P. T. Black, project manager, making geological, magnetometer, and induced polarization surveys. Two holes totalling 204 feet were diamond drilled.

[Reference: Assessment Report No. 1073.]

*Gold-Silver-Tungsten*

## WHITESAIL LAKE

**Harrison**
*The Granby Mining Company Limited*
By W. G. Clarke

(53° 127° S.E.) Company office, 1111 West Georgia Street, Vancouver 1. The Harrison group of 29 Crown-granted claims, held by The Granby Mining Company Limited under agreement from Deer Horn Mines Limited (62 Richmond Street West, Toronto), is on the north side of Lindquist Lake, 96 miles by air from Smithers. Five men spent two months on the property. Some geological mapping was done, 15 trenches totalling 5,000 lineal feet were bulldozed, and 8,000 feet of access roads was built. The work was supervised by D. H. James.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1955, pp. 25–27.]

*Molybdenum*

**AM**
*Canex Aerial Exploration Ltd.*
By W. G. Clarke

(53° 127° S.E.) Company office, 800, 1030 West Georgia Street, Vancouver 5. The AM group of 33 claims, owned by Alan Blackwell, is between the southwest end of Whitesail Lake and Lindquist Lake and is east of Kenney Lake. It is 85 miles from Burns Lake and is accessible by float plane. Two men spent one week under the direction of G. Wilson, geologist, making a geochemical survey.

*Molybdenum*

## EUTSUK LAKE

**Red Bird (CAFB)**
*Ashfork Mines Limited*
By W. G. Clarke

(53° 127° S.E.) Company office, 409 Granville Street, Vancouver 2. The Red Bird group of 239 claims, owned by Ashfork Mines Limited, is on Red Bird Mountain between Haven Lake and the west end of Eutsuk Lake. Nineteen men spent three months under the direction of J. Brander diamond drilling 15 holes totalling 11,626 feet and geological mapping.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1960, p. 14; 1962, p. 17; 1963, p. 29; 1964, pp. 57–58; 1965, p. 88; 1966, pp. 112–116; Duffell, S., 1959, *Geol. Surv., Canada*, Mem. 299, Whitesail Lake.]

*Molybdenum*

**ED, Surel**
*Canex Aerial Exploration Ltd.*
By W. G. Clarke

(53° 127° S.E.) Company office, 800, 1030 West Georgia Street, Vancouver 5. The ED and Surel groups, totalling 25 claims, owned by L. Kiss, are on the south shore of Surel Lake, west of the west end of Eutsuk Lake. The property is 85 miles from Burns Lake and is accessible by float plane. Seven men spent two months under the direction of W. Pentland making geological, geophysical, and geochemical surveys and diamond drilling three holes totalling 1,465 feet.

*Molybdenum*

## ENDAKO

**Endako Mine**
*Endako Mines Ltd.*
By W. G. Clarke

(54° 125° S.E.) Company office, 1218, 1030 West Georgia Street, Vancouver 5; mine office, Endako. T. H. McClelland, president; H. J. Matheson, manager. Endako Mines Ltd., controlled and managed by Canadian Exploration Limited, holds 239 mineral claims and fractions, 18 of which are mineral leases. The property lies north of the east end of Francois Lake, 115 miles west of Prince George. The mine townsite is at Fraser Lake, about 15 miles from the mine.

The molybdenite mineralization occurs primarily as fine fracture fillings in a south-dipping highly faulted and hydrothermally altered zone. The orebody is approximately 6,000 feet long and 1,800 feet wide.

During 1967, 15,016,900 tons was mined from the pit, of which 6,773,000 tons, containing 0.212 per cent $MoS_2$, was milled, producing a total of 13,716,016 pounds of molybdenum as molybdenite concentrate and molybdic oxide. An additional 156,000 cubic yards of overburden was stripped from the pit.

Pit equipment includes three shovels with 5-cubic-yard dippers, one shovel with an 8-cubic-yard dipper, seventeen 35-ton trucks, three rotary drills, one air track drill, one Tractair drill, one 600-cubic-feet-per-minute portable compressor, three D-8 tractors, one Hough paydozer, two road graders, one bulk ammonium nitrate truck, one water truck, and one sand truck and miscellaneous gas vehicles.

The expansion of the Endako plant to a capacity of 24,500 tons per calendar day was completed in November, 1967. Major additions to the plant were two 12½- by 15-foot rod mills, two 12½- by 15-foot ball mills, 32 No. 30 D-R flotation cells, two fine-ore bins, one 17- by 84-inch hydrocone secondary crusher, and increased tailings-disposal facilities.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1966, p. 117; 1965, pp. 136–138.]

*Molybdenum*

**Lorne**
*Amax Exploration, Inc.*
By W. G. Clarke

(54° 125° S.E.) Western office, 535 Thurlow Street, Vancouver 5. R. A. Barker, manager. The Lorne group of 38 claims, owned by the company, is on Sam Ross Creek, 8 miles west of Endako and 750 feet south of Highway No. 16. Two men spent one month surveying the claims and making a geological and induced polarization survey of them. Twenty-five trenches totalling 2,000 lineal feet were excavated by bulldozer.

[Reference: Assessment Report No. 1018.]

**Gros**
*Amax Exploration, Inc.*
By W. G. Clarke

(54° 125° S.E.) Western office, 535 Thurlow Street, Vancouver 5. R. A. Barker, manager. The Gros group of 20 claims, owned by Amax Exploration, Inc., is just north of Haney Lake at the head of Sam Ross Creek and 8 miles southwest of the village of Endako and is accessible by 3 miles of dirt road from Highway No. 16. It is reported that pyrite and fluorite occupy silicified fractures in the volcanics. In 1967 W. Lodder and an assistant spent one month making geological and geochemical surveys of the group.

*Molybdenum*

**Nu, Elk, Bell, Etc.**
*Denak Mines Ltd.*
By W. G. Clarke

(54° 125° S.E.) Company office, 1223, 409 Granville Street, Vancouver 2. The Nu, Elk, Bell, Dis, Dat, and Deer groups of 75 claims, owned by Denak Mines Ltd., are 3 miles west of the Endako mine. The property is accessible by 6 miles of road from Highway No. 16. Seven men spent five months under the direction of D. B. Petersen, geologist, diamond drilling 29 holes totalling 10,000 feet.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 136.]

*Molybdenum*

**Poop, End**
*United Buffadison Mines Limited*
By W. G. Clarke

(54° 125° S.E.) Company office, 305, 100 Adelaide Street West, Toronto, Ont. The Poop and End groups consist of 19 claims straddling the Canadian National Railway 3 miles north of Savory Station and are accessible by road from Highway No. 16. Five men spent one month under the direction of C. J. Cryderman diamond drilling five holes totalling 1,106 feet.

*Molybdenum*

**Grub**
*Amax Exploration, Inc.*
By W. G. Clarke

(54° 125° S.E.) Western office, 535 Thurlow Street, Vancouver 5. R. A. Barker, manager. The 28 Grub claims, owned by the company, are west of Cheskwa Lake and are accessible by 3 miles of bush road from Savory Station. A geologist and two assistants spent three months making geological, geophysical, and geochemical surveys.

[Reference: Assessment Report No. 1096.]

*Molybdenum*

**Gem**
*Amax Exploration, Inc.*
By W. G. Clarke

(54° 125° S.E.) Western office, 535 Thurlow Street, Vancouver 5. R. A. Barker, manager. The Gem group of 14 claims, owned by the company, is 2 miles west of Endako and 1 mile south of Oval Lake. It is accessible from Highway No. 16 by 2 miles of bush road. Two men spent one month under the direction of W. Lodder, geologist, making a chain and compass survey, soil-sampling, and excavating eight trenches totalling 1,200 feet.

[Reference: Assessment Report No. 1021.]

*Molybdenum*

**CM**
*Endako Mines Ltd.*
By W. G. Clarke

(54° 125° S.E.) Company address, Endako. The CM group of 32 claims, 5 miles by road from the village of Endako, was optioned from Torwest Resources (1962) Ltd. and Vimy Explorations Ltd. Nine men spent six weeks under the direction of E. T. Kimura, geologist, diamond drilling 15 holes totalling 4,123 feet.

*Molybdenum*

**Pat**
*Endako Mines Ltd.*
By W. G. Clarke

(54° 125° S.E.) Company address, Endako. The Pat group, owned by Endako Mines Ltd., is 7 miles by road from the village of Endako. Three men spent two weeks, under the direction of E. T. Kimura, geological mapping and bulldozing 17 trenches totalling 3,600 feet.

## NITHI MOUNTAIN

*Molybdenum*

**Owl**
*Anaconda American Brass Limited*
By W. G. Clarke

(53° 124° N.W.) Company office, Britannia Beach. The Owl group of 20 claims, owned by Anaconda American Brass Limited, is 3 to 4 miles south of Nithi Mountain. Five men spent one month under the direction of G. D. Bysouth, geologist, making seismic and geochemical surveys.

[Reference: Assessment Report No. 1002.]

*Molybdenum*

**Gel**
*Amax Exploration, Inc.*
By W. G. Clarke

(53° 124° N.W.) Western office, 535 Thurlow Street, Vancouver 5. R. A. Barker, manager. The Gel group of 40 claims, owned by the company, is 4 miles southeast of Nithi Mountain and is accessible by a logging-road from the Nithi River road, a distance of 10 miles. Four men spent three months under the direction of N. Shepherd, geologist, surveying the claims and making geological, geophysical, and geochemical surveys of them. One hundred trenches totalling 9,000 lineal feet were bulldozed.

[Reference: Assessment Report No. 1108.]

*Mercury*

## FORT ST. JAMES

**Pinchi Lake Mine**
*Cominco Ltd.*
By W. G. Clarke

(54° 124° N.W.) Head office, Trail; mine office, Pinchi Lake. K. V. S. Meyer, superintendent. The Pinchi Lake mine is on the north shore of Pinchi Lake, 29 miles by good gravel road from Fort St. James. The property, now comprising 169 mineral claims, was first developed during World War II and produced mercury from mid-1940 until July, 1944. In 1943 a total of 450 men was employed in the mine and in the plant. After the war all the equipment and buildings were removed. Reopening of the mine and construction of a new plant commenced in June, 1967. A total of 4,978 feet of diamond drilling was done from the surface to outline ore and to check plant foundations. Underground diamond drilling totalling 7,240 feet was done in the main ore zone.

The main haulage tunnel, collared 25 feet above the lake, is 14 feet wide and 13 feet high, is inclined at minus 9½ per cent, and is designed to accommodate trackless haulage. It was driven 1,318 feet to the ore zone. Sumps were made at the bottom of the incline, as were drill sublevels and a transformer-station. The total development advance was 2,029 feet. At the end of the year, work was starting on the inclined footwall haulage to the old workings, and further underground drilling was in progress to confirm ore outlines and grade.

Site clearing and camp construction commenced in June, and by the end of the year, with interior work, was proceeding and initial equipment installation was under way in the following buildings:—

(1) Crushing building.
(2) Concentrator-roaster building.
(3) Office-warehouse-machine shop complex.
(4) Carpenter shop-core shed.
(5) Compressor-house.
(6) Change-house.

A sewage lagoon and secondary overflow lagoon were 90 per cent completed, and the tailings dam was completed. Temporary power of 550 volts was supplied by four diesel generators. At the end of the year the total number staff and crew, mainly contractors, consisted of 117 men.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1939, p.99; 1940, p. 85; 1941, p. 79; 1942, p. 75; 1943, p. 76; 1944, pp. 42, 75; *B.C. Dept of Mines,* Bull. 5, 1940, p. 18.]

*Mercury*

**Geo, Toad**
*Cominco Ltd.*
By W. G. Clarke

(54° 124° N.W. and N.E.) Exploration office, 300, 890 West Pender Street, Vancouver 1. The Geo and Toad groups of 25 claims, owned by Cominco Ltd., are in the Pinchi Lake area, 14 miles from Fort St. James, and are accessible by road. Two men spent two weeks under the direction of G. M. Gibson, exploration geologist, making a geochemical survey and bulldozing trenches totalling 1,300 feet.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 118; Assessment Report No. 1020.]

*Mercury*

**K, Belle, M**
*Ajax Mercury Mines Limited*
By W. G. Clarke

(54° 124° S.E. and N.E.) Company office, 115, 815 West Hastings Street, Vancouver 1. Ajax Mercury Mines Limited holds 201 claims, comprising the K, Belle, M, Ajax, and others, on the highway 6½ miles north of Fort St. James. Cinnabar occurs in limestone and serpentine in the general area of the Pinchi fault. Five men spent four months making geological and geochemical surveys, building 1 mile of access road, and diamond drilling 2,891 feet in 32 holes. MacDonald Consultants Ltd. was in charge of the programme.

[Reference: *Minister of Mines, B.C.*, Ann Rept., 1966, p. 118.]

## INDATA LAKE

*Copper*

**B**
*Cominco Ltd.*
By W. G. Clarke

(55° 125° S.E.) Exploration office, 300, 890 West Pender Street, Vancouver 1. The B group of 20 claims, held by option from William Rigler and Robert Jackson, is on Rottacker Creek, east of Indata Lake. The property is accessible from Fort St. James, 75 miles away, by road and boat or by float plane. Two men spent two weeks under D. L. Cooke making geological and geochemical surveys.

[Reference: Assessment Report No. 1064.]

## NATION LAKES

*Silver-Lead-Zinc*

**Wit, Wag**
*Royal Canadian Ventures Ltd.*
By W. G. Clarke

(55° 125° S.E.) Company office, 270, 180 Seymour Street, Kamloops. The Wit and Wag groups of 52 claims, optioned from T. Taylor, of Winfield, are on the north shore of Chuchi Lake, 6 miles west of Nation Lakes Camp. Access is from Fort St. James to Chuchi Lake by the Manson Creek road and thence by boat to the property, a total distance of 53 miles. Eight men spent one month under the direction of N. B. Vollo, exploration manager, making geological, magnetic, and gravity surveys.

[References: *Minister of Mines, B.C.*, Ann Rept., 1965, p. 108; Assessment Report No. 1119.]

*Copper*

**Jay**
*Tro-Buttle Exploration Limited*
By W. G. Clarke

(55° 124° S.W. and S.E.) Company office, 118, 815 West Hastings Street, Vancouver 1. The Jay group of 28 claims, owned by Tro-Buttle Exploration Limited, is on the north shore of Chuchi Lake. It is accessible from Fort St. James, 50 miles distant, by road and boat or by float plane. Four men, under the direction of Peter F. Bland, spent one month making a geochemical survey.

*Copper*

**Windy, Rum, Janet, Sob**
*Noranda Exploration Company, Limited*
By W. G. Clarke

(55° 124° S.E. and S.W.) Company office, 1050 Davie Street, Vancouver 5. B. O. Brynelsen, president. The Windy, Rum, Janet, and Sob groups, totalling 292 claims, owned by the company, are on both the north and south sides of Chuchi Lake. They are accessible by aircraft from Smithers, a distance of 110 miles, or by road to the east end of Chuchi Lake and thence by boat and trail. Three men spent four months making geological and geochemical surveys under the direction of Gavin E. Dirom.

*Copper*

**Tan** (55° 124° S.W.) Company office, 1, 904 Helmcken Street, Vancouver 1. The Tan group of eight claims is south of the west end of Chuchi Lake, 60 miles north of Fort St. James. Five men spent one month making geophysical and geochemical surveys under the direction of H. Veerman.

*West Coast Mining & Exploration*
By W. G. Clarke

*Copper*

**Klawli** (55° 124° S.W.) Company office, 118, 815 West Hastings Street, Vancouver 1. The Klawli group of eight claims, owned by Tro-Buttle Exploration Limited, is on the Klawli River north of Nation Lakes. It is 60 miles from Fort St. James and may be reached by helicopter or by road, boat, and trail. Four men spent one month, supervised by Peter F. Bland, making a geochemical survey.

*Tro-Buttle Exploration Limited*
By W. G. Clarke

[Reference: *Geol. Surv., Canada,* Mem. 252, 1949.]

*Copper*

**R.T., S.K.** (55° 124° S.W.) Company office, 1, 904 Helmcken Street, Vancouver 1. The R.T. and S.K. groups, comprising 76 claims, are south of the east end of Tchentlo Lake, 65 miles north of Fort St. James. Eight men spent four months making geophysical and geochemical surveys and diamond drilling six holes totalling 2,000 feet. H. Veerman was in charge of the work.

*West Coast Mining & Exploration*
By W. G. Clarke

## TAKLA LAKE

*Copper*

**Bol** (55° 125° S.W.) Company office, 1111 West Hastings Street, Vancouver 1. The Bol group of 60 claims, held by option from Helicon Explorations Limited, is on the west side of Takla Lake, 5 miles south of Takla Landing. It is accessible by river boat from Fort St. James. Three men spent one month on the property making geological, geophysical, and geochemical surveys under the direction of D. Milburn, geologist. One EX-size hole was diamond drilled to a depth of 80 feet.

*Magnum Consolidated Mining Co. Ltd.*
By W. G. Clarke

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 119.]

## KWANIKA CREEK

*Copper-Molybdenum*

**Boom, Frankie, Etc.** (55° 125° S.E. and N.E.) Head office, 301, 550 Burrard Street, Vancouver 1. The Boom, Frankie, CV, TX, CHO, MG, OVP, and JAM groups of 203 claims, owned by Hogan Mines Ltd., are on Kwanika Creek, east of Tsayta Lake. They are accessible by road 49 miles from Manson Creek via the Silver Creek road. Two men worked for two weeks under the supervision of A. Hodgson making a geological survey.

*Hogan Mines Ltd.*
By W. G. Clarke

## NINA LAKE

*Silver-Lead-Zinc*

**Donna, B.V.D., Lisa** (55° 124° N.W.) Company office, 800, 1030 West Georgia Street, Vancouver 5. The Donna, B.V.D., and Lisa groups of 81 claims are north of Nina Lake and are reached by 20 miles of horse-trail from Germansen Landing. Ten men spent six weeks, supervised by B. Ainsworth, geologist, making a geochemical soil- and stream-sampling survey.

*Canex Aerial Exploration Ltd.*
By W. G. Clarke

*Molybdenum*

## OSILINKA RIVER

**Slide**
*Kennco Explorations, (Western) Limited*
By W. G. Clarke

(56° 125° S.W.) Company office, One Bentall Centre, 505 Burrard Street, Vancouver 1. The Slide group of 40 claims, owned by the company, is west of Uslika Lake and accessible from the Uslika Lake road by 12 miles of trail. Four men spent two months working under the direction of R. W. Stevenson, geologist. Eight small trenches were dug by hand, and 266 feet of diamond drilling was done in three holes.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 119; Assessment Reports Nos. 996 and 1004.]

*Silver-Lead-Zinc*

**Beveley**
*Donna Mines Ltd.*
By W. G. Clarke

(56° 125° S.E. and 56° 124° S.W.) Company office, 642 Clark Drive, Vancouver 6. A group of 60 claims, comprising the Beveley 1 to 4, Pine, Spruce, Balsom, Willow, Donna 1 to 36, and others optioned from E. D. Vinnedge and Associates, is half a mile downstream from the junction of the Osilinka River and Wasi Creek. Five men worked for six months on the property under the direction of Alrae Exploration Ltd., consultants. A compass and chain survey was made of the claims. Geological and geophysical surveys were made, and 12 trenches totalling 6,716 feet were made with a bulldozer and ripper. An access road 7½ miles long was constructed.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1950, p. 101; 1951, p. 118; 1952, pp. 98–101; Assessment Report No. 1080.]

*Silver*

**Ruby, Ivan**
*Sevrex Explorations Ltd.*
By W. G. Clarke

(56° 125° S.E.) Company office, 2071 Creelman Avenue, Vancouver 9. W. C. Sevrens, director. The Ruby and Ivan groups, totalling 10 claims, owned by Sevrex Explorations Ltd., are on Jim May Creek, 10 miles north of Uslika Lake. Five miles of access road was built from the property to join the access road to the Beveley property at Tenakihi Creek. Diamond drilling was done in two holes totalling 51 feet.

*Corundum*

## AIKEN LAKE

**DD, ED**
*KRC, Inc.*
By W. G. Clarke

(56° 125° S.W.) Company office, 1300 Elveden House, Calgary, Alta. The DD and ED groups of 31 claims, owned by KRC, Inc., are 5 miles east of Aiken Lake. The property is accessible by air from Germansen Landing, 50 miles to the southeast. Two men spent one month making a geological survey.

# CARIBOO MINING DIVISION

*Tungsten-Molybdenum*

## PRINCE GEORGE

**Burn**
*Union Carbide Exploration Ltd.*
By W. G. Clarke

(53° 122° N.W.) Company office, 601, 1112 West Pender Street, Vancouver 1. The Burn group of 32 claims, owned by C. B. O'Brien and associates, of Prince George, is on the east side of Tabor Lake, 6 miles east of Prince George and is accessible by logging-road. Scheelite, molybdenite, bismuthinite, chalcopyrite, and pyrite are reported to occur in narrow skarn bands and small quartz veins in tuffaceous greywackes, argillites, and clastic volcanics of Triassic age. Five men spent one month under the direction of J. J. Royall, geologist, making geological surveys and diamond drilling three holes totalling 800 feet.

[Reference: Assessment Report No. 1129.]

*Gold*

## WELLS

**Aurum**
*The Cariboo Gold Quartz Mining Company Limited*
By W. G. Clarke

(53° 121° S.W.) Head office, 617 West Pender Street, Vancouver 2; mine office, Wells. J. R. Morris, president; Charles McNiel, mine manager. The Aurum mine is on the east side of Island Mountain, at Wells. The mine closed March 30th after 34 years of production. The hoist, pumps, and some pipe were salvaged and the mine was allowed to flood. All mill and shop equipment was removed. In 1967, 5,481 ounces of gold and 960 ounces of silver were produced from 6,821 tons of ore mined and milled. No development or exploration work was done.

*Silver-Lead-Zinc*

**Space**
*Mt. Agnes Mines Ltd.*
By W. G. Clarke

(53° 121° S.W.) Company office, 401, 615 West Pender Street, Vancouver 2. The Space group of 51 claims is on Mount Agnes and is accessible by 5 miles of road south from Barkerville. Seigel Associates, Limited, consultants, conducted two electromagnetic surveys over the Space 1 to 4 claims. The road from Barkerville was rehabilitated.

[Reference: *Minister of Mines, B.C.*, Ann Rept., 1966, p. 120.]

*Copper-Molybdenum*

## McLEESE LAKE

**HD, HAS, FFE, Etc.**
*Gunn Mines Ltd.*
By W. G. Clarke

(52° 122° S.E. and N.E.) Company office, 1129, 925 West Georgia Street, Vancouver 1. The HD, HAS, FFE, and others totalling 128 claims, owned by Gunn Mines Ltd., are east of Cuisson Lake, 10 miles by road from McLeese Lake. Nine men worked for 10 months under the supervision of Cliff Gunn, resident superintendent. A total of 6,995 feet of diamond drilling was done in 17 holes. Some trenching and stripping were done by bulldozer.

*Copper*

**Mayday, Remo, Brenda, Sue**
*Earlcrest Resources Ltd.*
By W. G. Clarke

(52° 122° S.E.) Company office, 213, 678 Howe Street, Vancouver 1. The Sue group of 46 claims and the Remo, Mayday, Brenda, and others optioned by the company are on the road to Likely, 1 to 4 miles northeast from McLeese Lake. A magnetometer survey was made, trenches and access roads were made by bulldozer, and four diamond-drill holes totalling 1,000 feet were drilled on the Sue group. One 250-foot drill-hole and some geochemistry was done on the other claims.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 120.]

*Copper*

**AL, BK, GA, JJ**
*Calta Mines Ltd.*
By W. G. Clarke

(52° 122° N.E.) Company office, 640, 890 West Pender Street, Vancouver 1. The AL, BK, GA, and JJ groups of 70 claims, owned by Calta Mines Ltd., are accessible by 10 miles of logging-road from Marguerite (on Highway No. 97). Nine men spent one month under the direction of D. W. Goodbrand, geologist, making an induced polarization survey.

[Reference: Assessment Report No. 1029.]

*Copper*

**Gibraltar (Zephyr, Pan)**
*Cominco Ltd.*
By W. G. Clarke

(52° 122° N.E.) Company office, 300, 890 West Pender Street, Vancouver 1. The Gibraltar property, totalling 220 claims, owned by Gibraltar Mines Ltd., is on the east side of Cuisson Lake, 4 miles by road from McLeese Lake on Highway No. 97. During 1967 the property was under option to Cominco Ltd., who made topographic, induced polarization, magnetometer, and geochemical surveys and diamond drilled 14 holes totalling 4,695 feet. Seven men worked 7½ months under the supervision of M. R. Murrell, exploration geologist.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 123.]

*Copper*

**Pollyanna**
*Duval Corporation and*
*Canex Aerial Exploration Ltd.*
By W. G. Clarke

(52° 122° N.E.) Company office, 506, 675 West Hastings Street, Vancouver 2 (Duval); 800, 1030 West Georgia Street, Vancouver 5 (Canex). The Pollyana group of 80 claims, held by option, includes most of the western part of Granite Mountain, which is about half-way between Quesnel and Williams Lake. The property is accessible by 12 miles of bush road from McLeese Lake. Six men spent five months under the direction of Benno J. G. Patsch making geological, induced polarization, and geochemical surveys. A total of 4,670 feet of percussion drilling was done in 17 holes.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 124.]

## LIKELY

*Gold*

**Lukin**
*Continental McKinney Mines Limited*
By T. M. Waterland

(52° 121° N.W.) Company address, 506, 540 Burrard Street, Vancouver 1. The Lukin group, consisting of 16 claims situated 2 miles northeast of Likely on the south end of Poquette Lake, was optioned from S. Miecznik. Work consisted of geological mapping by J. Schaefle, geologist, about 500 feet of bulldozer trenching, and about 5,000 square feet of bulldozer stripping. It is reported that narrow quartz veins containing low gold values occur in green-grey andesitic porphyry.

*Copper*

**Polley, Meg, Redrock**
*Giant Explorations Limited*
By T. M. Waterland

(52° 121° N.W.) Company address, 1825, 355 Burrard Street, Vancouver 1. This 91-claim property, comprising the Polley, Meg, and Redrock groups, is just west of Likely and straddles the main road to Likely. During 1967 H. Fader, geologist, conducted a geochemical survey over most of the property.

*Copper*

**Cariboo Bell**
*Cariboo-Bell Copper Mines Limited*
By T. M. Waterland

(52° 121° N.W.) Company office, 300, 999 West Pender Street, Vancouver 1. The 200-claim property, comprising the B.J., Raft, and other claims, is located between Bootjack and Polley Lakes, about 6 miles southwest of Likely and 54 miles by road from Williams Lake. The detailed geology of the property is described in the Annual Report of the Minister of Mines and Petroleum Resources for 1966, pages 126 to 131.

Diamond drilling continued until June, 1967, when the option to proceed with stage two of the project was relinquished by the three Japanese participating companies—Mitsui Mining and Smelting Company, Limited, Sumitomo Metal Mining Co. of Canada Ltd., and Nippon Mining Company, Limited. Work on the property was suspended in June and had not been resumed at year-end. It has been reported that flotation methods of concentration did not give sufficient recovery of copper values; subsequent testing indicates flotation-leaching methods may give satisfactory results.

Until work was suspended, some 28 men were employed by the company and T. Connors Diamond Drilling worked and lived at the property. Some geological mapping was carried out, the access road was repaired and maintained, and 8,700 feet of BQ wireline drilling in 26 holes was completed. Work on the property was supervised by G. Newcombe.

*Copper*

**Morehead, Limecap, Copper Ridge, Ace, Miles**
*Milestone Mines Limited*
By T. M. Waterland

(52° 121° N.W.) Company address, 401, 540 Burrard Street, Vancouver 1. The 48-claim property, comprising the Morehead, Limecap, Copper Ridge, Ace, and Miles groups, is owned by Milestone Mines Limited and is near Morehead Lake in the Likely area. Work was conducted over a one-month period with six men working under the supervision of J. A. Brown, A. G. Hodgson, and D. R. Cochrane. Work consisted of geochemical and geophysical surveys, 20,000 square feet of bulldozer stripping, access-road construction, and drilling one BX hole to a depth of 256 feet.

It is reported that native copper, copper sulphides, and copper carbonates occur as disseminations in lavas and acidic intrusive rocks.

[Reference: Assessment Report No. 1097.]

*Copper*

**Sue**
*Silver City Petroleums Ltd.*
By T. M. Waterland

(52° 121° N.W.) Company office, 215 Maclean Block, Calgary, Alta. This 33-claim property is located in the Morehead Lake area, 14 miles from Likely. Four men worked for one month during 1967 under the direction of A. G. Hodgson, consulting geologist. A geochemical survey was made of the entire claim group. It is reported that chalcocite occurs as disseminations in syenite.

[Reference: Assessment Report No. 1005.]

**Lar, Chuck**
*Mollusca Oils Limited*
By T. M. Waterland

(52° 121° N.W.) Company address, 720 Seventh Avenue Southwest, Calgary, Alta. This 49-claim property, comprising the Lar and Chuck groups, is held by option agreement with H. C. MacDonald and S. Bjornson. Work during 1967 was supervised by A. G. Hodgson, consulting geologist. Four men spent two months making a soil-sampling survey of the entire property.

[Reference: Assessment Report No. 924.]

*Silver-Lead*

**Bear Creek, Jimmy, Sunshine**
*Plutus Mines Ltd.*
By T. M. Waterland

(52° 121° N.E.) Company address, 1232 Flury Road, Richmond; mine address, P.O. Box 8, Likely. The Bear Creek, Jimmy, and Sunshine groups are on the east side of Black Bear Creek about 3 miles from the confluence of the Cariboo River and Spanish Creek. They cover the property formerly known as the Providence.

Work done during 1967 included a tape and compass survey of the claims, a survey of the surface workings, six bulldozed trenches totalling 2,600 feet in length, and driving about 100 feet of adit. Camp buildings were erected and 2 miles of access road was constructed. Work on the adit was continuing at the end of 1967. The work was under the supervision of A. Christmas; V. B. Bjorkman acted as consultant.

## QUESNEL

*Lead-Silver*

**AB, ANO, XL**
*Coast Silver Mines Ltd.*
By Stuart S. Holland

(52° 122° N.E.) Company office, 890 West Pender Street, Vancouver 1. The AB, ANO, and XL groups, totalling 157 claims, are on the east side of Quesnel River at the head of Cantin Creek, about 15 miles southeast by road from Quesnel.

Minor pyrite, galena, and tetrahedrite mineralization was found, but after exploration the claims were allowed to lapse.

In 1967 the geology of the claims was mapped, magnetometer and electromagnetic surveys were made of selected areas, and a soil-sampling survey was made of the entire claim area. Five trenches totalling 720 feet were bulldozed and six holes totalling 2,360 feet were diamond drilled. Armand Beaudoin was in charge of the work.

*Copper*

**QB**
*Northair Mines Ltd.*
By W. G. Clarke

(52° 122° N.E.) Company office, 450, 890 West Pender Street, Vancouver 1. The QB group of 28 claims, owned by Northair Mines Ltd., is 15 miles east of Quesnel and is accessible by 4 miles of logging-road from the Wells road. Three men supervised by L. J. Manning & Associates Ltd. spent two days making a ground magnetic survey.

[Reference: Assessment Report No. 1135.]

## HORSEFLY

*Copper*

**Wood**
*Magnum Consolidated Mining Co. Ltd.*
By T. M. Waterland

(52° 121° S.E.) Company address, 1111 West Hastings Street, Vancouver 1. The Wood group of 70 claims, optioned from Helicon Explorations Limited in 1967, is on Woodjam Creek southeast of Horsefly. The claims are accessible by road from Horsefly, a distance of approximately 10 miles. Six men were employed for a period of two months under the direction of B. Williams, geologist. The geology of about 24 claims was mapped, an induced polarization survey was run over 7 line miles, and approximately 3 miles of access road was built.

*Copper*

**GI**
*Magnum Consolidated Mining Co. Ltd.*
By T. M. Waterland

(52° 121° S.E.) Company address, 1111 West Hastings Street, Vancouver 1. The GI group of claims is on Gibbons Creek approximately 10 miles east of Horsefly and is accessible by road. The property was located and explored by Helicon Explorations Limited in 1966 and was optioned to Magnum Consolidated Mining Co. Ltd. in 1967. Work during 1967 was under the direction of B. Williams, geologist, and consisted of approximately 1,400 feet of diamond drilling in three holes.

[Reference: Assessment Report No. 883.]

*Copper*

**Sue**
*Magnum Consolidated Mining Co. Ltd.*
By T. M. Waterland

(52° 120° S.W.) Company address, 1111 West Hastings Street, Vancouver 1. The Sue group, located on Suey Bay of Horsefly Lake, was optioned from Helicon Explorations Limited in 1967. Access is by boat from Horsefly Landing, a distance of approximately 20 miles. During 1967 a total of nine men worked for a period of three months under the direction of G. Lorinczi, geologist. Work consisted of geological mapping of an area 2,000 by 2,400 feet, magnetometer, induced polarization, electromagnetic, and geochemical surveys of much the same area, and some 1,000 feet of diamond drilling in three holes.

*Molybdenum*

## BIG TIMOTHY MOUNTAIN

**Boss Mountain Mine**
*Brynnor Mines Limited*
By T. M. Waterland

(52° 120° S.W.) Company office, 1050 Davie Street, Vancouver 5; mine office, Hendrix Lake. L. R. Redford, manager; K. G. Collins, mine superintendent; J. Austin, mill superintendent; A. Ozols, plant superintendent. The Boss Mountain mine is on the east slope of Big Timothy (Takomkane) Mountain about 35 miles northeast of 100 Mile House and is reached by 57 miles of road via Forest Grove and Canim Lake, about 6 miles from the mine.

The geology of the mine, mine layout, and general mining method were described in the Annual Reports for 1966, page 133; 1965, page 141; and 1964, page 66. The mine plant and mining methods remain essentially unchanged from previous years.

During 1967 most of the subdrifting for stope development was carried out on the 5160 and 5260 sublevels, with undercut sublevels being driven on the 5060 undercut level. Drawpoint development was carried out on the main 5045 level in the preparation of the west stringer zone for mining. Muck raises were driven to the 5260 level, and service raises were driven in the east and west stringer zones to 5,200, 5,260, 5,280, 5,340, 5,360, and 5,400 elevations. A system of orepasses was driven from 5L53 drift south (5,045 elevation) to the 5,200 elevation scram drifts, which were started in 1967. The north 5550 drift west on 5,400 elevation was driven to join the 5P56 and 5453 service raises. Exploration drifting included extending the 5R47 drift west, 5P48 drift north, and 5M45 drift south.

Development and production figures for 1967 are as follows:—

| | | Ft. |
|---|---|---|
| Drifts and crosscuts | | 2,134 |
| Subdrifts | | 6,926 |
| Raises | | 1,942 |
| Diamond drilling— | | |
| Underground | 5,501 | |
| Surface | 11,515 | |
| | | 17,016 |
| Blast-hole drilling | | 383,952 |

The mill treated 469,444 tons of ore, from which 2,705 tons of concentrates was produced, which contained 3,106,460 pounds of molybdenum. The concentrates were shipped to several buyers in England, one in France, and one in the United States.

T. Connors Diamond Drilling contracted the company's diamond drilling, and Takomkane Contracting Limited mined a small tonnage of low-grade surface ore for mill testing.

The total number of company employees at year-end was 216.

## CLINTON MINING DIVISION

*Copper-Gold-Silver*

### TATLAYOKO LAKE

**Lost Fiddle, Mary M., Etc.**
By V. A. G. Preto

(51° 124° N.W.) The Lost Fiddle, Mary M., Leader, Snap, and Frost claims, totalling 10 in number, are located on the upper Ottarasko River, 6 miles west of Tatlayoko Lake. The claims are owned by K.W.G. Haynes, J. Davis, and E. R. Flesher, of Phillips Arm. Work done in 1967 consisted of geophysical surveys over part of the claim group and of one hand trench approximately 30 feet long.

*Copper-Molybdenum*

### TASEKO LAKES

**Eggs**
*Falconbridge Nickel Mines Limited*
By T. M. Waterland

(51° 123° S.W.) Company office, 504, 1112 West Pender Street, Vancouver 1. The seven-claim Eggs group, held under option from H. V. Warren, lies between 4,500 and 7,000 feet elevation on the Tchaikazan River. Access is via helicopter or fixed-wing aircraft from Williams Lake or Vancouver.

Mineral showings are reported to consist of chalcopyrite and molybdenite occurring in a shattered andesite-basalt complex cut by quartz monzonite dykes. During 1967 four men worked for a period of three months under the direction of J. J. McDougall, geologist. Preliminary magnetometer and self-potential surveys were carried out and a soil-sampling survey was done on a 100-foot grid over an area 1,500 feet square. Approximately 1,250 feet of AX and NX holes was drilled in seven holes.

*Copper*

### LAC LA HACHE

**Peach, Fly, Tim**
*Coranex Limited*
By T. M. Waterland

(51° 121° N.E.) Company office, 1521 Pemberton Avenue, North Vancouver. The Peach, Fly, and Tim groups, comprising about 200 claims, are adjacent to and southeast of Peach Lake, about 15 miles northeast of Lac la Hache. Access is from Lac la Hache via the Timothy Lake road and Rail Lake road for 12.3 miles and thence via the mine access road for 6.8 miles to the camp.

Work was carried out over a seven-month period with an average of 14 men being employed. R. H. Janes, geologist, was in charge of the exploration programme, which included geological mapping, magnetometer and induced polarization surveying, soil-sampling, hand and bulldozer trenching, road construction, and 1,500 feet of diamond drilling in five holes.

[References: Assessment Reports Nos. 1037, 1038, and 1131.]

*Copper-Lead-Zinc*

**FF**
*Anaconda American Brass Limited*
By T. M. Waterland

(51° 121° N.E.) Company address, Britannia Beach. The FF group of 107 claims is 6 miles northeast of Lac la Hache, whence it is accessible by road. Eight men worked for three months under the supervision of J. M. McAndrew, geologist. Exploration work included geological mapping, geophysical and geochemical surveys, and bulldozing four trenches having a total length of 600 feet.

*Copper*

**Cop**
*Buffalo Lake Mines Ltd.*
By T. M. Waterland

(51° 121° N.E.) Company address, 814, 510 West Hastings Street, Vancouver 2. The Cop 1 to 40 claims are owned by Buffalo Lake Mines Ltd. and are located near Greeny Lake, east of Lac la Hache. Access is via the Timothy Lake road, a distance of about 8 miles from Lac la Hache.

Two men worked for a period of one month under the direction of J. P. Elwell, consulting engineer. A topographic map was made and surface workings were mapped, the geology of the property was mapped, and geochemical soil samples were taken over the property.

## 70 MILE HOUSE

**Joe**
*Rayfield Mining Company Ltd.*
By V. A. G. Preto

(51° 121° S.E.) Company office, 650, 890 West Pender Street, Vancouver 1. Hill, Manning and Associates, consulting engineers. The company has retained 10 recorded claims comprising part of the former Joe group and located 17 miles east of 70 Mile House, 2 miles north of the west end of Young Lake. Work done in 1967 consisted of an aeromagnetic survey. A contract crew of three men worked for a period of one month.

[References: Assessment Reports Nos. 954 and 1172.]

*Copper*

**BD**
By T. M. Waterland

(51° 121° S.E.) Owner's address, P.O. Box 10, Savona. The BD group of 50 claims, owned by C. W. Dansey, is on Rayfield River and is reached by 16 miles of road from 70 Mile House. Some bulldozer trenching was done during 1967.

*Copper-Molybdenum*

## POISON MOUNTAIN

**Giant, P.M., Fish, Copper, Cheap**
*Homestake Mineral Development Company*
By T. M. Waterland

(51° 122° S.W.) Company office, 615, 1030 West Georgia Street, Vancouver 5. A total of 180 claims, comprising the Giant, P.M., Fish, Copper, and Cheap groups, is under option from Copper Giant Mining Corporation Limited. Access to the property is via the Yalakom River road to the Blue Creek turn-off and thence about 10 miles via a newly constructed access road along the northeast side of the Yalakom River. Total distance from the Bridge River road is 34 miles.

The geology of the property is summarized in the 1961 Minister of Mines and Petroleum Resources Annual Report (pp. 23–24).

Work was done during a three-month period by an average crew of 15 men living in a good tent camp on the property. It included 1,900 feet of bulldozer trenching, 2,860 feet of BQ wireline diamond drilling in eight holes, 4,600 feet of 2½-inch percussion drilling in 18 holes, a small amount of geological mapping, and some road construction. Engineering work for the project was contracted to Chapman, Wood & Griswold Ltd., with H. J. Toohey directing the work. The operation of the camp was under the supervision of Brian Williams.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1956, p. 35; 1959, p. 25; 1960, p. 19; 1961, pp. 23–24; 1966, p. 136.]

*Copper-Molybdenum*

**Ruby, TC, Paul**
*Rainbow Lake Explorations Ltd.*
By T. M. Waterland

(51° 122° S.W.) Company address, 814, 510 West Hastings Street, Vancouver 2. The Ruby, TC, and Paul groups, comprising 40 claims, lie between 6,000 and 7,000 feet at the head of Yalakom River, east and southwest from the peak of Poison Mountain. They are owned by Rainbow Lake Explorations Ltd., and during 1967 two men worked for a period of two months under the direction of J. P. Elwell, consulting engineer.

Work consisted of geologic and topographic mapping and soil-sampling of the 40-claim group. Pyrite, chalcopyrite, and magnetite are reported to occur as fracture fillings and disseminations in porphyry dykes intruding siliceous greywacke.

## LILLOOET MINING DIVISION

### POISON MOUNTAIN

**Giant, P.M., Fish, Copper, Cheap**
*Homestake Mineral Development Company*

(51° 122° S.W.) *See under* Clinton Mining Division, page 127.

**Ruby, TC, Paul**
*Rainbow Lake Explorations Ltd.*

(51° 122° S.W.) *See under* Clinton Mining Division, page 127.

*Copper-Molybdenum*

**Churn**
*Canzac Mines Ltd.*
By T. M. Waterland

(51° 122° S.W.) Company address, 818, 510 West Hastings Street, Vancouver 2. The Churn group of 40 claims is on Poison Mountain at the headwaters of the Yalakom River. Access to the property is via the Bridge River and Yalakom roads, 60 miles from Lillooet.

During 1967 two men worked for a period of four months under the direction of Ralph Sostad. A chain and compass survey of the property was made and four trenches totalling 4,000 feet were bulldozed.

[Reference: Assessment Report No. 926.]

*Copper-Molybdenum*

**Hill**
*Burlington Mines Ltd.*
By T. M. Waterland

(51° 122° S.W.) Company office, 510 West Hastings Street, Vancouver 2. The Hill group of 60 claims is on the northeast slope of Poison Mountain. Access is via the Bridge River road and Yalakom road, a distance of 60 miles from Lillooet.

Ralph Sostad supervised a crew of two men for a two-month period. The claims were surveyed by tape and compass and four trenches having a total length of 2,000 feet were bulldozed.

[Reference: Assessment Report No. 968.]

### YALAKOM RIVER

*Mercury*

**Apex, Candy**
*Roosevelt Mines Ltd.*
By T. M. Waterland

(51° 122° S.W.) Company address, 10128—103rd Street, Edmonton, Alta. The Apex and Candy groups, totalling 14 claims, are on Quartz Mountain near the head of the Yalakom River. They are 50 miles from Lillooet via the Bridge River and Yalakom River roads.

The geology for approximately four claims was mapped, bedrock was stripped by bulldozer, and five small rock cuts were blasted. The work was directed by M. A. Roed, geologist.

*Mercury*

## TYAUGHTON CREEK

**Silverquick, Quicksilver, Dot, Bob, Kim** (51° 122° S.W.) Company address, *Silverquick Development Co. (B.C.) Ltd.* 21729 — 22nd Road, Haney. This By T. M. Waterland 84-claim property straddles Tyaughton Creek just west of Relay Creek. A good road leads from the Manitou (Empire Mercury) mine road to the property.

Mineralization consists of cinnabar associated with quartz, calcite, limonite, and dickite. The cinnabar is present as disseminated grains, streaks, and as small lenses in brecciated conglomerate, as smears on slickenside fault surfaces, and in the mud of gouge seams. The host rocks are a sequence of conglomerate and argillaceous shale beds.

During 1967 a crew of 10 men worked for five months under the direction of S. H. Glassmire, mining engineer. Work completed during 1967 included bulldozing three trenches a total length of 300 feet, bulldoze stripping an area of 40,000 square feet, drilling and blasting two trenches, driving 170 feet of adit, and drilling 110 feet in two diamond-drill holes. All material from the adit drive was stockpiled and sampled, as was material from surface stripping (about 3,000 tons in all).

Seven 350-pound barrels of ore were shipped out for leaching and flotation tests. This material went to " Vimarc " in London, England, and to " Colorado Assay " in Denver, Colorado.

The crew lived in the Silverquick camp on the property until work was suspended in November.

*Copper-Lead-Gold*

## BRIDGE RIVER

**King** (50° 122° N.E.) Company address, 2561 East 27th *Benn Explorations Ltd.* Avenue, Vancouver 12. The King group of 28 claims By T. M. Waterland is between elevations of 4,800 and 5,600 feet on the summit of the ridge between Anderson and Seton Lakes, 2 miles east of the Mission Mountain road. The group is under option from Paul Matson. During 1967 some geological mapping was done, 12 trenches totalling 240 lineal feet were dug, and 1,000 square feet of bedrock was stripped.

[Reference: Assessment Report No. 994.]

*Gold-Silver-Copper-Lead-Zinc*

**Bonanza, Lucky Strike, Ricky, Bob** (49° 122° N.W. and 50° 122° S.W.) Com- *Bridge River United Mines Ltd.* pany address, 1368 West 47th Avenue, Van- By T. M. Waterland couver 13. The Lucky Strike, Ricky, and Bob groups of recorded claims together with Crown-granted mineral claims lying between the heads of Eldorado and Taylor Creeks are held by Bridge River United Mines Ltd. The property has been known in the past as the Lucky Strike, Robson, Bill & White, and Homestake. Work during 1967 was supervised by R. R. Taylor and was carried out over a five-month period by four men. Eleven miles of road from Tyaughton Lake was rebuilt, about 3,500 feet of bulldozer trenching was done, and some geological, electromagnetic, and geochemical work was done in the vicinity of the old showings.

*Gold*

**Bralorne Mine** (50° 122° N.W.) Company office, 355 Bur- *Bralorne Pioneer Mines Limited* rard Street, Vancouver 1; mine office, P.O. By T. M. Waterland Box 367, Bralorne. G. H. Davenport, president; E. H. Hall, resident manager; W. E. Field, manager of mining; D. B.

Cameron, mine superintendent. The company operates the Bralorne mine on Cadwallader Creek, which is reached by 75 miles of road from Lillooet. Production from the Bralorne mine has been continuous since 1930.

No. 8 level is the main adit and haulage level and is connected to the mine workings by the Empire service shaft between No. 3 and No. 26 levels and the Crown shaft, which extends from No. 8 to No. 26 level. The Queen shaft connects No. 26 level with the producing section of the mine. The lowest level is No. 43 level and is now in production. Rock temperature on No. 43 level is 128 degrees Fahrenheit.

Ventilating the mine and keeping air of acceptable temperatures circulating at the lower levels have been a major problem. Ventilation is essentially a forcing system with two 48-inch-diameter Aerodyne fans located on the surface and blowing 115,000 cubic feet per minute of fresh air through vent raises to the collar of the Queen shaft. Fans located on the lower levels draw fresh air from the Queen shaft for distribution to the working areas. The air then exhausts through stopes and old transfers and to the surface via the Crown and Empire shafts.

During 1967 mine development included drifting and crosscutting, 1,048 feet; conventional raising, 107 feet; bored raising, 870 feet. Raise-boring was used to catch up with drifting and stope preparation, and bored raises provided the necessary ventilation openings, manways, and an ore-pass.

Production for 1967 was almost entirely from the 77 vein, with only a minor amount from the 79 vein.

During 1967 the mill operated a total of 195 days and milled 97,332 tons of ore, from which 48,711 ounces of gold was recovered. The mine was closed for a three-week period during the summer for annual vacations, and production was hampered during August when mine employees were required to fight forest fires.

Development work on No. 42 and No. 43 levels has added some 100,000 tons of good-grade ore to the reserves.

The only significant change in mining methods during 1967 was a change to the use of Yielding steel arches in stope sills on both No. 42 and No. 43 levels.

The raise-boring machine purchased by Bralorne in 1966, in addition to boring raises at Bralorne, was used to contract raise-boring work at Texada Mines Ltd. and at Lynn Lake, Manitoba.

During 1967 W. E. Field was transferred to the company's Vancouver office to assume the position " manager of mining " and E. H. Hall, formerly mill superintendent, was promoted to the position of resident manager.

The future of the Bralorne mine appears considerably brighter at the end of 1967 than it did at the end of 1966. A year ago the company stated that ore reserves were sufficient to last until 1968. Since that time 100,000 tons has been added to the reserves, with present reserves, estimated at 165,000 tons, grading 0.54 ounce of gold per ton. Consideration is now being given to sinking below No. 43 level.

## LILLOOET

*Copper*

**Don**
*New Indian Mines Ltd. and Vananda Explorations Ltd.*
By T. M. Waterland

(50° 121° N.W.) Company address, 661 Hornby Street, Vancouver 1. The 23-claim Don group is held under option agreement from Don Dillon. Access is via 5 miles of road from Lillooet. The property was formerly held as the Copper Ridge, Grey Rock, and Mile " O."

Work during 1967 was supervised by F. J. Hemsworth, consulting engineer, and consisted of drilling and blasting two trenches having a total length of 600 feet and bulldozer stripping an area of about 34,000 square feet. Four men were employed for three months.

*Silver*

DUFFY LAKE

**Pat, Nels, Tom, Jim**
*Barkley Valley Mines Ltd.*
By T. M. Waterland

(50° 122° S.E.) Company address, 96—67th Street, Ladner. The Pat, Nels, Tom, and Jim claims are between 5,000 and 7,000 feet on a tributary of Haylmore Creek, 12 miles north of Duffy Lake. Work on the property consisted of drilling a 25-foot diamond-drill hole and some hand stripping.

NESIKEP CREEK

**Mud, Cherry, Rickhill, Sharon**
*Dalex Mines Ltd.*

(50° 121° S.W. and N.W.) *See under* Kamloops Mining Division, page 149.

## KAMLOOPS MINING DIVISION

*Copper*

CLEARWATER

**CL**
*Anaconda American Brass Limited*
By T. M. Waterland

(51° 120° N.E.) Company address, Britannia Beach. The CL 1 to 10 claims, held by the company, are located on Corsica Lake, 5 miles south of Mahood Lake, and are reached by road from Clearwater, a distance of about 25 miles. Exploration of the property was under the direction of H. Reich and included geological mapping and geophysical and geochemical surveys.

[Reference: Assessment Report No. 1092.]

*Copper-Molybdenum*

**Wet, Sun, Aku, Dry, Lee, Mud, Ray**
*Falconbridge Nickel Mines Limited*
By T. M. Waterland

(51° 120° N.E.) Company address, 500, 1112 West Pender Street, Vancouver 1. This 470-claim property is owned by the company and lies west of Clearwater, whence access is via logging-road. Twelve men worked for a period of six months under the direction of D. H. Helgesen, field geologist. Work consisted of geological mapping, geophysical and geochemical surveys, construction of 5 miles of access road, and drilling and blasting five trenches for a total length of 800 feet.

[Reference: Assessment Report No. 1026.]

*Molybdenum-Copper*

**Jud, Rex, Ax, Ab, Ti, Nx**
*Secondo Mining Ltd.*
By T. M. Waterland

(51° 120° N.E. and 51° 119° N.W.) Company address, 621, 602 West Hastings Street, Vancouver 2. The Jud, Rex, Ax, Ab, Ti, and Nx groups are located some 12 miles from Clearwater via the Clearwater valley road to Wells Gray Park.

A crew of six men worked for a four-month period under the direction of T. McMahon. Work included a partial survey of the claims and of the geology, a geochemical survey by Sulmac Explorations Services Limited, construction of a trail to the property, and some hand stripping and trenching.

It is reported that molybdenite occurs in Shuswap granitic gneisses.

[Reference: Assessment Report No. 1046.]

*Molybdenum*

**Mad, Nod**
*Noranda Exploration Company, Limited*
By T. M. Waterland

(51° 120° N.E. and N.W.) Company address, 1050 Davie Street, Vancouver 5. The Mad and Nod groups are located southeast of Clearwater and are reached by 27 miles of good gravel road. Work during 1967 was under the direction of W. Rainboth, geologist, with four men working for a period of one month. Work consisted of reconnaissance geological mapping, drilling and blasting 13 pits, and diamond drilling 444 feet of X-ray drill-hole.

It is reported that molybdenite, specularite, and pyrite occur in quartz veins filling fractures in quartz diorite.

[Reference: Assessment Report No. 1013.]

*Copper-Lead-Zinc*

**Goof, Sue**
*Noranda Exploration Company, Limited*
By T. M. Waterland

(51° 119° N.W.) Company office, 1050 Davie Street, Vancouver 5. The Goof and Sue groups consist of 49 claims held by location on Harper Creek south of Clearwater. Access is by road from Clearwater, a distance of approximately 25 miles. The geology of 20 claims was mapped by W. Osborne, geologist, 52 line miles of magnetometer survey was completed, geochemical soil-sampling on 20 claims was done, and 1,500 feet of trenches was bulldozed. Four men worked for three months under the direction of A. Soregaroli.

It is reported that quartz lenses mineralized with galena, sphalerite, chalcopyrite, and pyrite occur in the various schists of the area.

## LITTLE FORT

*Copper*

**Jan**
*Anaconda American Brass Limited*
By T. M. Waterland

(51° 120° N.E. and S.E.) Company address, Britannia Beach. The Jan 1 to 30 claims are at Janice Lake, 10 miles northwest of Little Fort, and are reached via the Bridge Lake road. Work during 1967 was under the supervision of H. Reich and consisted of geological mapping and geochemical and geophysical surveys. Pyrite and chalcopyrite are reported to occur as fracture fillings and disseminations in argillite and andesite.

*Copper-Molybdenum*

**EC**
*Royal Canadian Ventures Ltd.*
By T. M. Waterland

(51° 120° N.E. and S.E.) Company address, 270, 180 Seymour Street, Kamloops. The EC group of 146 claims is on the north side of Eakin Creek, 10 miles northwest of Little Fort. Access to the property is 15 miles from Little Fort via the Bridge Lake road. Work during 1967 was supervised by N. B. Vollo, and it is reported that geological mapping and stream silt and soil sampling were carried out. Seven men worked for a period of one month.

[Reference: Assessment Report No. 1055.]

*Copper*

**Kala, Red**
*Anaconda American Brass Limited*
By T. M. Waterland

(51° 120° N.E.) Company address, Britannia Beach. The Kala and Red groups are held under option agreement with J. M. MacKinlay and are one-half mile east of Lakeview Lake. The showings were formerly held on the Aurora. Access is by road from Little Fort, a distance of 20 miles via the Bridge Lake and Aurora Lake roads. Work during 1967 was directed by H. Bradshaw. A chain and compass survey of the claims was made, geological, geophysical, and geochemical surveys were undertaken, access roads were built, and two drill-holes totalling 587 feet were diamond drilled.

[Reference: Assessment Report No. 1123.]

*Copper*

**TC**

*Anaconda American Brass Limited*

By T. M. Waterland

(51° 120° N.E. and S.E.) Company address, Britannia Beach. The TC group of 141 claims is located near Aurora Lake, 16 miles northwest of Little Fort. Access to the property is via the Bridge and Aurora Lake roads, a distance of about 20 miles from Little Fort. Work during 1967 was supervised by H. Bradshaw, with 11 men being employed for a period of six months. It is reported that chalcopyrite, arsenopyrite, pyrite, pyrrhotite, and magnetite occur in skarn and as disseminations in diorite. Work included geological mapping, geophysical and geochemical surveys, 2,240 lineal feet of bulldozer trenching, and about 1,250 feet of diamond drilling in four holes.

[References: Assessment Reports Nos. 905, 907, and 910.]

*Silver-Lead-Copper-Molybdenum*

**RO, SO, TC, RL, LO**

*Anaconda American Brass Limited*

By T. M. Waterland

(51° 120° N.W. and N.E.) Company address, Britannia Beach. This 237-claim property is located at Friendly Lake and access is from Little Fort via the Bridge Lake road, a distance of 20 miles. Work during 1967 was supervised by P. E. Hirst, with eight men working over a period of seven months. Work included geological mapping, geophysical and geochemical surveys, road construction, and drilling 1,554 feet of diamond-drill holes in four holes.

[Reference: Assessment Report No. 952.]

*Copper*

**Silver**

*United Copper Corporation Limited*

By T. M. Waterland

(51° 120° N.E.) Company address, 411, 475 Howe Street, Vancouver 1. This property, comprising the Silver 1 to 56 claims, was discovered in the autumn of 1967 after soil-sampling and magnetometer surveys revealed an anomaly 9,000 feet long. Pyrite, magnetite, and traces of chalcopyrite were noted in three exposures, but winter conditions forced cessation of work before the discovery could be further explored. Three months' work by four men was supervised by A. D. K. Burton, consultant.

The property is reached via the Bridge Lake road from Little Fort for a distance of 11 miles and thence 10 miles north to the property.

[References: Assessment Reports Nos. 981, 1061, and 1169.]

*Copper*

**PC**

*Anaconda American Brass Limited*

By T. M. Waterland

(51° 120° N.E. and N.W.) Company address, Britannia Beach. The PC 1 to 92 claims, held by Anaconda American Brass Limited, are near Willow Creek, some 20 miles northwest of Little Fort. Access is from Little Fort via the Bridge Lake road, a distance of about 25 miles. Work during 1967 was under the direction of H. Reich and consisted of geological mapping and geochemical and geophysical surveys. Pyrite and chalcopyrite reportedly occur as fracture fillings in argillite.

[Reference: Assessment Report No. 1193.]

## BARRIERE

*Molybdenum*

**H, M**
*Royal Canadian Ventures Ltd.*
By T. M. Waterland

(51° 119° S.W.) Company address, 270, 180 Seymour Street, Kamloops. The H 1 to 10 and the M 16 to 24 claims are on the Barriere Plateau between Harper and Vermelin Creeks, 2 miles north of North Barriere Lake. The geology of the claims was mapped and soil samples were taken for geochemical analysis.

[Reference: Assessment Report No. 1062.]

*Copper*

**Bex**
*Barriere Explorations Ltd.*
By T. M. Waterland

(51° 119° S.W.) Company address, P.O. Box 189, Barriere. The Bex group of 63 located claims is on the south side of East Barriere Lake and is reached by 21 miles of gravel road from Barriere on the North Thompson highway. Work during 1967 consisted of geological mapping, a magnetometer survey, a geochemical survey, and some bulldozer trenching and stripping. Engineering work was done by G. M. T. Marshall and W. Read.

## ADAMS LAKE

*Copper-Silver-Lead-Zinc-Gold*

**Tom, Glen**
*Buchanan Mines Ltd.*
By T. M. Waterland

(51° 119° S.W.) Company address, 10612—124th Street, Edmonton, Alta. This 32-claim property is on the east side of Adams Lake opposite Skwaam (Agate) Bay and is reached by boat from Skwaam Bay or by car and boat from Chase. Work during 1967 was supervised by L. G. Siega and consisted of 1,880 feet of NX diamond drilling in 10 holes. Four men worked on the property and lived in a tent camp near Adams Lake.

[Reference: Assessment Report No. 1114.]

*Silver-Lead-Zinc*

**Elmoore**
*Cannon Mines Limited*
By T. M. Waterland

(51° 119° S.W.) Company address, 204, 1920 Weston Road, Weston, Ont. The Elmoore group of eight claims is located 3 miles east of Skwaam Bay and is optioned from C. J. Brown. Access is from Skwaam Bay via jeep-road. Work carried out in July and August was supervised by D. K. Bragg. It consisted of 1,500 feet of bulldozer trenching and some road improvement work.

[Reference: Assessment Report No. 904.]

## SHUSWAP LAKE

*Silver-Lead-Zinc*

**Pat, Ex, E, Garnet**
*Giant Metallics Mines Limited*
By T. M. Waterland

(51° 119° S.E. and S.W.) Company address, P.O. Box 457, Salmon Arm. A total of 150 claims on the Adams Plateau are owned by the company. The property is reached via a 6-mile logging-road from a booming-ground on the north side of Shuswap Lake 5 miles from the main Trans-Canada Highway at Squilax. Work during 1967 was supervised by John Spelay and was directed by MacDonald Consultants Ltd., of Vancouver. Work included topographical and geological mapping, gravity, electromagnetic, and geochemical surveys, and diamond drilling a total of 3,150 feet of AQ- and E-size diamond-drill holes.

The property was formerly known as the Mosquito King and was first discovered in 1914. It was examined in 1949 for I. W. C. Solloway and Associates and was diamond drilled by Cominco Ltd. In 1953 exploration was done by Trans-Mountain Mines Ltd. Mill tests were conducted in 1953, and test shipments were made that year to Cominco Ltd. in Trail.

The sedimentary and metamorphic rocks of the area have been intruded by granite, granodiorite, and porphyry dykes. Throughout the sedimentary and metamorphic rocks there are replacement zones of silver, lead, and zinc mineralization. Argillaceous limestone and schist are the most common host rocks. The sulphide zones for the most part are narrow and usually are separated by sparsely mineralized or barren material.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 146.]

*Zinc-Lead-Copper*

**Annis, Dawn, Lakeview**
*Annis Mines Ltd.*
By N. D. McKechnie

(50° 119° N.E.) Company office, 280, 180 Seymour Street, Kamloops. Donn Spankes, president; S. F. Kelly, consultant. Annis Mines Ltd. holds 35 recorded claims, located as the Annis, Dawn, and Lakeview groups, situated between Mara Lake and the Shuswap Arm of Shuswap Lake. From the Trans-Canada Highway 5 miles southwest of Sicamous a dirt road leads eastward about a quarter-mile to the camp on Annis No. 5 mineral claim.

The narrow pyrrhotite zone mentioned in the 1966 Annual Report on the boundary between Annis Nos. 5 and 6 mineral claims is spatially associated with a band of gneiss composed of quartz, biotite, hornblende, plagioclase, clinozoisite, and rutile. The gneiss strikes north 80 degrees east to east and dips north at 35 to 60 degrees and is mineralized with pyrite, chalcopyrite, and sphalerite. What appears to be the same structure is exposed at two points northwestward from the adit portal at, approximately, 800 and 1,600 feet respectively from the pits on the claim boundary. At the lowest pit, 2,330 feet elevation, it is exposed for a width of 15 feet. This structure has a possible length of some 2,000 feet.

Work during 1967 was confined to minor bulldozer trenching.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 205; 1966, p. 146.]

*Silver-Lead-Zinc-Copper-Tin*

**Lobo, Bonnie Brae**
*Annmar Mining Ltd.*
By V. A. G. Preto

(50° 119° N.E.) Company address, 1154 Lillooet Street, Vancouver 6. The company owns 50 recorded mineral claims and fractions comprising the Lobo and Bonnie Brae groups and centred on Upper Leonard Creek, on the north slope of Mount Ida, 2½ miles south of Salmon Arm.

Work in 1967 was done under the supervision of B. L. Olheiser and included seven bulldozer trenches totalling approximately 1,800 feet in length and the construction of 1½ miles of access road. Surface and underground mapping of the existing workings and a geochemical survey of the Bonnie Brae 1 to 10 claims were also done. Three men were employed by company and contractors for a period of seven months.

*Copper-Silver-Nickel*

**Galaxy, Mark, Ed**
*Negas Mining and Exploration Ltd.*
By V. A. G. Preto

(50° 119° N.E.) Company address, 4th Floor, 153 Seymour Street, Kamloops. Douglas Jebson, president. The company owns 28 recorded claims comprising the Galaxy, Mark, and Ed groups and located on upper Gordon Creek, 6 miles west of Salmon Arm.

Work in 1967 was supervised by C. S. Boomer and included three bulldozer trenches totalling 1,300 feet in length and stripping by bulldozer of an area 300 feet long and 200 feet wide. One open cut 18 feet deep in bedrock was also made. Two men were employed by the company for a period of nine months.

## FALKLAND

*Copper*

**Ruby, Topaz, Pearl, Opal, Deadwood**
*Canex Aerial Exploration Ltd.*
By David Smith

(50° 119° S.W.) Company office, 800, 1030 West Georgia Street, Vancouver 5. The Jewel and Deadwood groups, totalling 66 claims, are between Salmon River and Pinaus Lake and are accessible by road from a point on Highway No. 97, 4 miles west of Falkland. The Ruby, Topaz, Pearl, and Opal are the key claims and were under option to P. LaFleur, of Vernon, from Mrs. E. Marzoff, of Vernon.

Seven men worked under the direction of C. C. Rennie, senior geologist, geological mapping, running an induced polarization and magnetometer survey, bulldozing 100 feet of trench, building 500 feet of road, and diamond drilling one hole 595 feet deep. Malachite, chalcopyrite, and pyrite are reported in quartz veins and as minor replacements in sheared and brecciated zones in silicified siltstones and sandstones of the Cache Creek Series.

## HEFFLEY CREEK

*Copper-Iron*

**Jed**
*Northwood Mining Limited*
By V. A. G. Preto

(50° 120° N.E.) Company office, 506, 540 Burrard Street, Vancouver 1. The company owns 23 recorded mineral claims which comprise the Jed group and are located directly west and northwest of the west end of Heffley Lake.

Work in 1967 was supervised by J. Schaefle, geologist, and included a geological, geophysical, and geochemical survey of the entire claim block. Three thousand feet of road was also built and 104.5 feet of diamond drilling was done in two holes. Four men were employed by company and contractor for a period of three months.

*Copper*

**Tun**
*Northwood Mining Limited*
By V. A. G. Preto

(50° 120° N.E.) Company office, 506, 540 Burrard Street, Vancouver 1. The company has 27 mineral claims held under option from J. E. R. Wood. The claims, known as the Tun group, are centred 2 miles west of Lyons Lake.

J. Schaefle, geologist, supervised the work done in 1967, which consisted of 272 feet of diamond drilling in three holes and of geological, geophysical, and geochemical surveys over the entire claim block. Four men were employed by the company and by contractor for a period of three months.

*Copper-Iron*

**Cab, Bac**
*Northwood Mining Limited*
By V. A. G. Preto

(50° 120° N.E.) Company office, 506, 540 Burrard Street, Vancouver 1. The company has 38 mineral claims held under option from W. Callahan.

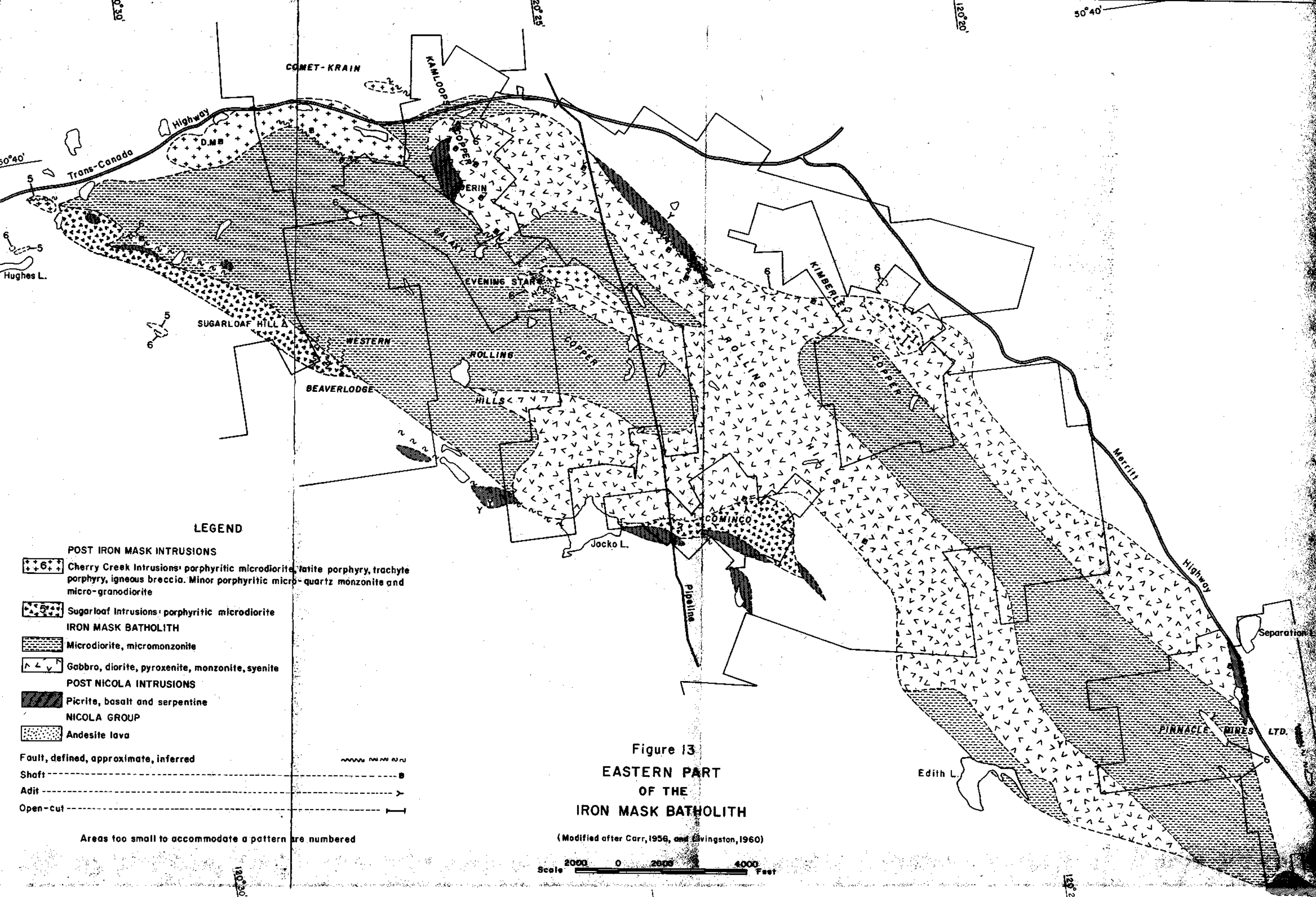



Figure 13
EASTERN PART
OF THE
IRON MASK BATHOLITH

(Modified after Carr, 1956, and Livingston, 1960)

The claims comprise the Cab and Bac groups and are centred three-quarters of a mile north of Lyons Lake.

J. Schaefle, geologist, supervised the work done in 1967, which consisted of 370 feet of diamond drilling in three holes and of a geological and a geochemical survey over the entire claim block. A magnetometer survey at a scale of 1 inch equals 200 feet was also done over claims Cab 1, 2, and 3. Four men were employed by the company and contractor for a period of two months.

*Copper*

**Hal**
*Madison Oils Limited*
By T. M. Waterland

(50° 120° N.E.) Company address, 516 Lancaster Building, Calgary, Alta. The 36-claim Hal group is held under option agreement with L. C. Hunt, the owner. It is on Heffley Lake and is reached from Heffley Creek on the North Thompson highway, a distance of 14 miles via the Mount Tod Resort highway. Work during 1967 was supervised by L. Manning and consisted of a geochemical survey of the property.

## KAMLOOPS

### Geology of the Eastern Part of Iron Mask Batholith

By V. A. G. Preto

Considerable more work has been done by exploration companies on the eastern part of the Iron Mask batholith since 1956, when J. M. Carr studied the geology of this complex pluton and of its associated copper deposits. This work, mainly in the form of diamond drilling, trenching, geophysical surveys of various types, and some geological mapping, has added information on the petrology of the batholith, and on the distribution, and perhaps origin, of the copper deposits associated with it. Perhaps the most valuable contribution is the work by E. Livingston, formerly with New Jersey Zinc Exploration Company (Canada) Ltd., who in 1960 distinguished two new suites of intrusive rocks younger than the Iron Mask batholith and closely associated with the copper mineralization. These two groups of rocks he named Sugarloaf porphyritic diorite and Cherry Creek porphyry. Subsequent diamond drilling and other work by various exploration companies has confirmed, to the present writer's satisfaction, Livingston's original distinction and petrographic description of the two post-Iron Mask intrusive suites. The age of the two units, and that of the associated mineralization, however, is not, in this writer's opinion, post-Kamloops Group, as suggested by Livingston, but probably older and pre-Kamloops.

The following paragraphs are a brief description of the Sugarloaf and Cherry Creek intrusive suites, of their relationship to copper mineralization and structural setting with respect to the Iron Mask batholith. Figure 13 is a generalized geological map of the eastern part of the Iron Mask batholith, modified after Carr, 1956, and in part after Livingston, 1960. It is intended primarily to show the outcrop distribution of the Sugarloaf and Cherry Creek intrusives with respect to the rest of the Iron Mask batholith and known areas of copper mineralization. For this purpose the map should be studied in conjunction with Carr's 1956 geological map.

#### *Sugarloaf Intrusions*

Grey-green porphyritic microdiorite, commonly with conspicuous phenocrysts of hornblende, is found at several localities along the southwestern edge of the Iron Mask batholith, from the vicinity of Hughes Lake to the Cominco claims near Jacko Lake. Diamond-drill hole intersections of similar rocks, probably representing dykes, are found near the Evening Star shaft in the east central part of the batholith, and further to the north in some holes recently put down by Sulmac Exploration Services Ltd. a few hundred feet to the northwest of the Erin shaft. Occurrence of Sugarloaf-type diorite in the Makaoo workings is also reported by Livingston.

The name Sugarloaf Intrusions is assigned to the microdiorite and related phases because Sugarloaf Hill is composed, except for its northern flank, of these rocks. Although probably all are of andesitic composition, rocks of this suite display a considerable variety in outward appearance and texture from very fine-grained, nearly aphanitic hornblende plagioclase or plagioclase porphyries to medium-grained porphyritic microdiorite with phenocrysts of plagioclase, hornblende, and (or) clinopyroxene. A distinctly hypabyssal texture, commonly characterized by the preferred orientation of plagioclase and mafic phenocrysts, is typical of rocks of this suite. If examined under the microscope, it is readily seen that rocks of the Sugarloaf Intrusions are not as rich in hornblende as it may first appear from a cursory hand-specimen examination, and that the amphibole commonly replaces crystals of clinopyroxene or, as in several observed instances, may be totally absent. The matrix and feldspar phenocrysts are virtually always very strongly altered to sericite, epidote, and carbonate, so that the original composition of the plagioclase can very seldom, if ever, be determined. The plagioclase phenocrysts commonly show relict zoning, as might be expected in rocks with a typically hypabyssal texture, and, from the sparse data that could be gathered, appear to have originally been of intermediate andesine composition. A few grains of quartz, always amounting to much less than 5 per cent, are commonly seen in thin-section.

In the vicinity of the Ajax-Monte Carlo showings east of Jacko Lake, widespread albite alteration such as described by Carr (1956, p. 51) is found in porphyritic diorite of the Sugarloaf type. A similar alteration, though not as pervasive and strong, is found in similar rocks seen in Galaxy drill core, near the Evening Star shaft. Pink potash feldspar veining and alteration, though present, is not common in Sugarloaf rocks in contrast to its widespread occurrence in rocks of the Cherry Creek suite.

The age of the Sugarloaf intrusives, although not certain on an absolute scale, is clearly post-Iron Mask and post-picrite basalt intrusions. Inclusions of coarse-grained diorite and gabbro of the Iron Mask batholith in Sugarloaf porphyritic microdiorite can fairly commonly be seen in drill core from the Ajax-Monte Carlo area, and in core from the Sugarloaf Hill area. In addition, drill core from the latter locality also shows typical Sugarloaf porphyritic microdiorite with inclusions of a non-porphyritic microdiorite, probably part of the fine-grained division of Iron Mask rocks as defined by Carr (1956). In an old short adit approximately 1,000 feet east of Hughes Lake, porphyritic Sugarloaf diorite contains numerous inclusions of strongly serpentinized picrite basalt. An upper limit to the age of Sugarloaf-type rocks is not as readily available. The only known probably significant occurrence is in the Makaoo workings, where Cherry Creek porphyry is reported by E. Livingston to cut Sugarloaf diorite.

Copper mineralization is found in Sugarloaf rocks at the Ajax-Monte Carlo, near the Evening Star shaft, in the Afton-Pothook shaft area east of Hughes Lake, and, to a lesser extent as presently known, on Sugarloaf Hill.

### *Cherry Creek Intrusions*

Rocks of the Cherry Creek suite range in composition from trachyte and latite porphyry to microdiorite locally and rarely with sufficient free quartz to approach granodiorite in composition. Rocks belonging to this suite are found mostly along the northeastern edge of the Iron Mask batholith from near Separation Lake to near Hughes Lake, and farther northwesterly to Cherry Bluff and to the north shore of Kamloops Lake near Frederick. Similar rocks, slightly richer in quartz but nevertheless believed to belong to the same suite, are also found to the east and west of the Evening Star shaft in the east central part of the Iron Mask batholith. The name Cherry Creek was selected by Livingston because of the excellent exposures on Cherry Bluff near the old Copper King mine.

Although also merely saturated in silica and somewhat similar in composition to the Sugarloaf suite, Cherry Creek rocks are usually distinguished from the latter by their nearly ever-present pinkish cast due to widespread introduction of pink potash feldspar. The less obviously porphyritic, medium-grained phases of the Cherry Creek Intrusions are diorite in composition. Their texture, which in the hand specimen may appear to be equigranular, under the microscope can readily be seen to be porphyritic and typified by generally closely packed and commonly crudely aligned crystals of andesine together with a few phenocrysts of clinopyroxene and, rarely, hornblende. The matrix is feldspathic, generally highly altered and, in most cases, extensively replaced by pink potash feldspar. When the latter is the case, the texture can more easily be identified as porphyritic in hand specimen as the pink potash feldspar tends to outline the dull-grey plagioclase phenocrysts. The finer grain phases of the Cherry Creek Intrusions, which may be referred to as trachyte and (or) latite porphyries, depending on the amount of potash feldspar they contain, are typified by a greater proportion of matrix material, in which are set zoned phenocrysts of intermediate plagioclase, commonly displaying preferred orientation. The matrix is fine grained and nearly always extensively altered to epidote, chlorite, sericite, and carbonate. Interesting features of these more clearly porphyritic phases are irregular bodies of igneous breccia, which are found at several localities. The breccia, most probably produced by intrusive and perhaps even explosive processes, consists of a fine-grained, generally highly altered matrix, in which are set rounded, sub-rounded, and angular fragments of Cherry Creek and older rocks both of plutonic and of volcanic nature. The matrix material usually forms a large proportion of the rock, so that fragments are seldom in contact with one another. The high degree of alteration of the matrix may indicate a large amount of fluids and (or) volatiles available during the magmatic stage of formation of the rock.

Breccia of this type may be seen at the portal of the Last Chance adit on the Charlotte Crown-granted claim, 1½ miles northwest of Knutsford. A similar rock is also found just south of the Trans-Canada Highway on the Lorna claims of Comet-Krain Mining Corp. Ltd., which were drilled by Vanco Explorations Limited in 1966, and farther west in the vicinity of the D.M. shaft. Similar rocks are also reported by Livingston to occur along the Canadian National Railway tracks just east of Frederick on the north shore of Kamloops Lake and to the north and southeast of Hughes Lake.

Immediately to the west and for a distance of approximately three-quarters of a mile to the southeast of the Evening Star shaft, on the claims of Galaxy Copper Ltd., is a body of medium- to fine-grained pinkish-grey to grey quartz-bearing porphyritic rock which ranges in composition from diorite to granodiorite. Although finely disseminated quartz is commonly visible in hand specimen, point counts of four thin-sections, selected from specimens which appeared to be richer in quartz, gave contents of the mineral ranging from 7.5 to 10.7 per cent. Potash feldspar content, as estimated visually from several stained hand specimens, is never more than 25 per cent, and more commonly 10 to 15 per cent. Mafic minerals, generally an augitic clinopyroxene but occasionally hornblende, make up 5 to 10 per cent of the rock. Plagioclase, by far the most common mineral, forms 50 to 75 per cent of the rock and typically occurs as complexly twinned, strongly zoned phenocrysts with a more calcic, highly altered core. Where it could be determined, the composition of the plagioclase ranged from $An_{38}$ to $An_{45}$ but, in view of the strong zoning and alteration, this must be considered to be only a crude estimate. The texture is typically porphyritic, occasionally weakly trachytoid.

In the vicinity of the Galaxy workings the rock is subject to a widespread strong albitic alteration. The altered rock is buff to light grey in colour, with a pinkish cast, generally completely devoid of potash feldspar and mafic minerals and may contain veinlets of secondary quartz and carbonate. In thin-section the rock appears to be highly altered and to consist almost entirely of cloudy low-relief plagioclase, with patches of epidote and carbonate. Ghost outlines of former plagioclase phenocrysts showing relict zoning are commonly seen. Finely disseminated hematite, probably the oxidized equivalent of original magnetite, produces a reddish coating on slip and fracture planes, commonly giving the rock a reddish-buff colouration.

To the southwest of the Galaxy workings, near the fringes of the altered zone, sharp veining of relatively fresh rock by the alteration described above may be seen in the walls of some old hand trenches.

Although found on both sides and beneath the zone of altered volcanic rocks which at the Galaxy are favourable hosts to copper mineralization, the microdiorite is never seen in direct contact with the volcanics. The southwestern contact is marked by a drift-filled northwesterly trending topographic depression which follows a major shear zone. The northeastern contact is not exposed either and may, at least in part, be marked by a fault. The bottom of the zone favourable to copper mineralization is marked by a zone of highly foliated red hematitic mylonite several feet thick and dipping gently to the southwest. Below this zone of intense shearing, diamond-drill holes invariably intersect albitized microdiorite.

Because of the typically hypabyssal texture, composition, and general appearance where least altered, the microdiorite is provisionally considered as part of the Cherry Creek Intrusions.

The relative age of the Cherry Creek Intrusions is not exactly known. They are clearly younger than the picrite basalt and both the coarse- and fine-grained divisions of the Iron Mask batholith, as indicated by inclusions at several localities along the northeastern edge of the batholith. At the Makaoo workings, Livingston reports Cherry Creek porphyry cutting Sugarloaf diorite. The Cherry Creek rocks are closely related to copper mineralization, and at several localities they are extensively mineralized. The fact that Cherry Creek Intrusions are not known to cut volcanic rocks of the Kamloops Group, and that no copper mineralization of any consequence is known to occur within Kamloops volcanics in the area, suggests to this writer that both the Cherry Creek Intrusions and the copper mineralization are of pre-Kamloops age.

### *Structure*

In his discussion of the structural setting of the Iron Mask batholith, Carr (1956, pp. 52–53) has already pointed out the existence of at least three major zones of recurring fracture, one at each batholithic margin and a third within the batholith between the Evening Star and Iron Mask localities. The distribution of Cherry Creek and Sugarloaf intrusive rocks is almost totally restricted to these three zones, thus lending support to Carr's idea that these zones were the loci of recurring structural and igneous activity. Known occurrences of copper mineralization also follow these active zones, and in virtually every instance they are accompanied by the presence of Sugarloaf and (or) Cherry Creek Intrusions which can be seen either at the surface or in diamond-drill core. Although both Sugarloaf and Cherry Creek intrusives may be considered a useful guide in the search for copper mineralization in the area and, as observed at several localities, may themselves be hosts to mineralization, several other factors such as, for instance, favourable types of alteration and (or) favourable structural conditions undoubtedly play an important role in the localization of sulphide deposits.

The existence of northerly and northeasterly trending faults, though local as they may be, has been established at the Makaoo. Similarly oriented faults are present on Sugarloaf Hill and are indicated at the Galaxy. Identification of similar structures elsewhere, perhaps because of their limited size and small displacements involved, is difficult. Recently completed geophysical surveys, in some cases covering a large portion of the batholith, appear to be of little use in identifying any major structures, except for those already known from geological mapping.

*Copper*

**Kimberley**
*Kimberley Copper Mines Ltd.*
By V. A. G. Preto

(50° 120° N.E.) Office, 11th Floor, 20 Toronto Street, Toronto 1, Ont. C. C. Rollins, president; L. G. Phelan, consulting geologist. The property consists of several Crown-granted claims as well as of the Alf, Dan, Jeep, Kim, and Fox groups of recorded claims. The key Crown-granted claims are Kimberley (Lot 1447), Charlotte (Lot 1448), Last Chance (Lot 1449), Morning Star (Lot 1450), Stemwinder (Lot 1451), Occidental (Lot 1452), and Keystone Fractional claim (Lot 1453). The claims lie 3 miles south of Kamloops and 1½ miles northwest of Knutsford.

During the early part of 1967 the company put down three diamond-drill holes totalling 906 feet. Hole No. 1 is on the Last Chance claim; holes No. 2 and No. 3 are on the Morning Star claim. All three holes are entirely in porphyritic Cherry Creek microdiorite and (or) micromonzonite with breccia occurring in several places. Pink potash feldspar alteration is widespread and locally intense. Development of veinlets of secondary carbonate, quartz, and epidote along fractures is present throughout the holes. Pyrite is also found throughout, both disseminated and along fractures, and is particularly abundant in the sections of breccia.

In the latter part of 1967 the company embarked on a more extensive exploration programme, involving trenching, percussion and diamond drilling, and geophysical surveys. Work done at the year's end included a geological map of the property at a scale of 1 inch equals 400 feet, 10 bulldozer trenches totalling 2,500 feet in length, and approximately 1 mile of road construction.

[Reference: Assessment Report No. 993.]

*Copper*

**A, C, Cle**
*Pinnacle Mines Ltd.*
By V. A. G. Preto

(50° 120° N.E.) Company office, 11th Floor, 20 Toronto Street, Toronto, Ont. C. C. Rollins, president; L. G. Phelan, consulting geologist. The property was formerly known as the Joker and Grey groups. Access is via Highway No. 5 south from Kamloops for a distance of 8 miles. For a more detailed description of the claims, reference is invited to the Annual Report of the Minister of Mines for 1956, pages 67 and 68.

Work done in 1967 by Pinnacle Mines Ltd. included a magnetometer survey on claims A-1 to A-12, C-1 to C-5, and C-14 to C-18, and 150 feet of diamond drilling in one hole, from which no core was obtained. A crew of five men worked for a period of two months under the direction of L. G. Phelan. In addition to the above work, four other holes were drilled on the property during the latter part of 1966 for an additional footage of approximately 825 feet. Of these, three vertical holes were put down west of the old Joker adits in an area drilled in 1956 by Commercial Minerals and for which Carr provides a description. For the most part, the holes intersect microdiorite of the Iron Mask batholith, but at least in one hole some pink Cherry Creek trachyte porphyry is also found.

[Reference: Assessment Report No. 965.]

*Copper*

**Ajax, Wheal Tamar, Monte Carlo**
*Cominco Ltd.*
By V. A. G. Preto

(50° 120° N.E.) Company office, 300, 890 West Pender Street, Vancouver 1. The property consists of eight Crown-granted mineral claims and of the Jacko group of recorded claims, all of which are located approximately 5 miles southwest of Kamloops immediately east of Jacko Lake. The Crown-granted claims are Ajax (Lot 4710), Neptune (Lot 4712), Copper Star (Lot 3015), Forlorn (Lot 3016), Wheal Tamar (Lot 2126), Monte Carlo (Lot 4716), Grass Roots (Lot 1496), and Sultan (Lot 4717). A detailed description of the property is given by Carr (1956, pp. 63–67).

Work done in 1967 was under the direction of W. P. Armstrong, company geologist, and included a magnetometer survey and eight diamond-drill holes totalling approximately 4,171 feet. All holes were drilled in a northwesterly or in a northeasterly direction, and with a dip of 45 degrees. This brings to 56 the total number of holes drilled to date on the property.

Of the 1967 holes, four were drilled in the southwestern corner of the Wheal Tamar claim, more than 3,500 feet to the east of the Ajax workings, where most of the former drilling was concentrated. Of these, hole No. 50 has visible copper mineralization continuous from 25 to 238 feet and from 355 feet to the bottom at 570 feet. Holes No. 49, No. 51, and No. 55, however, which were drilled to the southeast, southwest, and west of No. 50 respectively, show only scattered, apparently lower-grade mineralized intersections. Most of the mineralization occurs in altered porphyritic Sugarloaf microdiorite. All four holes were drilled in a northwesterly direction.

Approximately 1,500 feet farther to the southeast, on the Monte Carlo claim, hole No. 52 also intersects low-grade copper mineralization in altered porphyritic Sugarloaf microdiorite at 19 to 78, 115 to 164, 233 to 292, and 378 to 408 feet. The hole was drilled to 507 feet in a northeasterly direction and ended in picrite basalt.

Little can be added to the general description of this property given by Carr in 1956. It should, however, be remembered that since that date a large part of the mineralized microdiorite occurring on the property has been recognized as being part of the Sugarloaf Intrusions.

*Copper*

**Evening Star, Golden Star**
*Galaxy Copper Ltd.*
By V. A. G. Preto

(50° 120° N.E.) Company office, 15th Floor, 355 Burrard Street, Vancouver 1. The company holds six Crown-granted claims and 49 recorded claims, comprising the Ursus, Shear, Dart, Venus, Key, Rocket, and Gal groups and located about 5 miles southwest of Kamloops, east of the old Lac Le Jeune road. The key claims are the Evening Star and Golden Star Crown-granted claims.

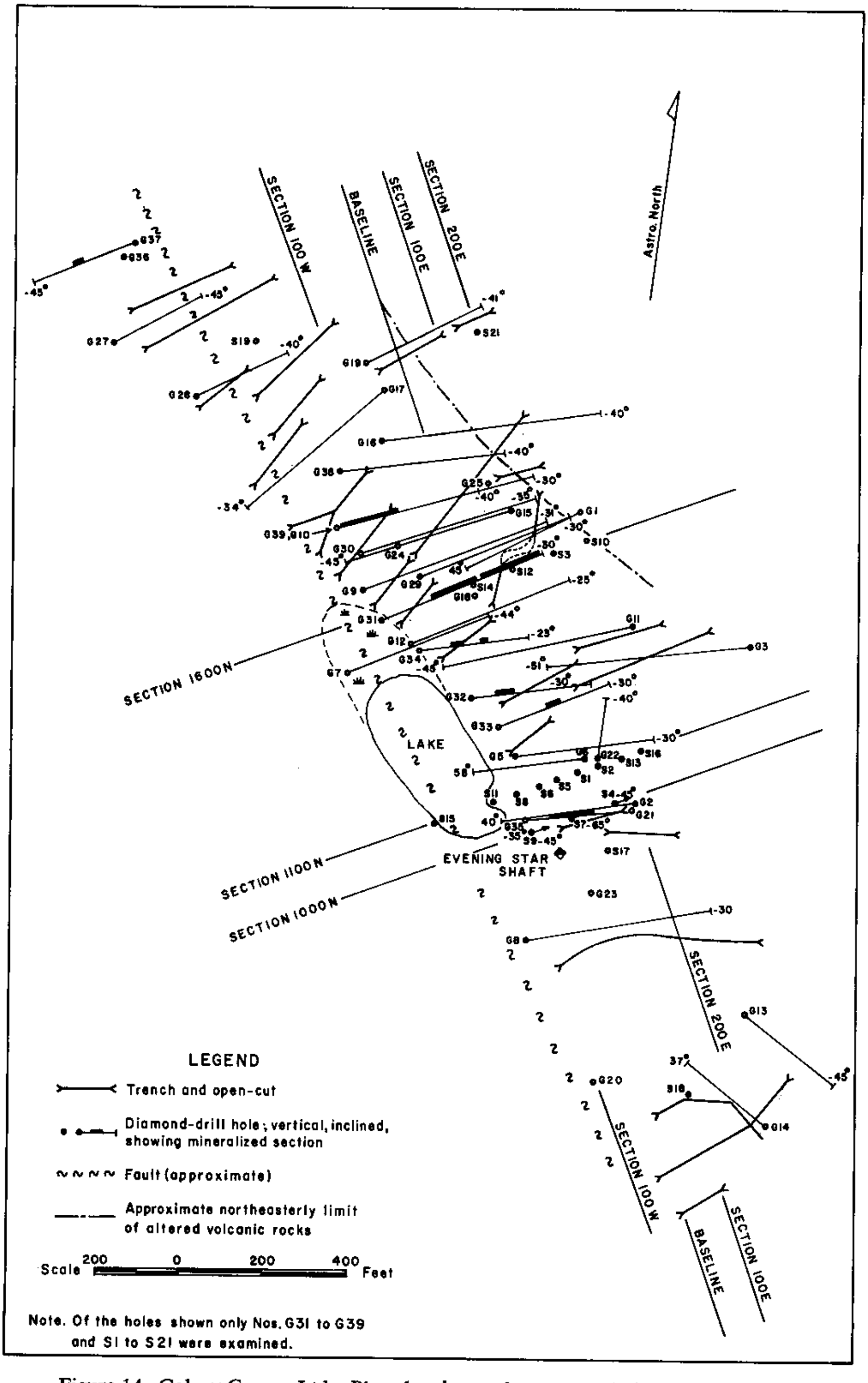
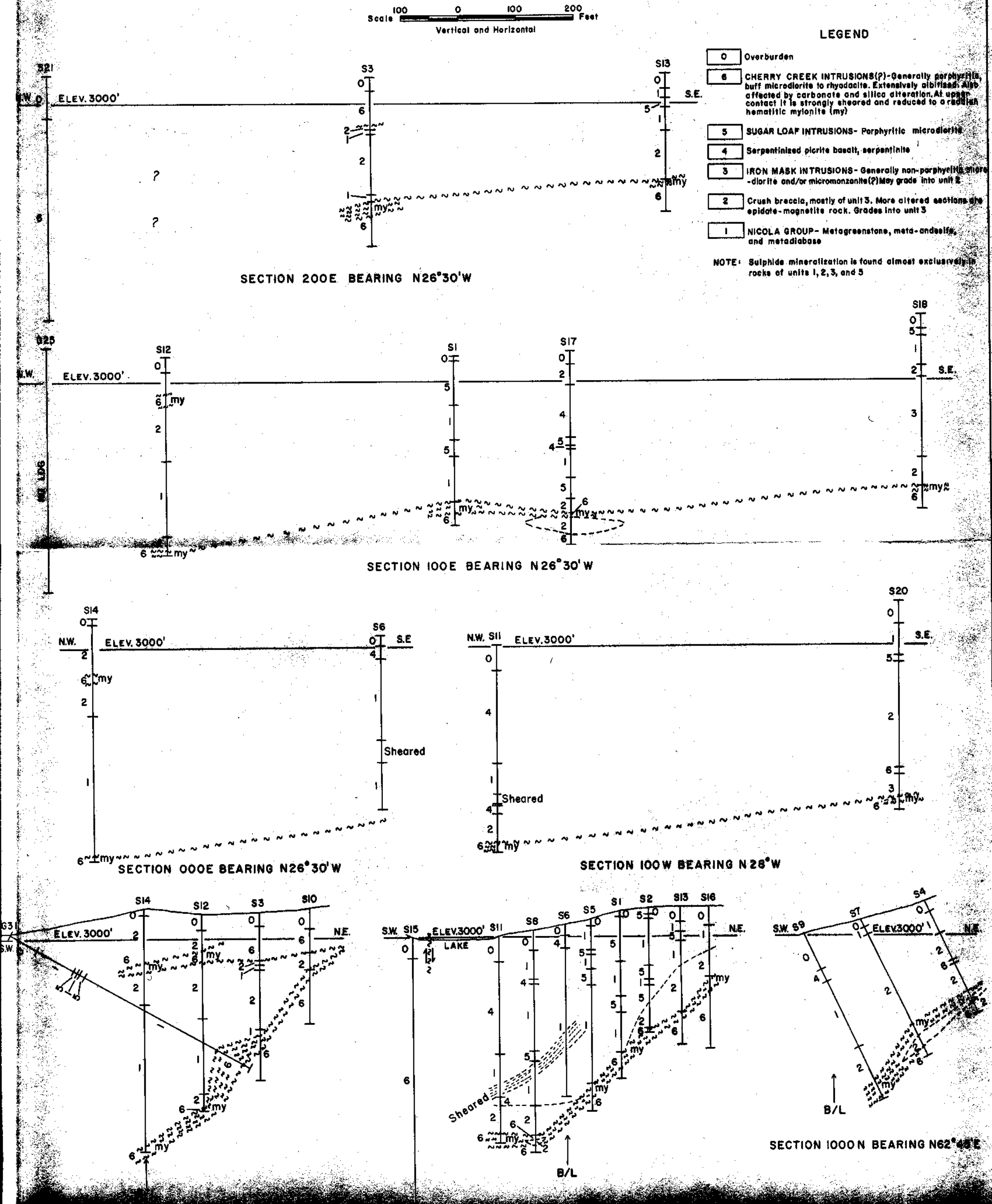



Figure 14. Galaxy Copper Ltd. Plan showing surface cuts and diamond-drill holes.

Figure 15

GALAXY COPPER MINES LTD.

DIAMOND-DRILL HOLE SECTIONS



Although no work was done on the property during 1967, a very considerable amount of diamond drilling, trenching, and geophysical surveying has been done in recent years by the company, as well as by Sulmac Exploration Services Ltd. and by Vanco Explorations Limited. In the vicinity of the Evening Star shaft a zone consisting largely of altered volcanic rocks which are mineralized with copper has been explored by trenches and diamond-drill holes. The work is shown in plan on Figure 14 and in sections drawn across and along the zone on Figure 15. The more recent diamond-drill holes, those designated by the letter " S," were drilled by Sulmac Exploration Services Ltd. Most of these holes are vertical and were laid out in a definite pattern.

The zone extends for an unknown distance to the north-northwest and south-southeast of the Evening Star shaft. In a northeasterly direction the zone has a maximum width of 500 to 600 feet. Approximately 200 feet southwest of the Evening Star shaft the zone is truncated by a shear zone or fault which follows a marked north-northwesterly trending topographic depression. This fault appears to have a vertical or steep southwesterly dip. To the southwest of the fault for a considerable distance is microdiorite and microgranodiorite of the Cherry Creek Intrusions, locally strongly albitized and virtually devoid of copper mineralization. Cherry Creek intrusive rocks lying to the north and northeast of the volcanics are also essentially barren. The nature of the contact here is only very poorly and vaguely known—in part it also may be marked by a fault. The bottom of the zone of altered volcanics is at a depth of approximately 100 to 350 or more feet below the elevation of the brackish pond near the Evening Star shaft. It is marked by a zone of very intense shearing and mylonitization, which has been mentioned on page 140 of this report. The red mylonite dips at moderate angles to the southwest, and appears to be truncated by the steep northwesterly trending fault. Below this shear zone, for an unknown but apparently considerable depth, the Cherry Creek intrusive rocks are albitized and virtually barren. In short, the zone of altered volcanic and other rocks which may be hosts to copper mineralization may be compared to a truncated trough facing southwest and trending north-northwest with a gentle northerly plunge. It should be emphasized that this zone is by no means uniformly nor continuously mineralized; on the contrary, sections of copper mineralization within it appear to be highly variable and irregular, and very difficult to correlate from hole to hole.

*Copper*

**Lorna, Ro**
*Comet-Krain Mining Corp. Ltd.*
By V. A. G. Preto

(50° 120° N.E.) Company office, 510 West Hastings Street, Vancouver 1. The property consists of a number of recorded mineral claims, including the Lorna and Ro groups, which are located immediately west of Iron Mask Lake on either side of the Trans-Canada Highway. The main showings are in open sagebrush-covered hills approximately 1,500 feet south of the Trans-Canada Highway. In 1966 the property was under option to Vanco Explorations Limited, at which time 15 diamond-drill holes for a total of 5,290 feet were drilled and geophysical surveys were made for Vanco by Sulmac Exploration Services Ltd. No work was done in 1967.

Appreciable chalcopyrite mineralization with traces of bornite and molybdenite was found in holes VC-1, VC-3, and VC-9 in reddish Cherry Creek porphyry and breccia extensively replaced by pink potash feldspar. From drill-hole and surface

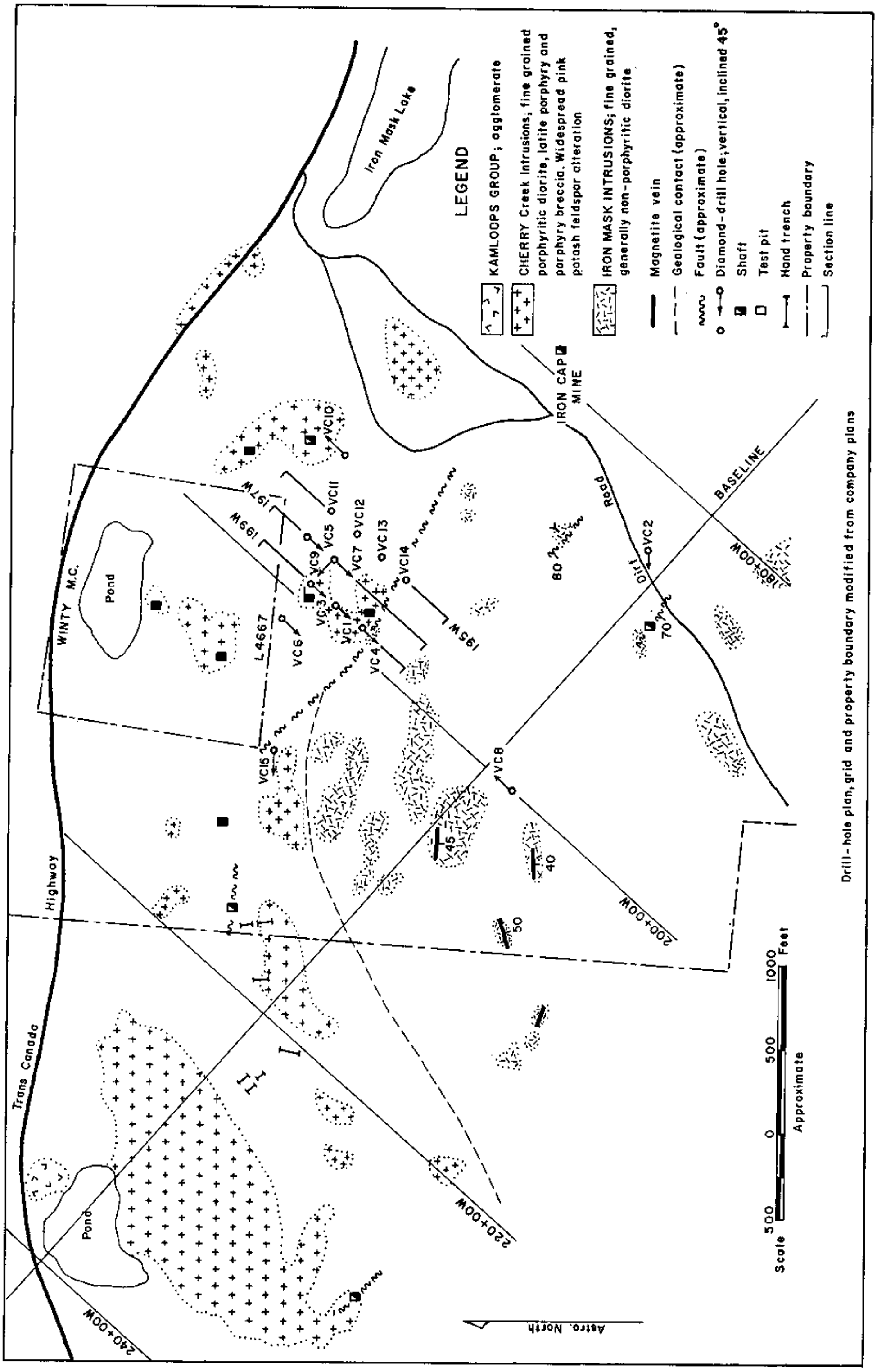



Figure 16. Comet-Krain Mining Corp. Ltd. Geological plan showing surface workings, shafts, and diamond-drill holes.

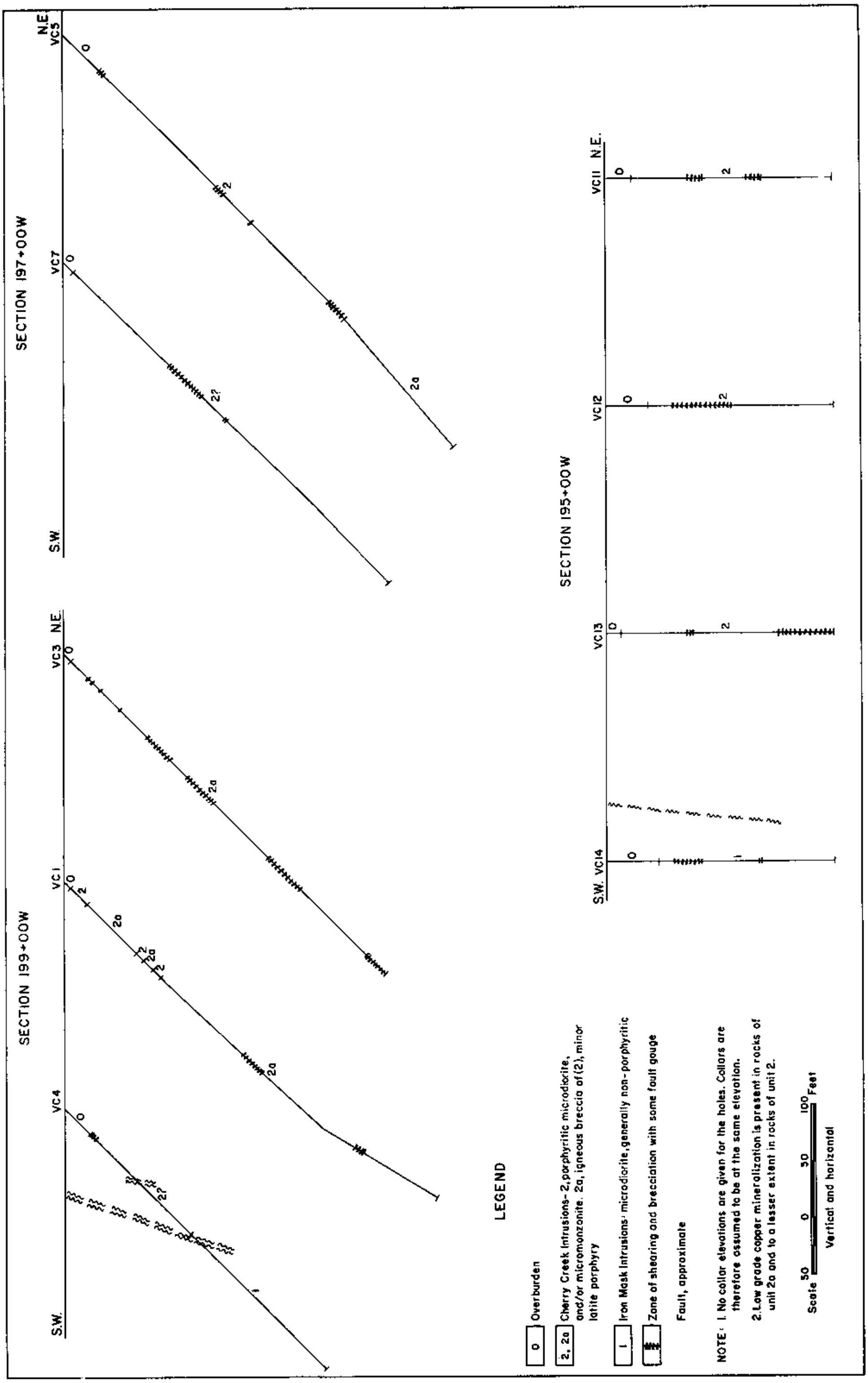



Figure 17. Comet-Krain Mining Corp. Ltd. Diamond-drill sections along lines shown on Figure 16.

information it seems that the mineralization occurs in an irregular and apparently small body of Cherry Creek breccia within Cherry Creek microdiorite and porphyry and located immediately northeast of a northwesterly trending fault which probably dips to the southwest at 70 to 75 degrees. The fault follows a pronounced drift-filled depression and separates, at least locally, Cherry Creek intrusives to the northeast from Iron Mask microdiorite to the southwest. Figure 16 is a geological map of the area, and Figure 17 shows some vertical cross-sections of diamond-drill holes in the area of copper mineralization.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1956, pp. 47–69; Assessment Reports Nos. 891 and 1011.]

*Copper*

**Makaoo**
*Rolling Hills Copper Mines Limited*
By David Smith

(50° 120° N.E.) Company office, P.O. Box 4183, Station D, Vancouver 9. The Makaoo property, formerly known as the Python, is 6 miles west of Kamloops and is accessible by 3 miles of mine road from Highway No. 1. Three men worked for one week under the direction of K. Spraggs, field supervisor, percussion drilling six holes totalling 700 feet.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1956, pp. 47–69.]

*Copper*

**Afton, Add**
*Afton Mines Ltd.*
By David Smith

(50° 120° N.E. and N.W.) Company office, 205, 1201 West Pender Street, Vancouver 1. The Afton and Add groups consist of a total of 46 claims. They are 7 miles southwest of Kamloops. An induced polarization survey was made over all the claims.

[Reference: Assessment Report No. 879.]

*Gold-Silver-Lead*

**Gold Bug, Lucky Strike**
By T. M. Waterland

(50° 120° N.E.) The Gold Bug and the Lucky Strike are owned by Mike Salk, of 1344 Eighth Street, Kamloops, who reports that 10 feet of adit was driven in 1967.

## CRISS CREEK

*Copper-Zinc-Molybdenum*

**BO, Crik**
*Newconex Canadian Exploration Ltd.*
By T. M. Waterland

(50° 120° N.W.). Company address, 914, 525 Seymour Street, Vancouver 2. The BO and Crik groups were optioned from the Joanne Grubstake Syndicate in 1967. They are on Criss Creek about 9 miles above its junction with Deadman River. Access is by Copper Creek road from Savona, a distance of 26 miles. Work, which was supervised by J. Ives and A. J. Teed, consisted of a geochemical survey of 10 claims. Five men worked for a period of two months on the property. It is reported that quartz veins mineralized with copper, zinc, and molybdenum occur in schist.

[Reference: Assessment Report No. 1124.]

**Art**
*Silver Summit Mining Co. Ltd.*
By T. M. Waterland

(50° 120° N.W.) Company address, P.O. Box 269, Kamloops. The Art group of 22 claims is on Criss Creek on the north side of Kamloops Lake. Access is by road from Kamloops, a distance of 26 miles. Three trenches totalling 430 feet were dug by hand, but nothing of interest was disclosed.

**Colin**
*Silver Summit Mining Co. Ltd.*
By T. M. Waterland

(50° 120° N.W.) Company address, P.O. Box 269, Kamloops. The Colin group of seven claims is on Criss Creek and is reached by road from Kamloops, a distance of about 27 miles. Two trenches totalling 85 feet were dug by hand, but nothing of interest was disclosed.

*Copper-Molybdenum*

## GREENSTONE MOUNTAIN

**TC, Spur**
*Dominic Lake Mining Ltd.*
By David Smith

(50° 120° N.W.) Company office, 118, 815 West Hastings Street, Vancouver 1. This property, which consists of a total of 196 claims, of which the key groups are the TC and Spur, is south of Greenstone Mountain. Access is by road from Cherry Creek, a distance of 16 miles. Work during 1967 consisted of geological mapping, magnetometer work on the TC group, and geochemical surveys on the TC and Spur groups. Two miles of road was built. Fifteen surface diamond-drill holes totalling 2,447 feet and nine percussion holes totalling 1,005 feet were drilled. Ten men worked for a period of six months under the supervision of G. A. Dirom, consultant.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 148; Assessment Report No. 1009.]

*Copper-Molybdenum*

**GB**
*Noranda Exploration Company, Limited*
By David Smith

(50° 120° N.W.) Company office, 1050 Davie Street, Vancouver 5. The GB group, which is at the head of Durand Creek between Durand and Dominic Lakes, is accessible by road from Savona, a distance of 14 miles. Two men spent two months on magnetometer, electromagnetic, and geochemical surveys. Work was supervised by A. Soregaroli, regional geologist, and T. Walker, geophysicist.

[Reference: Assessment Report No. 1099.]

*Copper*

## MEADOW CREEK

**Ash, Cash**
*Cannoo Mines Ltd.*
By V. A. G. Preto

(50° 120° S.W. and N.W.) Company address, P.O. Box 1409, Merritt. The company owns 27 recorded claims comprising the Ash and Cash groups and centred on upper Meadow Creek, 3 miles northeast of its junction with Guichon Creek. The workings were formerly known as the Ford group. Work in 1967 was done under the direction of R. L. Curnow and consisted of two EX diamond-drill holes totalling 135 feet. Two men were employed by the company for a period of one month.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1929, p. 228.]

*Copper-Zinc-Silver*

## ASHCROFT

**ED, A & H, Togo**
By T. M. Waterland

(50° 121° N.E.) This 32-claim property, comprising the ED, A & H, and Togo claims, is owned by J. Ashdown, T. A. Winters, and L. Humphreys. It is on the north side of Highway No. 1 near Anglesey. Work during 1967 was supervised by M. P. Stadnyk, geologist, and consisted of a geochemical survey and bulldozer trenching 700 feet in four trenches. This property was formerly located as the Fairview.

[Reference: *Geol. Surv., Canada,* Mem. 262, p. 107.]

## SPENCES BRIDGE

*Copper*

**Moly**
*Cosmic-Lode Mines Ltd.*
By David Smith

(50° 121° N.E.) Company office, 711, 543 Granville Street, Vancouver 2. The Moly group consists of a total of 30 claims owned by Cosmic-Lode Mines Ltd. and was formerly known as Baby's Own. The property is on Venables Creek, 10 miles from Spences Bridge, and is accessible by road. Two men worked for one month soil-sampling under the direction of F. L. C. Price, consulting engineer. Chalcopyrite is reported to occur in a vein in altered greenstone.

*Molybdenum-Silver*

**MSG, MS**
*Cannoo Mines Ltd.*
By V. A. G. Preto

(50° 121° N.E.) Company address, P.O. Box 1409, Merritt. The company owns 13 recorded claims comprising the MSG and MS groups and located approximately 1 mile east and southeast of Venables Lake. Work in 1967 was done under the direction of R. L. Curnow and consisted of cleaning out an old adit and making a pace and compass survey of the claims. Two men were employed by the company for one month.

## NESIKEP CREEK

*Copper-Molybdenum-Silver-Nickel*

**Mud, Cherry, Rickhill, Sharon**
*Dalex Mines Ltd.*
By T. M. Waterland

(50° 121° S.W. and N.W.) Company address, 506, 602 West Hastings Street, Vancouver 2. The 56-claim group was purchased by the company from John Rickard. Access to the property is by road via Lillooet, south along the west side of the Fraser River for a distance of 20 miles and thence via logging-road for about 6 miles to the property.

Work during 1967 was directed by M. H. Currie and consisted of an induced polarization survey, about 5,000 feet of bulldozer trenching, 3,200 square feet of stripping, drilling and blasting 175 square feet of trenches, construction of about 2 miles of access road, and drilling eight percussion-drill holes totalling 1,165 feet.

[Reference: Assessment Report No. 1098.]

## HIGHLAND VALLEY

In this porphyry copper camp the principal developments during the year included a third expansion of production at the Bethlehem mine, this time to more than 12,000 tons per day, and the start of underground work and sampling at two large deposits on the Lornex and Highmont properties respectively. The locations of the Lornex and Highmont deposits relative to each other are shown on Figure 18, and an index map of most properties in the camp was previously given (Ann. Rept., 1966, Fig. 24). On some of these properties, exploration continued this year.

*Copper-Molybdenum*

**Krain**
*North Pacific Mines Ltd.*
By J. M. Carr

(50° 121° N.E.) Company office, 408, 409 Granville Street, Vancouver 2. R. J. Wiley, president; A. R. Allen, consulting engineer. This company holds by option from its partly owned company, Comet-Krain Mining Corp. Ltd., 32 recorded claims in the Krain and D.W. groups, east of the north peak of Forge Mountain. In 1967 four vertical holes totalling 2,739 feet were diamond drilled in the north part of the area previously explored by drilling on the Krain Copper mineral claim. The new drilling was financed by I. Shulman and associates, and it brought the total surface diamond drilling done in the vicinity of this mineral claim since 1955 to 27,385 feet in 55 holes.

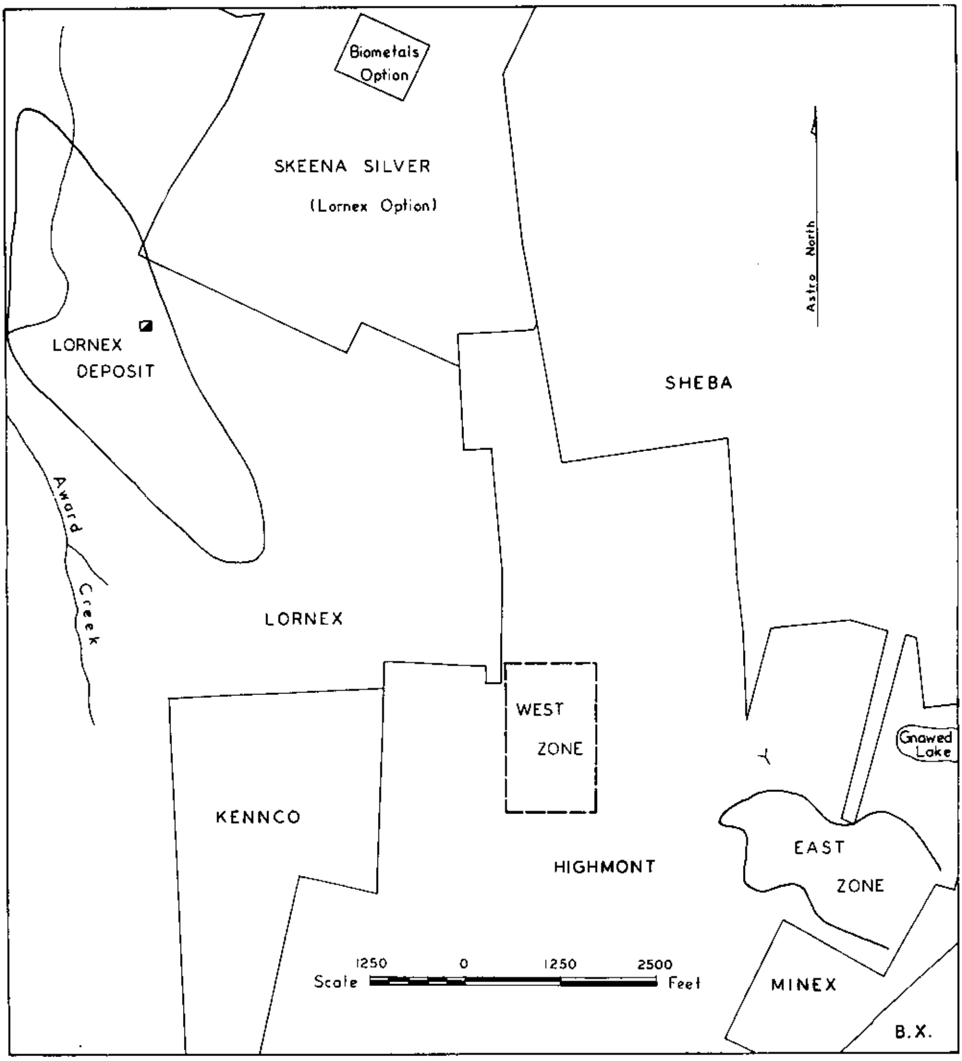



Figure 18. Highland Valley. Index map showing the relative positions of the Lornex, Highmont, and other properties.

On the Krain Copper claim, low-grade copper and molybdenum mineralization is shown by drilling to extend more or less continuously for a northerly distance of 1,300 feet across widths of as much as 500 feet, and to persist in sub-commercial grades to depths in places of as much as 1,200 feet. Estimates by various companies indicate the existence of between 8 and 20 million tons of material to depths of 700 to 900 feet at grades approaching half a per cent copper. The north part of the deposit is more or less oxidized to depths of as much as 260 feet beneath overlying unmineralized Tertiary volcanic and sedimentary rocks of the Kamloops Group, which reach a thickness of 250 feet in the northernmost recent drill-hole. The deposit occurs in the Guichon quartz diorite and in later intrusions composed variously of the Bethlehem quartz diorite and porphyries. The rocks are faulted, fractured, and traversed by seams of quartz, chlorite, and calcite, near which they

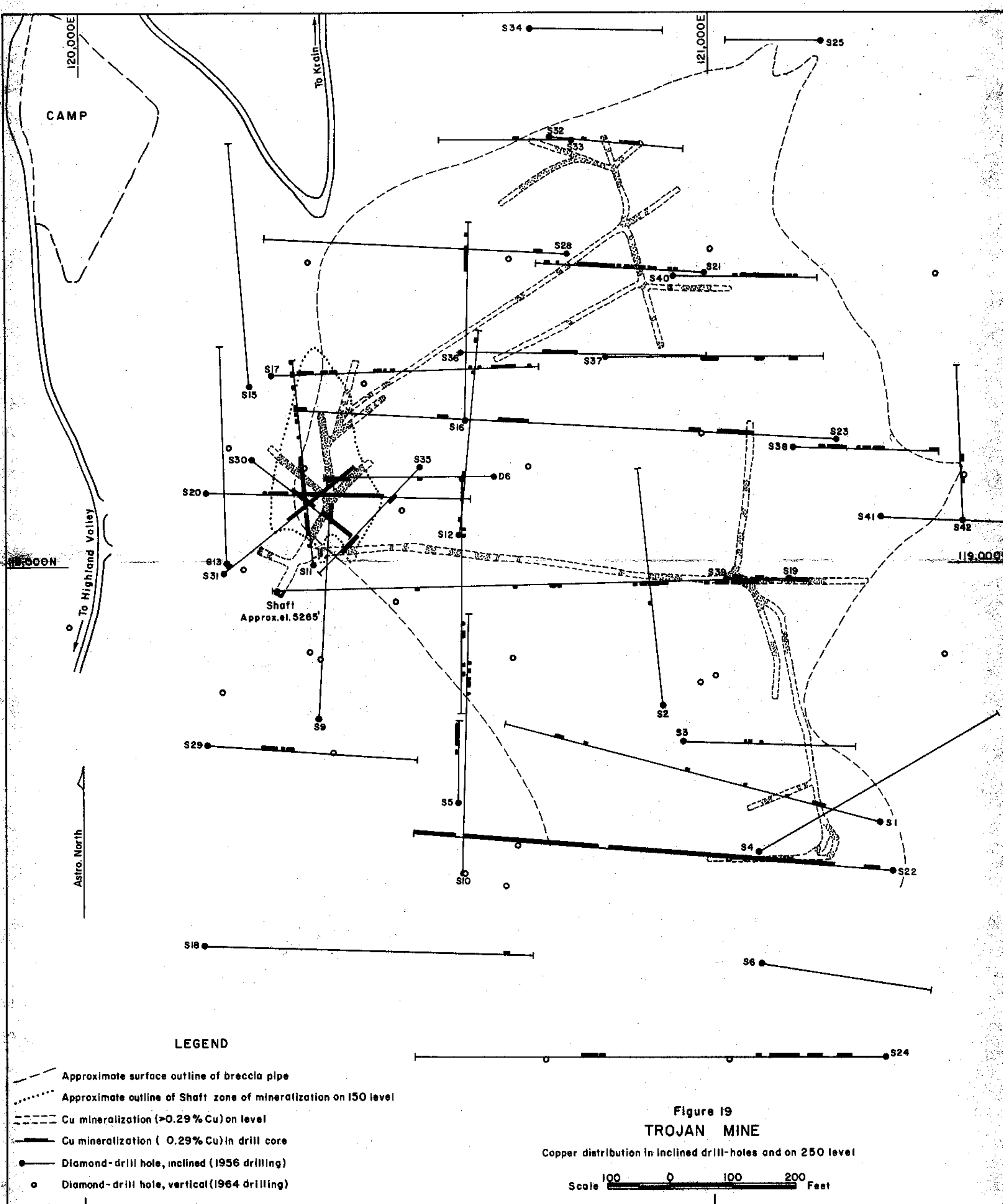



Figure 19
TROJAN MINE
Copper distribution in inclined drill-holes and on 250 level

are variously altered and bleached. Pyrite, chalcopyrite, and locally bornite and molybdenite are mainly in fractures and partly disseminated. Where oxidized, the sulphides give way to chrysocolla, malachite, azurite, cuprite, native copper, and rarely chalcocite.

The four recent holes were all drilled close to the 5,700-foot contour in the vicinity of a small lake in the north of the mineral claim. Three were drilled at 250-foot spacing on a line extending east-southeastward through the south end of the lake, and the fourth hole was drilled 400 feet farther north and is the northernmost hole on the property. The cores were briefly examined, and all showed mineralization, which was best in the two southernmost holes.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 151.]

*Copper*

**Lux, Jean**
*Canzac Mines Ltd.*
By David Smith

(50° 120° N.W.) Company office, 818, 510 West Hastings Street, Vancouver 2. Canzac Mines Ltd. controls 156 recorded claims partly in the Lux group and the adjoining Jean group, which is on ground formerly occupied by the Cindy group. The property is northwest of Bose Mountain and adjoins the Krain property.

Four men worked for six months under the direction of R. Sostad, manager, making a geochemical survey and bulldozing seven trenches totalling approximately 2,000 feet.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 151.]

*Copper-Molybdenum*

**Trojan**
*South Seas Mining Limited*
By J. M. Carr

(50° 120° N.W.) Company office, 390 West Hastings Street, Vancouver 2. Benjamin H. Swig, president; A. G. Pentland, manager. This company controls about 60 claims, including 24 which are Crown granted, to the north and east of the south peak of Forge Mountain.

Work in 1967 was in the area of the Trojan breccia pipe, and it included 2,585 feet of drifting and crosscutting on the existing 150-foot level of the Trojan mine. Shovel and grab samples were taken from each car of muck. Surface trenches were cleaned out, mainly in the north part of the area underlain by breccia. A crew of 15 was employed for five months mostly under contract and supervised by H. Johnson. Late in the year the workings were further sampled and examined, and a crew of five was employed under the supervision of J. W. Scott.

The new underground work, which began late in 1966, includes the addition of north and south drifts to the existing east crosscut and also includes a long northeast crosscut and other connected drifts and crosscuts in the north part of the breccia body, as outlined by previous drilling (*see* Fig. 19). When the property was visited briefly in August, the east crosscut and its connected workings were inaccessible, as were some of the workings farther north. The extent of mineralization on this level is shown according to company information, and agrees with what was seen during the visit. Chalcopyrite, locally accompanied by visible malachite and possibly other secondary copper minerals, occurs in the new northern workings chiefly as coarse blebs interstitially in the breccia. Several faults with northeasterly strikes and moderately steep westerly dips occur in the northeast crosscut and also, farther north, in the better-mineralized sections. Correlation of mineralized sections underground and in drill core appears difficult, but shoots may exist which possess north to northeast strikes and westerly dips. Trenches on surface are about 200 feet higher than the northernmost underground workings and lie somewhat east of them. They expose breccia that generally contains copper mineralization which is partly oxidized and ranges from weak to locally strong. Faults in the trenches have uncertain attitudes but may strike mostly north-northeast. Other trenches farther north expose quartz diorite with hematitic faults and little visible copper mineralization.

Collar elevations and dips of the inclined diamond-drill holes shown on Figure 17 are as follows:—

| Hole No. | Elevation[1] | Dip |
|---|---|---|
| 1 | 9,960 | —45° 00′ |
| 2 | 9,970 | —45° 22′ |
| 3 | 9,970 | —45° 31′ |
| 4 | 10,040 | —44° 46′ |
| 5 | 10,020 | —60° 24′ |
| 6 | 10,020 | —58° 58′ |
| 9 | 10,010 | —58° 56′ |
| 10 | 10,010 | —54° 51′ |
| 11 | 9,970 | —58° 45′ |
| 12 | 10,050 | —59° 11′ |
| 13 | 10,000 | —57° 45′ |
| 14 | 10,060 | —59° 30′ |
| 15 | 10,020 | —57° 23′ |
| 16 | 10,070 | —59° 49′ |
| 17 | 10,030 | —61° 04′ |
| 18 | 9,960 | —58° 45′ |
| 19 | 10,070 | —44° 30′ |
| 20 | 9,980 | —58° 29′ |
| 21 | 10,110 | —60° 33′ |
| 22 | 9,970 | —44° 15′ |
| 23 | 10,090 | —44° 57′ |
| 24 | 9,940 | —45° 07′ |
| 25 | 10,100 | —45° 00′ |
| 28 | 10,110 | —44° 30′ |
| 29 | 9,980 | —56° 30′ |
| 30 | 9,970 | —45° 07′ |
| 31 | 10,000 | —43° 49′ |
| 32 | 10,110 | —42° 45′ |
| 33 | 10,120 | —44° 40′ |
| 34 | 10,120 | —44° 00′ |
| 35 | 10,050 | —54° 30′ |
| 36 | 10,070 | —39° 30′ |
| 37 | 10,100 | —50° 40′ |
| 38 | 10,090 | —39° 00′ |
| 39 | 10,060 | —59° 45′ |
| 40 | 10,110 | —39° 40′ |
| 41 | 10,080 | —39° 40′ |
| 42 | 10,070 | —43° 40′ |

[1] Given to nearest 10 feet, relative to an assumed elevation of " 10,000 feet " at shaft collar.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 152.]

*Copper-Molybdenum*

**Bethlehem Mine**
*Bethlehem Copper Corporation Ltd.*
By David Smith

(50° 120° S.W.) Company office, 1821, 355 Burrard Street, Vancouver 1; mine office, P.O. Box 520, Ashcroft. P. M. Reynolds, president; T. P. Liss, general manager; D. S. Stevens, manager, engineering; C. W. Overton, manager, mill production; H. G. Ewanchuk, manager, mine production. The company holds 56 Crown-granted and 146 recorded claims and fractions immediately east of Quiltanton (Divide) Lake. The Bethlehem mine is reached by about 30 miles of paved road from Ashcroft. There is a dirt-surface airstrip 2,400 feet long, 6 miles from the mine office.

Mining has been carried out under contract, but on November 1, 1967, Bethlehem Copper Corporation Ltd. commenced mining in the Jersey pit with its own personnel and equipment on a continuous three-shift basis. Production from the Jersey pit was 5,721,872 tons of waste and 3,074,357 tons of ore. In addition, 1,047,427 tons of stockpiled ore was moved to the crusher. Prior to the change-over, mining was carried out in the Iona pit by the company. Production from the Iona was 4,121,784 tons of ore and 6,557,720 tons of waste.

Equipment placed in service in 1967 included 12 Haulpak 50-ton trucks, one 45-R rotary drill, a 900-cubic-foot-per-minute compressor, three 88-B diesel-electric shovels, a 777 motor-grader, one Airtrac drill, two Caterpillar tractors (D-8H and D-4), a 988 Caterpillar loader, one Komatsu A-7 tractor, one T-800 dump truck, and several ½-ton service pick-ups.

In 1967 the mill capacity was increased from 10,000 to 12,000 tons per day.

The construction of a research laboratory, assay offices, and a warehouse has been completed, and remodelling of the mine and engineering offices was completed in 1967.

Copper produced in 1967 totalled 40,123,750 pounds. There was no molybdenite production in 1967. Concentrates are hauled by truck to Vancouver Wharves in North Vancouver for shipment to Japan.

Fresh water is obtained from a series of deep wells on Shula Flats, which are capable of supplying 2,000 gallons per minute. In 1967 further work was done on the rock-fill dam to increase the storage capacity.

In 1967 further exploration work was done on the Iona and White zones and on the Pay claims. This comprised soil-sampling on the Pay claims, an induced polarization survey of an area just south of the Iona and White zones, and 30 diamond-drill holes totalling 19,051 feet.

In 1967 the number of persons employed was 279. No housing is provided at the property; the employees commute from Ashcroft.

[Reference: Assessment Report No. 1112 (Pay).]

*Copper*

**TAM, KAM, JAC, RAF, Etc.**
*Utah Construction & Mining Co.*
By V. A. G. Preto

(50° 121° N.E. and S.E.) Company office, 718, 510 West Hastings Street, Vancouver 2. M. J. Young, senior geologist. The company has 118 claims under option from Cleveland Mining & Smelting Co. Ltd. The claims comprise the KAM, TAM, JAC, RAF, MER, CM, and CLEV groups, and are located immediately to the west of Quiltanton Lake. Work in 1967 was done under the direction of M. J. Young and included seven bulldozer trenches totalling 900 feet in length and two AX diamond-drill holes totalling 1,000 feet. Induced polarization and electromagnetic surveys and geological mapping of the TAM claims

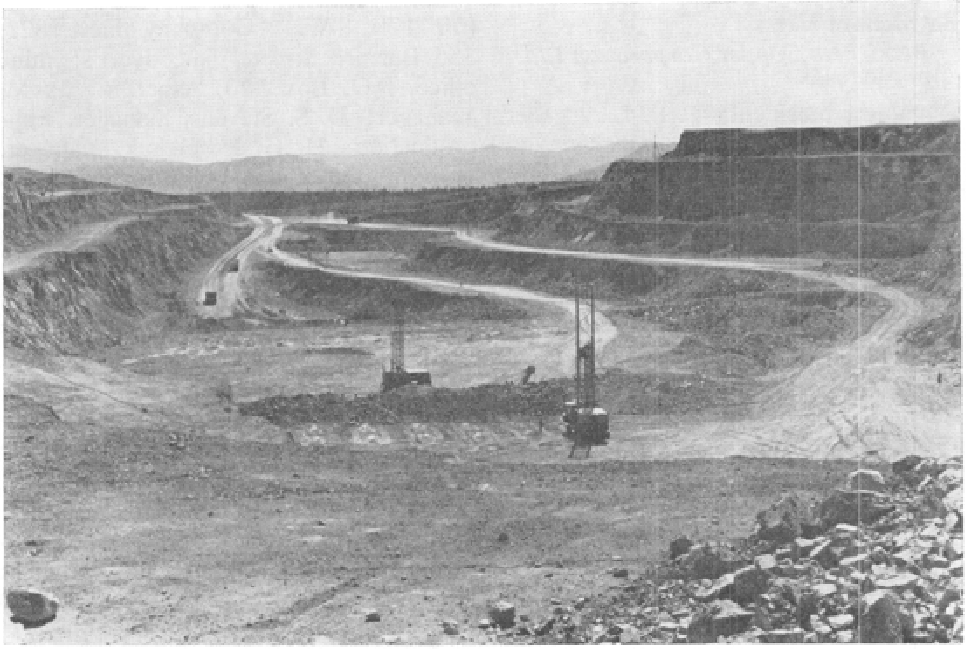


Plate IIIA. Endako Mines Ltd. View of open pit looking east toward Nithi Mountain.

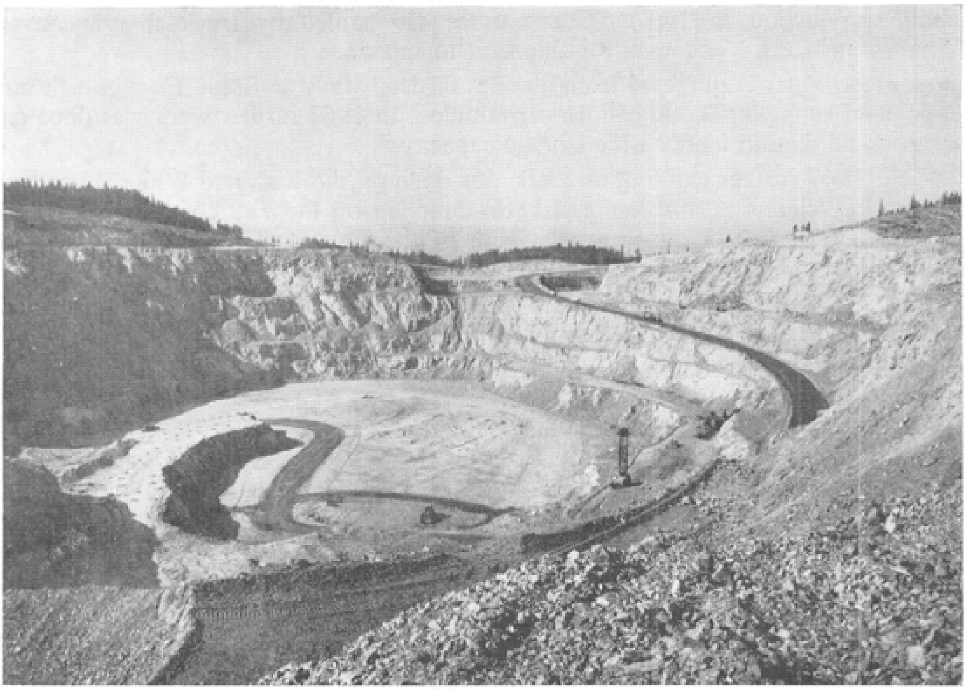


Plate IIIB. Bethlehem Copper Corporation Ltd. View of Jersey open pit in September, 1967.

at a scale of 1 inch equals 200 feet were also done. Six men were employed by the company for a period of two months.

[Reference: Assessment Report No. 1019.]

*Copper*

**Nim**
*New Indian Mines Ltd.*
By V. A. G. Preto

(50° 121° N.E.) Company office, 661 Hornby Street, Vancouver 1. T. E. Blossom, president; F. J. Hemsworth, consulting engineer. The company owns 20 recorded mineral claims comprising the NIM group and are located to the south of Pukaist Creek, 2 miles east of Jim Black Lake. Work done in 1967 was supervised by F. J. Hemsworth and consisted of a compass and chain survey and a geochemical survey of the entire claim block. Four men were employed by the company for a period of two months.

*Copper*

**A.L., I.C.**
*Arlington Silver Mines Ltd.*
By J. M. Carr

(50° 121° S.E.) Company office, 1110, One Bentall Centre, 505 Burrard Street, Vancouver 1. B. I. Nesbitt, president; H. A. Quinn, consulting geologist. This company controls 40 recorded claims named A.L. and I.C., which adjoin the O.K. road about 1 mile west of Quiltanton (Divide) Lake. Work in 1967 consisted of an induced polarization survey by McPhar Geophysics Limited, under contract.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 154; Assessment Report No. 1155.]

*Copper-Molybdenum*

**Ezz, O.K.**
*Alwin Mining Company Ltd.*
By J. M. Carr

(50° 121° S.E.) Company office, 1111, 409 Granville Street, Vancouver 1. H. E. Jacques, president; A. P. Fawley, consulting engineer. This company owns 24 recorded claims in the Ezz and O.K. groups surrounding a group of three Crown-granted mineral claims named I.O.U., O.K., and Apex, which it also controls. The property lies 3 miles west of Quiltanton (Divide) Lake and is reached by the O.K. road. In World War I high-grade ore containing bornite was shipped from the O.K. (Chataway) mine in the amount of 2,064 tons yielding: Silver, 869 ounces; copper, 529,748 pounds. Some 10,000 tons of material containing approximately 3.6 per cent copper is reported to have been treated at the O.K. mill, producing 1,487.8 tons of concentrate (wet) with an average assay of 20.33 per cent copper and 1.19 ounces silver (Ann. Rept., 1922, pp. 140–141).

Work in 1967 was supervised by J. Foster Irwin Engineering & Management Services Ltd. and included induced polarization and geochemical surveys and 6,720 feet of surface diamond drilling. Six men worked for a period of nine months. According to company reports, the drilling was done immediately east of the old O.K. workings and resulted in the discovery of good-grade copper mineralization accompanied by molybdenite more or less on an easterly strike with the former O.K. lode.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1915, pp. 278–280; 1922, pp. 140–141; 1966, pp. 154–155; Assessment Report No. 1028.]

*Copper-Molybdenum*

**Dave, Lodge, Outrider, Bethsaida, BL**
*Valley Copper Mines Limited*
By J. M. Carr

(50° 120° W. and 50° 121° E.) Exploration office, 1150 Bay Avenue, Trail. This company, which is under the management of Cominco Ltd., holds about 345 mineral claims in the Highland Valley area. Work in 1967 was by a small crew under F. L. Wynne. It consisted of 638 feet of diamond drilling in three holes on the Huestis property, which includes the Dave and Lodge groups of recorded mineral claims, 4,500 feet of percussion drilling in 18 holes on the Bethsaida property, which includes several Crown-granted mineral claims east of the old O.K. mine, and induced polarization surveying on the Bethsaida property and the Outrider group, which belongs to Northwest Ventures Ltd.

The core from some of the holes diamond drilled in the last two years was briefly examined. Hole No. 4 on the Huestis property is inclined westward on or near the Lodge No. 56 claim at the junction of the Trojan and Transvaal (Novak) roads, close to the west boundary of the Trojan property. Its length is 290 feet, and from 100 to 166 feet it intersects a major fault which separates porphyry on the east from the Guichon quartz diorite on the west. The altered quartz diorite contains a 6-inch quartz vein rich in chalcopyrite. Hole No. 5 on the Huestis property is inclined westward on or near the Dave No. 4 claim approximately 2,200 feet east-northeasterly from Bose Lake, in the same general area as two widely spaced holes previously drilled by the company (*see* Ann. Rept., 1965, pp. 147–148). It intersected the Guichon quartz diorite, some porphyry, but no significant mineralization. Hole No. 66-7 on the Bethsaida property was drilled northward from a point approximately 700 feet southeast of the former Tamarac adit, which is now largely cleared away by stripping. The length of the hole exceeds 300 feet, and it showed considerable amounts of mineralization, including veins of quartz and sericite variously accompanied by bornite, chalcopyrite, and molybdenite or pyrite.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1964, p. 85; 1965, pp. 147–148; 1966, p. 155; Assessment Report No. 1014.]

*Copper*

**Nip**
*Belcarra Explorations Ltd.*
By V. A. G. Preto

(50° 120° S.E.) Company address, 248 Second Avenue, Kamloops. M. G. Mooney, president. The company owns eight recorded claims comprising the Nip group and located in a straight line between 2 and 4 miles west of Calling Lake. Work done in 1967 consisted of three bulldozer trenches totalling 500 feet in length.

*Copper*

**Lorna**
*Zenith Mining Corporation Ltd.*
By K. E. Northcote

(50° 121° S.E.) Company office, 404, 602 West Hastings Street, Vancouver 2. The Lorna group of 100 claims is 1½ miles northwest of Pimainus Lake at elevations 5,100 to 5,500 feet and is accessible by 12 miles of mining-road from Highland Valley.

A crew, ranging from 4 to 13 men, spent six months, supervised by M. P. Stadnyk, making geological, geochemical, and magnetometer surveys, bulldozing seven trenches totalling 1,200 feet, and percussion drilling six holes totalling 1,310 feet.

[Reference: Assessment Report No. 1137.]

*Copper-Molybdenum*

**Lornex**
*Lornex Mining Corporation Ltd.*
By J. M. Carr

(50° 121° S.E.) Company office, 202, 580 Granville Street, Vancouver 2; mine office, P.O. Box 430, Ashcroft. E. H. Lorntzsen, chairman; R. D. Armstrong, president; G. M. Godfrey, programme manager; T. R. Sullivan, site superintendent; H. W. Marsh, resident geologist. This company, which is controlled by Rio Algom Mines Limited and Yukon Consolidated Gold Corporation Ltd., holds 204 recorded mineral claims, including 14 claims optioned from Consolidated Skeena Mines Ltd., south of Indian Reserve No. 13 in Highland Valley. In 1967 surface pattern drilling was completed on east-west lines 400 feet apart and bulk sampling partly completed of a very large low-grade deposit of copper and molybdenum occurring 4 miles southwest of the Bethlehem mine on the Award, Skeena Copper, and A.M. claim groups and the Lornex No. 1 fractional claim. A 550-foot vertical shaft was sunk and crosscuts extended to east and west. A trial open pit was dug that measures 200 by 500 feet horizontally and is 70 feet deep. Construction included a headframe, hoisthouse, pilot mill of 100 tons rated capacity, and warehouse. Other work included induced polarization surveying, 26,347 feet of diamond drilling from surface and 506 feet from underground, 550 feet of shaft-sinking, 624 feet of crosscutting, and removal of about 46,800 tons of material from the open pit. Surface diamond drilling done on the property since discovery of the Lornex deposit in 1964 amounts to 82,974 feet in 82 holes. The operation employed 99 persons in 1967, including 75 on contract.

The following notes on the geology of the deposit are based on a week-long examination made of drill core in early August, and they supplement a previous description (Ann. Rept., 1966, pp. 155–157, and Fig. 25). The deposit, whose generalized outline is shown on Figure 13, extends southeastward in an approximate line with deposits on the adjoining Highmont property. Its west limit is a steeply west-dipping northerly fault that separates the Bethsaida granodiorite stock on the west from the earlier Bethlehem (Skeena) quartz diorite, in which the deposit occurs.

The Bethlehem quartz diorite contains dykes or lenses, suggested by drilling to possess dips at moderate angles to the northeast or east and widths of as much as 100 feet, of rather fine-grained porphyritic rock named the Lornex granodiorite. Like granite on the Bethlehem property, this rock grades rapidly into the enclosing quartz diorite, is accompanied by swarms of aplite dykes, and is probably a differentiated late phase of the quartz diorite.

The Bethsaida granodiorite grades to porphyry within a few tens of feet of its contact with quartz diorite south of the deposit, in drill-holes east of Award Creek. This Bethsaida porphyry, which is absent farther north at the fault, is fine grained and has numerous large quartz eyes and biotite partly as small thick books. It contains pink orthoclase in the groundmass and rare larger crystals. Bodies of this or a similar porphyry extend roughly along the southwest limit of the deposit, and one is exposed in trenches at the former Discovery zone (*see* Ann. Rept., 1966, Fig. 25) and may persist farther south toward the contact of the stock, which trends southeastward, as indicated on the 1966 map.

Breccia which may have been the result of explosion is developed locally at the east side of the Discovery zone porphyry, and it consists of abundant porphyry fragments set in a speckled grey-white matrix. Cutting the porphyry near an intersection of breccia are narrow dykes of later felsite porphyry, which is grey-white in colour and contains feldspar phenocrysts and rare small quartz eyes. Farther northwest on line No. 11N, a larger body of felsite porphyry is intersected between faulted Bethsaida granodiorite on the west and brecciated Bethsaida porphyry on the east. Since it contains pyrite, the felsite porphyry is probably pre-mineral.

The present lack of surface exposures prevents knowledge of the fault pattern. Faults are numerous and difficult to correlate in drill core, and they mostly preceded mineralization and in some cases underwent a post-mineral movement. On the limiting western fault this movement may be considerable, since there is only a little pyrite and no visible copper and molybdenum mineralization in the adjoining Bethsaida granodiorite. Centrally in the deposit, pyrite only locally accompanies bornite, chalcopyrite, and molybdenite, whereas marginally the deposit generally contains pyrite, which therefore appears to form a halo. Sulphide abundance is more or less closely related to the occurrence of faults and attendant fractures, near which alteration has produced mainly quartz, sericite, and chlorite.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 155–157.]

*Copper-Molybdenum*

**Sheba**
*Sheba Copper Mines Limited*
By J. M. Carr

(50° 120° S.W.) Company office, 501, 535 Thurlow Street, Vancouver 5. R. C. Spall, president; D. D. Campbell, consulting geologist. This company, in which Peel Resources Limited holds a major interest, owns 105 recorded claims mainly in the Jay, Ann, CU, and Sheba groups adjoining the Lornex and Highmont properties to the west and south respectively. By agreement in April, work on the property is managed and financed by Sumitomo Metal Mining Co. of Canada Ltd. (Vancouver office, 1126, 510 West Hastings Street) in consideration of treasury shares.

Work in 1967 was supervised by G. R. Hilchey and included line-cutting, road construction, geological mapping, soil-sampling, induced polarization surveying, trenching, 4,000 feet of percussion drilling in 16 holes, and 6,600 feet of diamond drilling in 15 holes. Partly it was done on or near the Jay No. 19 mineral claim, which is about 1½ miles north-northeast of Gnawed Lake and where in August the writer was shown examples of weak widespread bornite mineralization partly on fractures in the Bethlehem quartz diorite to the west of a contact with an older quartz diorite probably of the Chataway type. Work near Gnawed Lake is reported to have discovered copper and molybdenum mineralization.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1964, p. 89; 1965, p. 148; Assessment Report No. 1087.]

*Copper*

**B.J., Chief**
*Highland Chief Mines Ltd.*
By David Smith

(50° 121° S.E.) Company office, 556 Howe Street, Vancouver 1. The B.J. 1 to 40, Chief 1 to 20, and other claims totalling 251 are in the Highland Valley camp, 6 miles by jeep from the Lornex camp. During 1967, 10 surface trenches totalling 500 lineal feet were bulldozed.

*Copper-Molybdenum*

**AM, IDE, Etc.**
*Highmont Mining Corp. Ltd.*
By J. M. Carr

(50° 121° S.E.) Company office, 702, 850 West Hastings Street, Vancouver 1. This company is controlled by Torwest Resources (1962) Ltd. (R. W. Falkins, president; H. H. Waller, resident mine manager; W. G. Hainsworth, consulting geologist), and owns 34 recorded claims named AM, IDE, Ann, and Phyllis on the west slopes of Gnawed Mountain adjoining the Lornex property (*see* Fig. 18). Since 1966 work on this property has been paid for by Nippon Mining Company, Limited, in exchange for treasury shares.

Access to the property is from Highland Valley by a road 5 miles long through the Lornex property. From September, 1966, to the following April an extensive programme of surface exploration included the following: 61,116 feet of percussion drilling in 262 holes, 8,278 feet of diamond drilling in 16 holes, and 8,160 feet of trenching. As a result, two principal mineral deposits were more or less outlined to depths of 250 feet and were locally explored to greater depths. Starting in August from a portal whose approximate location is shown on Figure 18, an adit was driven to the East zone and at year-end was 914 feet long. A crusher and bulk sampling plant of 200 tons daily capacity was installed, and all material from underground was sampled. A crew of as many as 30 men, including those on contract, was employed.

The East zone is in outcrop at elevations between 5,500 and 5,700 feet and lies in the Bethlehem (Skeena) quartz diorite immediately north of a Bethsaida porphyry and porphyritic granodiorite body which trends east-southeastward. When visited in August, trenches were partly caved and only a few exposures were examined. The quartz diorite is fractured in several directions, of which the northeast, north-northeast, and north-northwest ones are most evident. One or more faults, striking apparently northeastward, separate rock with different apparent intensities of fracturing. Rock alteration and mineralization are best developed in heavily fractured rock; chalcopyrite, locally oxidized to carbonates, is distributed mostly on quartz-bearing fractures and is partly accompanied by molybdenite. Tourmaline, orthoclase, chlorite, epidote, sericite, and argillic alteration were all noted, although partly the quartz diorite is unaltered.

Diamond-drill core from the East zone was seen in 1962 and later, and it showed bornite occurring with chalcopyrite, mostly in slender quartz veins but partly as disseminations in altered quartz diorite. Molybdenite occurred partly as coarse nests in quartz and partly as smeared platings on fractures. Pyrite accompanied the chalcopyrite and molybdenite in a hole located at the north margin of the deposit.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1962, pp. 49–50; 1966, pp. 158–159.]

*Copper-Molybdenum*

**Jericho, Bob, Gem, Etc.**
*Canadian Superior Exploration Limited*
By David Smith

(50° 120° S.W.) Company office, 7 King Street East, Toronto 1, Ont. Jericho Mines Ltd. (H. B. Hatch, president) holds 167 claims comprising the Jericho, Bob, Gem, Stibbard, and Mark groups, which are south of Witches Brook, about 7 miles east of Quiltanton (Divide) Lake. In 1967 the property was under option to Canadian Superior Exploration Limited. Three men, under the supervision of D. J. Whalen, percussion drilled 13 holes totalling 1,815 feet.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 159; Assessment Report No. 922.]

*Copper*

**Chataway**
*Chataway Exploration Co. Ltd.*
By J. M. Carr

(50° 120° S.W.) Company office, 301, 550 Burrard Street, Vancouver 1. S. W. Wright, managing director. This company owns 404 recorded claims in the southeastern part of the Highland Valley camp, extending nearly from Roscoe Lake southeastward to the Mamit Lake road north of Broom Creek. Until May, 148 of the claims in the southern part of the property were under option to Bralorne Pioneer Mines Limited (company office, 320, 355 Burrard Street, Vancouver 1), which in 1967 did 615 feet of rotary drilling in five holes and made seven trenches totalling 1,200 feet in length. Work by the company on its own in 1967 was mainly in the northwestern part of the property and included an induced polarization survey by Seigel Associates, Limited, soil-sampling on parts of the Sky and Jay claim groups, and 1,834 feet of diamond drilling in eight holes, of which two failed to reach bedrock.

The core of three holes drilled close together near the southeast corner of the Sky No. 7 mineral claim was examined in September. The area is lacking in outcrop and lies about 1 mile west of Chataway Lake and less than one-half mile north-northeast of showings on the Jay group (*see* Ann. Rept., 1963, p. 49). Hole No. 1 was drilled westward and intersected about 1 foot of siliceous sericitic breccia mineralized heavily with chalcocite, minor amounts of which persist for several feet higher in the hole. Other sericitic shear zones were encountered, but they contain neither quartz nor mineralization. Holes Nos. 3 and 2 were drilled from the same set-up and 350 feet farther west, respectively, and failed to intersect mineralization. The prevalent rock in the drill core is Chataway quartz diorite, one of the older phases of the Guichon batholith.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1963, pp. 48–49; 1966, pp. 164–165.]

*Copper*

**Sahara, Lee, File**
*Highpoint Mines Limited*
By V. A. G. Preto

(50° 120° S.W.) Company address, 1500, 355 Burrard Street, Vancouver 1. B. H. Gunning, president; H. C. Gunning, consulting engineer. The company owns 39 recorded mineral claims comprising the Sahara, Lee, and File groups and located on the south side of upper Skuhun Creek, immediately to the west and southwest of Farr Lake. In 1967 H. C. Gunning mapped the surface workings and an area of 1 square mile at a scale of 1 inch equals 300 feet. One man was employed by the company for one week.

*Copper*

**A-300**
*Rocket Mines Ltd.*
By David Smith

(50° 121° S.E.) Company office, 508, 789 West Pender Street, Vancouver 1. The A-300 property consists of a total of 24 claims on Skuhun Creek, to which access is by road from Spences Bridge, a distance of 15 miles. A preliminary geochemical survey, supervised by Franklin Price, was made during 1967.

[Reference: Assessment Report No. 1088.]

## NICOLA MINING DIVISION

### HIGHLAND VALLEY

**Jericho, Bob, Gem, Etc.**
*Canadian Superior Exploration Limited*

(50° 120° S.W.) *See under* Kamloops Mining Division, page 159.

**Chataway**
*Chataway Exploration Co. Ltd.*

(50° 120° S.W.) *See under* Kamloops Mining Division, page 159.

*Lead-Zinc*

## MAMIT LAKE

**Mad Arab**
*Cambridge Mines, Limited*
By N. D. McKechnie

(50° 120° S.W.) Head office, 602, 626 West Pender Street, Vancouver 2. S. F. Kelly, consultant. The company holds by record the Mad Arab 1 to 10 mineral claims situated on the northward and southward sides of Rey Creek, a westward-flowing tributary which enters Guichon Creek about three-quarters of a mile south of Mamit Lake. Access is by dirt road following the southward side of Rey Creek about 3½ miles east from the Mamit Lake road.

The claim group is underlain by Nicola volcanic rocks.

The showings are in a 9-foot adit at creek-level, 90 feet lower than the road, on the Mad Arab No. 2 mineral claim. The creek here is in a canyon trending north 50 degrees west; the adit is on the northeast side. In the adit there is an 8-inch-wide fault striking north 65 degrees east and dipping 45 degrees southeastward. A 2-inch vein striking north 40 degrees east and dipping 50 degrees southeastward is exposed in the footwall of the fault. The vein is banded, with quartz on the walls and up to one-half inch of pale-buff carbonate in the middle. The quartz carries pyrite, galena, and sphalerite; the carbonate carries very sparse pyrite. The wallrock throughout the adit is a grey fine-grained somewhat siliceous volcanic, possibly a tuff.

At 20 feet southeast of the adit portal and also at creek-level, a quartz vein 1 inch wide, striking north astronomic and dipping 40 degrees east, is exposed in andesitic lava. The quartz carries coarse pyrite, a little galena, and sphalerite.

A sample taken by Mr. Kelly of the vein in the adit assayed: Copper, 0.38 per cent; zinc, 1.0 per cent; molybdenum, 0.01 per cent; silver, 1.3 ounces per ton; gold, 0.04 ounce per ton.

*Copper*

**MLM, GCM**
*Mamit Lake Mining Ltd.*
By David Smith

(50° 120° S.W.) Company office, 61, 1091 Broughton Street, Vancouver 5. The company, formerly known as Gump Creek Mining Ltd., owns the MLM and GCM groups totalling 150 claims. These groups are west of Mamit Lake and east of Gump Lake respectively and are accessible by road from Merritt, a distance of 30 miles.

Work during 1967 consisted of geophysical and geochemical surveys, 2,000 lineal feet of bulldozer trenching, and 3,400 feet of percussion drilling in 17 holes. A crew of seven men was employed over a period of six months under the supervision of G. Saarse.

[References: Assessment Reports Nos. 873 and 1027.]

*Copper-Molybdenum*

**Aug, Cal**
*Cannoo Mines Ltd.*
By K. E. Northcote

(50° 120° S.W.) Company address, P.O. Box 1409, Merritt. A. D. Tidsbury, consultant. The Aug and Cal groups, owned by Cannoo Mines Ltd., consist of 41 claims, which are located 2 miles northwest of Mamit Lake at 4,000 feet elevation and are accessible from a British Columbia Hydro and Power Authority power-line access road.

Seven men, supervised by R. L. Curnow and A. D. Tidsbury, carried out geological mapping, ran magnetometer and geochemical surveys, bulldozed 15 trenches totalling 7,000 feet, and stripped 3 acres. One mile of access road was built.

*Copper*

**C, B** (50° 120° S.W.) Company office, 404, 550 Burrard Street, Vancouver 1. The C and B groups, totalling about 100 claims, are a few miles northeast of Mamit Lake and are accessible by the Mamit Lake road from Merritt, a distance of 15 miles. A total of 1,460 feet of surface diamond drilling in 22 holes was done in 1967.

*Tenax Mines Ltd.*
By David Smith

## GUICHON CREEK

*Copper*

**Elkroc, Tap, Flag** (50° 120° S.W.) Company address, P.O. Box 1269, Merritt. O. Gillespie, president. The company owns 49 recorded claims comprising the Elkroc, Tap, and Flag groups and located on the west side of Guichon Creek between Steffens Creek and Tyner Creek.

*Carolin Mines Ltd.*
By V. A. G. Preto

Work in 1967 was done under the direction of O. Gillespie and included three bulldozer trenches totalling 500 feet in length, two EX diamond-drill holes totalling 100 feet, and construction of 1 mile of access road. A chain and compass survey of the claims was also made, and magnetometer and geochemical surveys at a scale of 1 inch equals 400 feet were carried out on the Elkroc 1, 3, and 6 and on the Flag 17, 18, and 19 claims. A total of four men was employed by company and contractors for a period of two months.

## SWAKUM MOUNTAIN

*Zinc-Lead-Copper*

**Sunshine, Lo, Lee** (50° 120° S.W.) Company office, 1330, 510 West Hastings Street, Vancouver 1. A. D. Gavelin, president; J. P. Elwell, consultant. The company holds by record 140 claims on the westerly slope of Swakum Mountain, at the headwaters of Steffens and Tolman Creeks between 4,000 and 5,500 feet elevation. Access is through the Lazy L Ranch by a dirt road which leaves the Mamit Lake road about 7½ miles north of its junction with the Merritt–Spences Bridge highway.

*Vastlode Mining Company Limited*
By N. D. McKechnie

In 1967 work was begun, by San Doh Mines Ltd. under agreement, on a new discovery of mineralization on the Sunshine No. 1 mineral claim near its boundary with the Lo No. 15 mineral claim. The place is approximately 2,000 feet on a bearing of north 60 degrees east from Tolman Lake, at an elevation of about 4,800 feet.

The new discovery consists of a mineralized shear up to 25 feet wide in Nicola volcanic rocks. The shear strikes north 50 degrees east and dips 35 degrees to 60 degrees northwestward. The footwall and hangingwall are andesite porphyry. There is some recognizable tuff and fine-grained breccia on the walls of the shear and within it; probably the presence of a comparatively thin horizon of these rocks localized the movement. The shear is mineralized by calcite and quartz and by pyrite, sphalerite, galena, and chalcopyrite. The shear is intruded by a grey aphanitic micropegmatite which is exposed in widths up to 8 feet; it is massive, weakly mineralized, shows sharp contacts against the calcite-quartz-sulphide bodies, and probably is later than most of the mineralization. The calcite-quartz-sulphide occurs as discrete bodies within the shear and ranges in widths from a few inches to the full width of the structure. Shear and mineralization are offset, apparently only a few feet, by faults striking north 20 to 30 degrees east and dipping 75 to 85 degrees northwestward. An apparently contemporary set strikes north 50 degrees east and dips 65 degrees northwestward, nearly parallel to the shear. That crosscutting faults may offset the mineralized structure as much as 100 feet southwestward horizontally is suggested by projections from four diamond-drill hole intersections near the northeast end of the tested area.

At the time of the writer's visit in August, some 150 feet of the structure was well exposed at the southwest end of the trenching, and this, supplemented by seven diamond-drill holes, indicated a strike length of 500 feet, open at both ends.

The character of the material is indicated by the following assays of drill core samples:—

Hole No. 2—95 to 101 feet: Copper, 1.00 per cent; zinc, 21.30 per cent; lead, 13.47 per cent; silver, 2.00 ounces per ton.

Hole No. 3—104 to 112 feet: Copper, 0.42 per cent; zinc, 11.25 per cent; lead, 2.25 per cent; silver, 0.25 ounce per ton.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 150; 1966, p. 165.]

*Copper*

**AC**
*Valnicla Copper Mine Ltd.*
By Stuart S. Holland

(50° 120° S.W.) Company office, 404, 510 West Hastings Street, Vancouver 2. The AC group of 36 claims is at the head of Kirby Creek, on the southeast side of Swakum Mountain, 8 miles by logging-road from Merritt.

The showings are reported to consist of sulphide mineralization as disseminations and replacements in altered zones in volcanic and sedimentary rocks of the Nicola Group.

In 1967 the company diamond drilled three holes totalling 200 feet.

*Copper-Gold*

**CA**
*Valnicla Copper Mine Ltd.*
By V. A. G. Preto

(50° 120° S.W.) Company address, P.O. Box 1269, Merritt. A. D. Tidsbury, consultant. The company owns six recorded claims comprising the CA group and located at the headwaters of Clapperton Creek, 1½ miles east-southeast of Swakum Mountain. The workings were formerly known as the Peacock group.

Work in 1967 was done under the direction of O. Gillespie and included three bulldozer trenches totalling 500 feet in length, five EX diamond-drill holes totalling 300 feet, and one-half mile of road construction. A tape and compass survey of the claims was also made and a geological map of claims CA 5 and 6 at a scale of 1 inch equals 50 feet was prepared by A. D. Tidsbury. Three men were employed by the company for a period of four months.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1907, p. 138.]

## MERRITT

*Copper*

**Craigmont Mine**
*Craigmont Mines Limited*
By David Smith

(50° 120° S.W.) Company office, 700, 1030 West Georgia Street, Vancouver 5; mine address, P.O. Box 3000, Merritt. J. D. Simpson, president; R. E. Hallbauer, mine manager; A. J. Petrina, mine superintendent; R. J. Hanna, mill superintendent. Craigmont Mines Limited holds 106 mineral claims and fractions, 22 of which comprise 10 leases. The Craigmont orebodies are in the Merrell Nos. 7 and 8 and McLeod Nos. 5 and 6 claims, between the forks of Birkett Creek at elevations between 3,800 and 4,200 feet. The property is 8 miles from Merritt and is accessible by a road leading north from Highway No. 8 at Lower Nicola.

Mining and milling operations were continuous in 1967 with production both from open pit and from underground. A major part of the operation was the loading and transfer of ore from the open-pit stockpile to the crusher. Early in 1967 mining in the open pit ended and a large-scale backfilling programme was initiated to augment subsidence induced by underground mining. During the year 920,389 tons of open-pit ore and 279,250 tons of underground ore were mined and 810,997 tons of waste rock was excavated. Mill feed, including ore from the stockpile, totalled 1,934,810 tons, which produced 106,634 tons of copper concentrates. Copper concentrates were loaded at Coyle Siding and hauled by Canadian Pacific Railway for shipment to Japan.

The change-over from open-pit to underground mining has been completed. All trackless equipment is now in use and includes six scooptrams, three drill Jumbos, and five Unimogs. Work was suspended earlier in the year on the cut-and-fill and blast-hole stopes, and work was concentrated on development of the sublevel-caving programme. The first part of the sublevel-caving programme, the recovery of pit-wall remnants, was completed in September. The ventilation system, which provides for pre-heating the air entering the mine during winter months, now includes a fan capable of handling 150,000 cubic feet of air per minute and replaces the unit formerly on 3500 level. An underground heavy-duty maintenance-shop has been installed to service trackless equipment. Successful use of cement as a ground support has been followed up by the installation of two flocrete units. Underground work is summarized as follows:—

| | |
|---|---|
| Development— | Ft. |
| Lateral development | 23,349 |
| Raising | 2,766 |
| Shaft-sinking | 32 |
| Ore production— | Tons |
| Blast-hole stopes | 49,308 |
| Sublevel cave stopes | 46,835 |
| Development | 183,107 |

Diamond drilling was continued underground to aid in mine development plans. No. 1 service shaft was completed and has been in continuous service.

During 1967 a total of 461 persons was employed at the mine.

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

*Copper*

**Betty Lou, Loo**
*Canex Aerial Exploration Ltd.*
By David Smith

(50° 120° S.W.) Company office, 800 Burrard Building, Vancouver 5. The Betty Lou and Loo groups of 29 claims, owned by Canex Aerial Exploration Ltd., are on Promontory Hills. The property is accessible by road from Merritt, a distance of 15 miles. Six men worked for six months under the direction of C. Rennie, senior geologist, running an induced polarization survey and diamond drilling two holes totalling 3,230 feet.

*Copper*

**Crow, To**
*Consolidated Skeena Mines Ltd.*
By David Smith

(50° 120° S.W.) Company office, 716, 602 West Hastings Street, Vancouver 2. The Crow and To groups consist of 26 claims, of which the Crow claims are optioned from T. Curnow and the To claims are owned by

Plate IVA. Craigmont Mines Limited. View of the Craigmont open pit at the completion of mining. Ore in the pit floor is being covered by waste to ensure its withdrawal by underground mining.

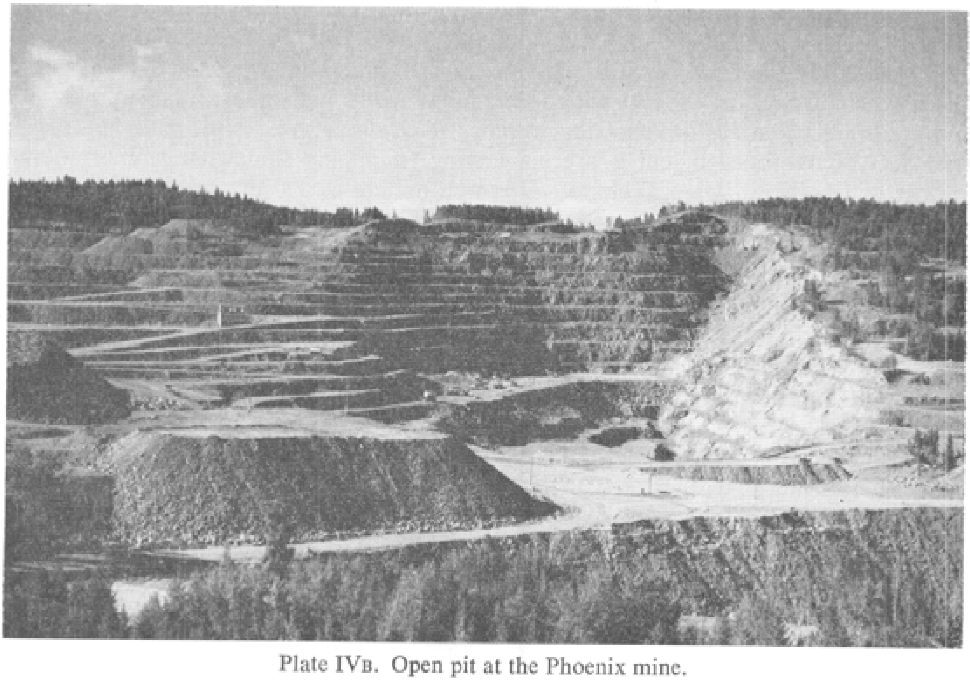


Plate IVB. Open pit at the Phoenix mine.

Consolidated Skeena Mines Ltd. The property is near Canford, 12 miles west of Merritt, and is accessible by road.

Six men spent six months under the direction of W. M. Sharp, consulting geologist, doing geological mapping, making magnetometer and geochemical surveys, and trenching a total of 600 feet. Chalcopyrite, bornite, and pyrite are reported to occur as veinlets in minor fractures in the Nicola volcanics.

*Copper*

**Law, Len**
*Copper Hill Mining and Exploration Ltd.*
By N. D. McKechnie

(50° 120° S.W.) Head office, c/o 284 Main Street, Penticton. A. W. McGuire, manager. The company holds by record the Law 1 to 50, Len 1 to 11, Blinn 1 and 2, Lyle 1 and 2, and Homan 1 and 2 mineral claims, situated on the north slope of Mount McInnes between 2,000 and 5,500 feet elevation, 5 miles west of Merritt. A dirt road on the south side of the Nicola River connects to jeep-roads on the property.

The area is shown on Geological Survey of Canada Map 886A, Nicola, as underlain by rocks of the Lower Cretaceous Kingsvale Group. Prospecting by Mr. McGuire and associates, however, disclosed a window of Nicola-type and intrusive dioritic rocks in the valley of an unnamed creek east of Logan Creek.

On Len No. 9 mineral claim a trench exposes a medium-grained greenish diorite composed, megascopically, of feldspar, pyroxene, minor biotite, and accessory magnetite. It is cut by a dark-grey dyke of diabase, 10 feet wide, striking north 40 degrees east and dipping 80 degrees northwestward. The dyke also contains minor magnetite and is mineralized along widely spaced fine fractures with chalcopyrite and specular hematite. No contacts of the diorite with older rocks are exposed.

On Len No. 2 mineral claim a disturbed zone about 100 feet wide is exposed on a near vertical face in a greenish fine-grained andesitic rock. The zone strikes about east and dips steeply northward. On the footwall a 6-inch quartz vein lies parallel to the strike and dip of the disturbed zone; it contains some sphalerite.

On Len No. 6 mineral claim a bulldozer cut exposed weathered and decomposed rock for about 50 feet. Mr. McGuire stated that an assay of this material had shown the presence of zinc. A vertical drill-hole here was stated to have cut solid volcanic rock at 40 feet which was mineralized with quartz and pyrite. At about 800 feet south of this showing, another vertical drill-hole, after passing through 105 feet of overburden, cut a breccia having fragments somewhat similar to the diorite of Len No. 9 mineral claim. It is well mineralized with pyrite, but no other sulphide was recognized.

On Law No. 1 mineral claim a vertical diamond-drill hole cut fine-grained andesitic lava which carried a sparse mineralization of pyrite and chalcopyrite.

*Copper*

**Ron**
*Polaris Mines Limited*
By David Smith

(50° 120° S.W.) Company office, 501, 535 Thurlow Street, Vancouver 5. The Ron group of eight claims, held by Polaris Mines Limited, is northwest of Merritt, from which it is accessible by 8 miles of road. A geophysical survey of the claims was made during 1967. K. J. Christie was in charge of the work.

[Reference: Assessment Report No. 1138.]

*Copper-Zinc*

**Dot**
*Craigmont Mines Limited*
By David Smith

(50° 120° S.W.) Company office, 700, 1030 West Georgia Street, Vancouver 5. The Dot group of 25 claims is on the east side of Iron Mountain. Access is by dirt road from Merritt, a distance of 9 miles. Work during 1967 consisted of geological mapping and magnetometer, induced polarization, and geochemical surveys. Four trenches totalling 350 feet were bulldozed and two holes totalling 532 feet were diamond drilled. Two men worked for a period of two months under the supervision of R. J. Young, exploration geologist.

*Copper*

**Peg, MMM, Go**
*Noranda Exploration Company, Limited*
By David Smith

(50° 120° S.W.) Company office, 1050 Davie Street, Vancouver 5. This property consists of a total of 50 claims comprising the Peg, MMM, and Go groups. Access to the property is by road northwest of Merritt, a distance of 10 miles. A geochemical survey, supervised by J. Knauer, geologist, was made over eight Peg claims.

[Reference: Assessment Report No. 1144.]

*Copper-Silver*

**LD**
*Valnicla Copper Mine Ltd.*
By V. A. G. Preto

(50° 120° S.W.) Company address, P.O. Box 1269, Merritt. The company owns eight recorded mineral claims centred on the southwestern side of Godey Creek, 2½ miles west of Garcia Lake.

Work in 1967 was done under the direction of O. Gillespie and consisted of four bulldozer trenches totalling 1,500 feet, of approximately one-third of an acre of bulldozer stripping, and mapping of the surface workings at a scale of 1 inch equals 50 feet. Two men were employed by the company for a period of one month.

*Copper-Molybdenum-Silver*

**M.E.**
*Carolin Mines Ltd.*
By V. A. G. Preto

(50° 120° S.W.) Company address, P.O. Box 1269, Merritt. O. Gillespie, president. The company has 20 mineral claims held under option from M. McQuire. The claims comprise the M.E. group and are west of Quilchena Creek along the western boundary of Indian Reserve No. 7, south of Teenamilsts Creek. O. Gillespie supervised the work done in 1967, which included a geochemical and a geophysical survey over the entire claim block. A. D. Tidsbury mapped the geology of claims M.E. Nos. 1, 2, 3, and 4 at a scale of 1 inch equals 200 feet. Fifteen bulldozer trenches totalling 1,500 lineal feet were also dug. Stripping by bulldozer was done over an area of approximately three-quarters of an acre. One hole 220 feet long was diamond drilled, and 1,100 feet of percussion drilling was done in four holes. Five men were employed by the company and by contractor for three months.

*Copper-Molybdenum*

**Copperado**
*Toluma Mining and Development Co. Ltd.*
By N. D. McKechnie

(50° 120° S.W.) Head office, 201, 535 Howe Street, Vancouver 1. G. A. Wilkinson, president; C. W. Marshall, secretary. The company owns the Turlite Crown-granted mineral claim; 60 recorded claims formerly held by the company now are in the name of National Trust Co. Ltd., 510 Burrard Streeet, Vancouver 1, by bill of sale. The property is 4½ miles by road north of Nicola between 3,500 and 4,500 feet elevation, between Clapperton Creek and the west end of Nicola Lake.

The property has been held by various interests since the early 1920's. The principal development is a shaft on the Turlite claim which was sunk on a copper-bearing quartz vein to a depth of 465 feet. Lateral work from the shaft and diamond drilling proved disappointing. Since 1956 work has been confined to surface stripping and test drilling, chiefly in the B6-P66 claim area northwest of the Turlite and on the TM1 claim eastward from it. Geological, geochemical, and geophysical surveys were made between 1961 and 1963, inclusive. Total expenditures on the property to date are of the order of $500,000.

The claims are at the south end of a northerly trending granitic stock which lies westward of Nicola Lake and Moore Creek. The stock is grouped in age by White (Fig. 10-1) with those that intrude Upper Triassic and older rocks. The mineralization lies within an area of gneissic quartz monzonite having biotite as its prominent ferromagnesian mineral. Limited outcrops indicate that the gneiss here forms an irregular belt, one to two claim lengths in width, between the Nicola volcanic rocks on the west and massive granitic rocks of the stock.

On claim TM1 stripping has exposed sparse copper-molybdenum mineralization in quartz monzonite augen gneiss. The gneissic structure strikes north and dips 69 to 77 degrees west. The gneiss is cut by narrow pegmatite dykes, up to 3 inches wide, striking north 40 degrees east and dipping 65 degrees southeastward, striking north and dipping 65 degrees east, striking north 15 degrees west and dipping 80 degrees northeastward, and striking north 35 degrees west and dipping 60 degrees southwestward. Of these, the best developed are the north-striking east-dipping dykes. In the footwall of one of them the gneiss turned from a 65-degree west to a 40- to 45-degree east dip. Cutting the gneiss is a tight shear about 1 foot wide striking north 50 degrees west and dipping very steeply northeastward. In the shear are straight-walled quartz stringers up to 1 inch wide striking north 35 degrees west and dipping 85 degrees northeastward, slightly flatter than the shear. The quartz is sparsely mineralized with thin threads and small grains of molybdenite and with scattered grains of bornite and chalcopyrite. The two copper minerals occur also in the walls of the stringers. A specimen of rock from the shear was examined in thin-section; it differed from the unsheared gneiss in the complete disappearance of plagioclase feldspar and the development of clinozoisite in parallel bands. About 10 feet southwestward from the 1-foot shear there is a slightly narrower one striking north 35 degrees west and dipping 80 degrees northeastward; quartz stringers in it up to 1 inch wide carry chalcopyrite. The gneiss between the two shears is cut by scattered quartz threads and stringers striking north 47 degrees west and dipping 83 degrees northeastward and striking north 28 degrees west and dipping 70 degrees southwestward. The quartz carries molybdenite, bornite, and chalcopyrite. In the footwall of this 10-foot mineralized shear zone, biotite granite is seen in a small exposure, to cut the quartz monzonite gneiss.

About 2 miles northwesterly from the TM1 showing is another stripping near the boundary between the B6 and P66 claims. Here the gneiss is sheared on strike of north 30 degrees west and a dip of 65 degrees southwestward. A specimen of the sheared rock showed in thin-section the same lack of plagioclase and development of clinozoisite as was found in the TM1 shear. Lenticular quartz veins, striking north 35 degrees west and dipping 30 degrees southwestward and striking north 55 degrees east and dipping 85 degrees southeastward, occur in the shear which is exposed for a width of 10 to 15 feet. The quartz is sparsely mineralized with chalcopyrite. Molybdenite was not recognized at this stripping.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1929, p. 246; 1947, p. 136; 1948, p. 120; 1949, pp. 115–120; 1950, p. 112; 1951, p. 128; 1952, p. 119; 1961, p. 45; 1962, p. 56; 1963, p. 54; Assessment Reports Nos. 425 and

503; *Geol. Surv., Canada,* Mem. 249, p. 130; White, W. H., *C.I.M.M.,* Special Vol. No. 8, Fig. 10-1.]

*Copper-Silver-Molybdenum*

**Mouse**
*Nicola Lake Mining Company Ltd.*
By K. E. Northcote

(50° 120° S.W.) Company office, 601, 850 West Hastings Street, Vancouver 1. J. A. Mitchell, consultant. The Mouse group of 133 claims, owned by Nicola Lake Mining Company Ltd., is located one-half mile south of the west end of Nicola Lake and is accessible by road. During 1967, 54 man-days were spent making a geochemical survey of the claim group.

[References: Assessment Reports Nos. 890, 1052, and 1053.]

*Copper-Molybdenum*

**Can**
*Cannoo Mines Ltd.*
By K. E. Northcote

(50° 120° S.E.) Company address, P.O. Box 1409, Merritt. A. D. Tidsbury, consultant. The Can group of 42 claims, owned by Cannoo Mines Ltd., is located at the head of Wasley Creek at 3,000 feet elevation and is accessible by 2 miles of logging-road from Minnie Lake. A. D. Tidsbury prepared a preliminary geological report of the Can group.

*Gold-Silver-Copper*

**Quilchena, Ensign, Ingersoll, Etc.**
*Quilchena Mining & Development Co. Ltd.*
By V. A. G. Preto

(50° 120° S.W.) Company office, 10, 815 West Hastings Street, Vancouver 1. Paul Schutz, president. The company controls seven Crown-granted claims held under agreement with Guichon Mines Limited, a mineral lease covering 12 former Crown-granted claims, and 83 recorded claims (*see* Fig. 20). The Crown-granted claims include the Ingersoll (Lot 3835), the Ensign (Lot 3836), the Frindsbury (Lot 3837), the Last Post (Lot 3838), the Camperdown (Lot 4789), the Quilchena (Lot 4790), and the Tete Rouge (Lot 4792). The former Crown-granted claims presently held under mineral lease consist of the Sonny Boy Nos. 1 to 6 (Lots 5190 to 5195), the Sonny Boy Fractions Nos. 7, 8, and 9 (Lots 5198 to 5200), the Spitfire Nos. 1 and 2 (Lots 5202 and 5203), and the Shannon claim (Lot 5201). The claims held by record include the Joe, Gail, Sandra, Quill, Cat, Spoke, and Kari groups. All of the above claims are on the west side of Quilchena Creek, just south of Nicola Lake. The property may be reached by approximately 1 mile of dirt road which leaves the Merritt–Kamloops highway at the Quilchena Hotel.

Work done in 1967 consisted of geological, geochemical, and geophysical surveys, 714 feet of BQ wireline diamond drilling in two holes, and 45 feet of small-diameter percussion drilling. A crew of five men was employed, over a period of nine months, under the direction of Paul Schutz. A description of the geology, a map, and a record of sampling are in the Annual Report for 1949. Further geological information and plans of six short adits are in the Annual Report for 1962. At the time of the writer's visit, work consisted mainly of group magnetometer surveying and of sampling.

Of the localities which were visited by the writer, the following are worthy of mention:—

*Roy No. 1 and No. 2 Trenches.*—These workings consist mainly of two northerly trending, parallel trenches, approximately 500 and 250 feet long, and located close to the western boundary of the Sonny Boy No. 6 claim (Lot 5194). Work other than trenching and sampling done on these two cuts consists of four diamond-

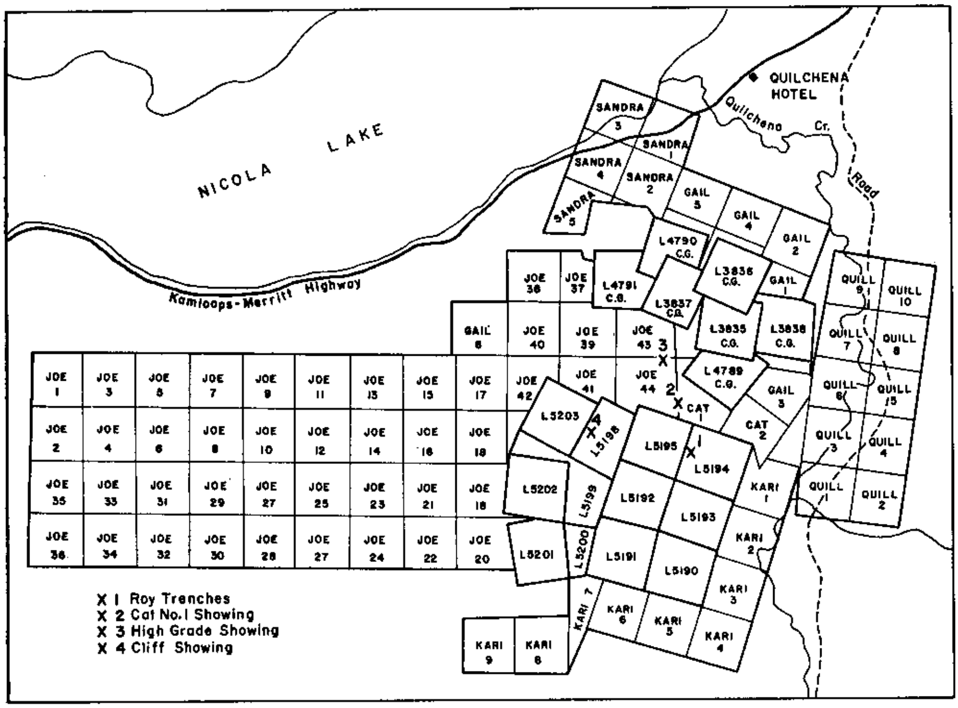



Figure 20. Quilchena Mining & Development Co. Ltd. Index map of the claims held by the company.

drill holes and of several shallow percussion-drill test holes. A northwesterly trending narrow shear zone, which dips very steeply to the northeast, is exposed in both trenches and contains copper mineralization consisting of sparse blebs and stringers of bornite, tetrahedrite, and malachite. This zone is best exposed in the lower trench (Roy No. 1 trench), where it contains a mineralized discontinuous lensy quartz vein approximately 8 inches thick. The rock on either side of the vein is highly fractured and sheared red lava of the Nicola Group, extensively altered to epidote and very sparsely mineralized with bornite, tetrahedrite, and malachite. Although values in molybdenum are reported by the company from one of the diamond-drill holes collared in this trench, no trace of this metal was observed by the writer. A later, nearly vertical slip surface trends north 15 to 35 degrees east and apparently truncates, and probably offsets slightly, the northwesterly mineralized shear. The mullion structure on this surface plunges to the north at 45 degrees.

*Cat No. 1 Showing.*—Several trenches described to the writer as the Cat No. 1 showing are in the southwestern corner of the Cat No. 1 mineral claim, approximately 1,000 feet north of the Roy trenches. At the time of the writer's visit the exposures which reportedly contain better mineralization were covered by rubble and could not be examined. Observed mineralization at this locality consists of sparse, discontinuous, and narrow quartz-calcite stringers with bornite and chalcocite. The host rocks are red and green lava and volcanic breccia of the Nicola Group, locally strongly altered to epidote. A very close jointing trending northwest and dipping very steeply gives the rock a sheeted appearance.

*High Grade Showing.*—A group of trenches described to the writer as the High Grade showing is located close to the intersection of the Joe No. 44, Joe No.

43, and Cat No. 1 mineral claims, approximately 1,000 feet in a north-northwesterly direction from the Cat No. 1 showing. Mineralization at this locality consists of bornite, chalcopyrite, and tetrahedrite occurring in irregular discontinuous quartz-calcite stringers and as coarse disseminations in extensively epidotized green lava of the Nicola Group. The more evident mineralization is confined to a 6-foot-wide zone of strongly epidotized rock, sheared along fractures which trend northwest and dip steeply to the southwest. A sharp, nearly vertical slip surface trending north 5 degrees east truncates the mineralized zone. The mullion structure on this later slip surface pitches 45 to 50 degrees to the north. Four chip samples collected by the writer in four different places, where sparse mineralization was visible, gave the following results:—

| Sample No. | Width | Gold | Silver | Copper |
|---|---|---|---|---|
| | Ft. | Oz. per Ton | Oz. per Ton | Per Cent |
| 1 | 55 | Trace | Trace | 0.02 |
| 2 | 66 | ——— | ——— | Trace |
| 3 | 32 | ——— | ——— | Trace |
| 4 | 50 | ——— | ——— | 0.03 |

A semi-quantitative spectrochemical analysis of these samples revealed no trace of molybdenum.

*Cliff Showing.*—Workings described to the writer as the Cliff showing consist of two trenches and at least one diamond-drill hole. These are located approximately at 3,900 feet elevation, above and below an abandoned logging-road, close to the mid-point of the northwestern boundary of the Sonny Boy No. 7 Fraction (Lot 5198). The country rocks at this locality consist of amygdaloidal andesitic lava and green and purple breccia of the Nicola Group, cut by at least one dyke of porphyritic microdiorite which trends northwesterly and is exposed in a trench below the road. A set of closely spaced joints and narrow quartz veins, which trend northwest and dip vertically or steeply to the southwest, is conspicuous in the dyke and in the country rocks. A chip sample taken in volcanic rocks along the trench in the vicinity of the microdiorite dyke is reported to have yielded low silver, copper, and gold values.

Uphill from the trench and along the logging-road, the contact between a porphyry dyke and volcanic breccia is marked by an irregular lensy quartz vein ranging in thickness from 0 to 28 inches, where observed by the writer. The vein trends north 40 degrees west, has a nearly vertical dip, and contains sparse blebs of chalcopyrite. Company officials report appreciable gold and low silver and copper values from this vein. A 440-foot diamond-drill hole drilled from a point to the northeast of the vein and below the logging-road failed to intersect the lode.

[References: *Geol. Surv., Canada,* Mem. 249, p. 131; *Minister of Mines, B.C.,* Ann. Repts., 1949, pp. 120–124; 1962, pp. 56–59; 1965, pp. 155–156; 1966, p. 167.]

*Copper-Molybdenum*

**Toad** (50° 120° S.W.) About 59 recorded claims in the Toad, Joe,
By J. M. Carr

Hop, Jem, and Bara groups, owned by H. D. Merrell and associates, lie mainly on the east side of Quilchena Creek adjoining the southeastern part of Indian Reserve No. 7, which is about 8 miles south of Highway No. 5 at Quilchena. Access is either by 12 miles of poorly marked road from Quilchena or by a road 7 miles long which leaves the highway 4 miles north of

Aspen Grove and passes to the east of Courtenay Lake. Work on the property in 1967 was done by Aden Mines Ltd. (registered office, 9th Floor, 475 Howe Street, Vancouver 1; A. D. Tidsbury, consulting geologist), and it included bulldozing a trench 1,000 feet in length in the east bank of Quilchena Creek on or near the Toad No. 2 claim, and diamond drilling a vertical hole 127 feet long from a set-up about 75 feet from the south end of the trench.

The core from this hole was not seen, and the trench was partly caved when visited in late August. The trench extends north-northeastward and exposes altered and weathered aplitic-textured biotite quartz porphyry, which may form the western edge of a granitic body that is shown on Geological Survey of Canada Map 886A as extending north-northeastward for about 3 miles. Throughout much of its exposure in the trench, the porphyry is crackled and contains fractures partly filled variously by quartz, limonite which is after pyrite and probably also chalcopyrite, and in places chalcopyrite and minor molybdenite. In places chalcopyrite is also seen lightly disseminated in the crackled porphyry. The mineralized quartz veins are about one-quarter inch wide and generally possess easterly dips of about 30 degrees. At the extreme south end of the trench a fault strikes north 40 degrees east and dips at 65 degrees to the west, and it contains grey gouge with pyrite and possibly molybdenite. Generally, the grade of the exposed copper mineralization is difficult to estimate because of severe weathering and oxidation; however, it is mainly distinctly low. Strong lineaments which trend north to northeast through the property are seen on air photographs and may indicate a series of extensive faults.

[References: *Geol. Surv., Canada,* Map 886A (Nicola); Assessment Report No. 1034.]

*Silver-Copper*

## STUMP LAKE

**Gert, S.F.**
*Marengo Mines Ltd.*
By N. D. McKechnie

(50° 120° S.E.) Company office, 901, 900 West Hastings Street, Vancouver 1. A. D. Tidsbury, consulting geologist. The property consists of 22 recorded mineral claims lying west of the south end of Stump Lake and about 30 miles from Merritt on the Merritt–Kamloops highway.

The property is underlain by Nicola volcanic rocks.

The rocks at the mineral showings are fragmental rocks of a bright-green colour. Only one specimen was examined in thin-section. It proved to be so strongly carbonatized that the original rock had virtually disappeared; an outline of a feldspar-like phenocryst and some pyroxene cleavage were recognizable. There was no obviously apparent source of the bright-green colour. The carbonate does not react to cold hydrochloric acid and so probably is dolomite or ankerite.

On the Gert Nos. 3 and 4 mineral claims the mineralization is in a shear striking north 80 degrees east and dipping 80 degrees southward. The mineralization is unevenly distributed and consists of quartz stringers, tetrahedrite, chalcopyrite, and bornite. At about 200 feet northward the sulphides occur in a quartz-healed breccia. The extent of neither the shearing nor the breccia is shown by present work. At some 2,000 feet from these showings, on the S.F. 5 mineral claim, a shear striking north 75 degrees west and dipping 65 degrees southward is exposed. The mineralization is similar to that of the north 80 degrees east shear, but it contains a higher proportion of bornite.

The bright-green colour is common to both localities and suggests a consistent rock alteration over a large area.

*Copper-Molybdenum*

## ASPEN GROVE

**Kit**
*Marengo Mines Ltd.*
By J. M. Carr

(49° 120° N.W.) Registered office, 901, 900 West Hastings Street, Vancouver 1. H. D. Merrell, director. This company holds about 57 recorded claims in the Kit, Vida, and Red groups on Quilchena Creek northeast of Pothole Lake, being partly on ground formerly covered by the Robin claims (*see* Ann. Rept., 1963, p. 55). Access is by nearly 7 miles of road from Highway No. 5, 4 miles north of Aspen Grove. Work in 1967 included bulldozing a trench about 200 feet long in the right bank of Quilchena Creek, which locally flows in a direction west of north, and diamond drilling two holes from separate set-ups in the trench.

At the north end of the trench is massive Nicola greenstone which apparently includes a greenstone dyke striking north 45 degrees east and dipping steeply to the northwest. The greenstone contains barren-looking quartz-calcite veins and is unmineralized except for local disseminations of fine pyrite. It is separated on the south from porphyritic biotite granodiorite by a gougy unmineralized fault that is 15 feet wide and possesses a strike of north 35 degrees east and a steep westerly dip. The granodiorite is shown on the Geological Survey of Canada Map 888A as forming a circular mass less than 1 mile across. In the trench it appears as a rather fine-grained pink- to buff-coloured rock with quartz eyes and altered biotite books. It is fractured (partly on planes that dip steeply to the southeast and strike in directions between north 55 and 70 degrees east) and contains small steep faults that strike either northward or northeastward. Some of these faults contain a dark gougy material that is probably partly graphite, and they locally contain quartz lenses an inch or two wide which locally have a dark graphitic coloration and contain disseminated molybdenite in small amounts. The fractures partly contain quartz seams with minor amounts of chalcopyrite, malachite, and molybdenite.

[References: *Geol. Surv., Canada,* Map 888A (Princeton); *Minister of Mines, B.C.,* Ann. Rept., 1963, p. 55; Assessment Report No. 1016.]

*Copper-Silver-Gold-Molybdenum*

**CM**
*Merritt Copper Co. Ltd. and Vananda Explorations Ltd.*
By David Smith and J. M. Carr

(49° 120° N.W.) The CM group of 17 claims is held jointly by Merritt Copper Co. Ltd. (248 Second Avenue, Kamloops; J. A. Whist, president) and Vananda Explorations Ltd. (661 Hornby Street, Vancouver 1; T. E. Blossom, president) and is on Quilchena Creek adjoining the Ski group of Chataway Exploration Co. Ltd. and the June group of Magnet Explorations Ltd. Access is by dirt road from Highway No. 5. Work in 1967 included geological mapping, induced polarization and magnetometer surveying, 1,438 feet of surface diamond drilling, and 813 feet of percussion drilling. It is reported that chalcopyrite and pyrite occur with copper-gold mineralization near the contact of a diorite plug and the Nicola volcanics. Five men worked for a period of five months under the direction of A. D. Tidsbury, consulting engineer, and L. Hodgson, foreman.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 168.]

*Copper*

**Snarf, Dote, Breach, Etc.**
*Dawood Mines Limited*
By K. E. Northcote

(49° 120° N.W.) Company office, 105, 287 Bernard Avenue, Kelowna. S. S. Gilmour, consultant. The Dote, Gun, Breach, Reef, Snarf, Limber, Pat, and Marion, totalling 59 claims held by Dawood Mines Limited, cross Highway No. 5

at Aspen Grove. In a geological report prepared by S. E. Asano it is stated that the property is underlain by rocks of the Nicola Group and that mineralization consists mainly of chalcopyrite in association with quartz, as fine disseminations and in minute fractures.

*Copper*

**Pay**
*Alscope Consolidated Ltd.*
By David Smith

(49° 120° N.W.) Company office, 10, 549 Howe Street, Vancouver 1. The Pay group of 40 claims is west of Alleyne Lake. The property is held under an agreement with Payco Mines Ltd. The property is accessible by 3½ miles on the Kentucky Lake road from Highway No. 5, 3 miles south of Aspen Grove.

Work during 1967 consisted of geological mapping of 20 claims, an induced polarization survey, some bulldozer stripping, and construction of a new bunkhouse and of roads to drill set-ups. A total of 1,800 feet of surface diamond drilling in 19 holes and 700 feet of percussion drilling in three holes was done. Six men worked under the supervision of Fred Kangas, geologist.

*Copper*

**Abe**
*Albedena Oils Limited*
By V. A. G. Preto

(49° 120° N.W.) Company office, 549 Howe Street, Vancouver 1. The company owns 14 recorded mineral claims comprising the Abe group centred three-quarters of a mile west of Alleyne Lake. Mineralization consists of disseminated chalcocite, bornite, chalcopyrite, native copper, and minor cuprite in altered volcanic rocks of the Nicola Group. F. Kangas, company geologist, supervised the work done in 1967, which included geological mapping of the surface workings at a scale of 1 inch equals 50 feet, geological mapping of approximately half of the claim group at a scale of 1 inch equals 200 feet, and an induced polarization survey over the whole claim block. Two AX diamond-drill holes totalling 500 feet were also completed. Four men were employed by the company for a period of six months.

*Copper-Molybdenum*

**Echo, Toe**
*Consolidated Skeena Mines Ltd.*
By David Smith

(49° 120° N.E.) Company office, 716, 602 West Hastings Street, Vancouver 2. The Echo and Toe groups, consisting of 117 recorded mineral claims, are in the vicinity of Tommy and Paradise Lakes, 20 miles from Merritt, and are accessible by road. Six men spent 11 months under the direction of W. M. Sharp, consulting geologist, geological mapping and making a geochemical survey. Aerial electromagnetic, magnetic, and scintillometer surveys were carried out on all claims.

[References: Assessment Reports Nos. 1049 and 1089.]

*Copper*

**M**
*Rayore Mines Ltd.*
By David Smith

(49° 120° N.W.) Company office, 625, 925 West Georgia Street, Vancouver 1. The M group of 50 recorded claims is on Highway No. 5, 8 miles south of Aspen Grove. Work was done on the M 1 to 4 and the M 26 to 29 claims. It comprised geological mapping, magnetometer, electromagnetic, induced polarization, and self-potential surveys, and some soil-sampling. Two men were employed for a month under the supervision of D. R. Cochrane, consultant.

[Reference: Assessment Report No. 934.]

*Copper-Silver*

**Blue Jay**
*Valnicla Copper Mine Ltd.*
By K. E. Northcote

(49° 120° N.W.) Company office, P.O. Box 1269, Merritt. The Blue Jay group of 20 claims, optioned from H. Nesbit, is located on Highway No. 5, 8 miles north of Aspen Grove. Five men spent four months under the direction of Orval Gillespie diamond drilling six holes totalling 2,000 feet. Sulphides are said to occur as disseminations and replacements in locally intensely altered Nicola andesites, basalts, and argillites.

*Copper-Molybdenum*

**Bob, Len, Bill**
*Diana Explorations Ltd.*
By David Smith

(49° 120° N.E.) Company office, 207, 470 Granville Street, Vancouver 2. The Bob, Len, and Bill groups, totalling 92 claims, are near Missezula Lake, 3 miles east of Highway No. 5. Work was done on the Len group in 1967; a geochemical survey was made and four trenches totalling 200 lineal feet were bulldozed. Four men worked for a period of 2½ months under the supervision of L. Stuckey, managing director.

*Copper*

**Kentucky**
*Alscope Consolidated Ltd.*
By V. A. G. Preto

(49° 120° N.W.) Company office, 549 Howe Street, Vancouver 1. The company owns 32 recorded mineral claims comprising the Kentucky group and centred immediately to the west and southwest of Kentucky Lake. Mineralization consists of disseminated chalcocite and chalcopyrite in altered volcanic rocks of the Nicola Group. Work in 1967 was supervised by F. Kangas, company geologist, and consisted of an induced polarization survey over the entire claim group, construction of 1,000 feet of road, and completion of three percussion-drill holes totalling 500 feet. Five men were employed by the company for a period of three months.

*Copper*

## COLDWATER RIVER

**Loc**
*Belcarra Explorations Ltd.*
By V. A. G. Preto

(49° 120° N.W.) Company address, 248 Second Avenue, Kamloops. M. G. Mooney, president. The company owns six recorded mineral claims comprising the Loc group and located on the southwestern side of Salem Creek, 1½ miles upstream from its junction with the Coldwater River. In 1967 three bulldozer trenches totalling 250 lineal feet were dug.

*Copper*

## SELISH MOUNTAIN

**CM**
*Cleveland Mining & Smelting Co. Ltd.*
By David Smith

(50° 120° S.W. and 49° 120° N.W.) Company office, 615, 850 West Hastings Street, Vancouver 1. The CM group of 40 claims is owned by Cleveland Mining & Smelting Co. Ltd. and is on Selish Mountain, 16 miles south of Merritt. The property is accessible from Coldwater River road. Four men spent three months constructing 2 miles of access road and soil-sampling. The work was supervised by F. J. Hemsworth, consulting mining engineer.

[Reference: Assessment Report No. 1045.]

*Copper-Lead-Zinc*

## COQUIHALLA

**Laverne, Cap, Etc.**
*Blueberry Mining Co. Ltd.*
By David Smith

(49° 121° N.E.) Company office, 52 Yates Avenue, Chilliwack. The Laverne 1 to 6, Cap 1 to 4, Mary, Jane, Gale, Helen, Eva, and Joan claims are owned by S. Petkovich. Laverne 3 to 6 are the key claims. The property is in Coquihalla Pass, 38 miles from Merritt, and is accessible from the Coldwater River road.

Two men spent six months under the direction of Steve Petkovich, president, bulldozing five trenches totalling 1,000 feet and constructing roads. Some sphalerite, galena, and copper are reported to occur in a vein in granodiorite.

## BRENDA LAKE

Part of the holdings of Brenda Mines Ltd., Noranda Exploration Company, Limited (North Brenda), and Lakeland Base Metals Ltd. (Jo group) are in the Nicola Mining Division, but the reports on these properties will be found on pages 210 and 211 under the Osoyoos Mining Division.

*Copper-Molybdenum*

**Marn, Visc, Cam, Rob, Bob**
*Kel-Glen Mines Ltd.*
By J. M. Carr

(49° 120° N.E.) Company office, 1614, 1030 West Georgia Street, Vancouver 5. Gordon V. Murray, president; Carson A. Murray, manager. The company owns 92 recorded claims named Marn, Visc, Cam, Rob, and Bob, which are mostly in a single block adjoining the north and west boundaries of the North Brenda property (*see* Fig. 22). The property is about 30 miles by road from Peachland and is mostly reached from the Cameo Lake road. Work in 1967 was supervised by E. J. Lees, geologist, and it included clearing 2 miles of road, an electromagnetic survey on the southern Marn claims, and 151 feet of diamond drilling in a single hole, which location is not reported. The geology and the main showing on the property are described in the accompanying text, page 206.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 173; Assessment Report No. 875.]

*Copper*

**FWP, Slim**
*Largo Mines Ltd.*
By J. M. Carr

(49° 120° N.E.) Company office, 1110 One Bentall Centre, 505 Burrard Street, Vancouver 1. B. I. Nesbitt, president. Jointly with Quinalta Petroleum Ltd. and Fleetwood Resources Ltd. (office of these companies: 502 Fina Building, Calgary, Alta.), the company holds as many as 70 recorded claims in the FWP, Slim, and other groups to the north and west of Brenda Lake. The property is accessible from the Noranda road and is underlain mostly by Nicola rocks (*see* Fig. 22). Work by Quinalta Petroleum Ltd. and Fleetwood Resources Ltd. in 1966 or 1967 included an aerial magnetometer survey and diamond drilling two holes on the Noranda road. Work in 1967 by the present company was partly supervised by D. R. Morgan, and it included some trenching and geological, geochemical, magnetometer, and induced polarization surveys of parts of the property.

[References: Assessment Reports Nos. 876 and 1121.]

## SIMILKAMEEN MINING DIVISION

*Copper*

### MISSEZULA MOUNTAIN

**AXE**
*Meridian Exploration Syndicate*
By David Smith

(49° 120° N.W.) Company office, 808, 837 West Hastings Street, Vancouver 1. The AXE group of 86 claims, of which the key claims are AXE Nos. 21 to 24, are on the south slope of Missezula Mountain, 1½ miles west of Summers Creek. Access is by road from the Princeton–Merritt highway, a distance of 14 miles. Ten men worked for six months under the direction of R. Wolfe, geologist, doing geological mapping, making induced polarization, magnetic, electromagnetic, and geochemical surveys, diamond drilling seven holes totalling 2,135 feet, bulldozing eight trenches totalling 2,500 feet, and constructing a mile of access road. Chalcopyrite associated with pyrite is reported to occur over a 2,400- by 1,000-foot area in fractures and as disseminations in Nicola volcanics.

*Copper*

### TULAMEEN

**Lode**
*Copper Mountain Consolidated Limited*
By David Smith

(49° 120° N.W.) Company office, 2627 Ottawa Avenue, West Vancouver. The Lode group of 24 claims is 3 miles northwest of Tulameen. During 1967 a geophysical survey and 200 feet of surface trenching were done. Two men worked for three months under the direction of R. Collishaw.

[Reference: Assessment Report No. 1156.]

*Gold-Silver-Lead-Zinc*

**Cousin Jack**
*Nelway Mines Ltd.*
By David Smith

(49° 120° N.W.) Company office, 13, 5901 East Broadway, Burnaby 2. The Cousin Jack group consists of a total of 36 claims and includes the Cousin Jack, Black Bird, Ymir, Morning, Berlin Fraction, and others. It is on Boulder Mountain, 4 miles northwest of Tulameen. Access is by logging-road from the Otter Lake road, a distance of 2 miles. Work during 1967 consisted of a geochemical survey and some surface diamond drilling. Four men worked for a period of four months under the supervision of J. Millican, consultant.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1937, pp. D 27–D 29; Assessment Report No. 944.]

*Copper*

**Law's Camp**
*Rayore Mines Ltd.*
By David Smith

(49° 120° N.W.) Company office, 625, 925 West Georgia Street, Vancouver 1. Mineral Lease M33, comprising the Grand Trunk (Lot 757), Rambler (Lot 758), Stonie Creek (Lot 759), and Morning Sun (Lot 760), is held under agreement by Rayore Mines Ltd. Access is by 8 miles of road west from Tulameen. It is reported that three men spent a short time running magnetometer and electromagnetic surveys along 8,250 feet of line.

*Silver-Lead-Zinc-Copper*

**Rook**
*Libra Mines Ltd.*
By David Smith

(49° 121° S.E.) Company office, 895 Fort Street, Victoria. The Rook group of 11 claims is near Summit Camp, to which access is by gravel road 23 miles from Tulameen. In 1967 three surface trenches totalling 86 cubic yards were drilled and blasted on the Rook

No. 11 claim. Four men worked for a period of four months under the direction of Nils P. Wrede.

## PRINCETON

*Copper*

**Copper Mountain Mine**
*The Granby Mining Company Limited*
By David Smith

(49° 120° S.W.) Company office, 507, 1111 West Georgia Street, Vancouver 5; field office, Allenby. The company owns 79 Crown-granted claims covering and surrounding the workings of the Copper Mountain mine. Access is by 12 miles of paved road from Princeton. In 1967 an extensive drilling programme, consisting of 20,094 feet of diamond drilling in 52 holes and 29,970 feet of percussion drilling in 202 holes, was done in the vicinity of the old townsite and in and adjacent to the surface workings. The drilling was based on information derived from geological, magnetometer, and induced polarization surveys. A crew of eight men was employed under the supervision of K. C. Fahrni.

On January 1, 1968, the entire property was sold to Newmont Mining Corporation of Canada Limited.

*Copper*

**Yam**
*Rolling Hills Copper Mines Limited*
By David Smith

(49° 120° S.W.) Company office, P.O. Box 4183, Station D, Vancouver 9. The Yam group, consisting of 136 claims, is 12 miles southeast of Princeton and is accessible by 6 miles of road from Highway No. 3.

During 1967 three men spent two weeks, supervised by Ken Spraggs, field supervisor, soil-sampling and trenching by plugging and blasting. Contractors built drill access roads and percussion drilled 51 holes totalling 2,550 feet.

*Gold-Silver-Copper*

**Eva, Ash, Jill**
*Oro Mines Ltd.*
By David Smith

(49° 120° S.W.) Company office, 511, 850 West Hastings Street, Vancouver 1. This property consists of a total of 86 claims, of which the key claims are the Eva 1 to 7, Ash 5 and 6, and Jill 1, 3, and 5. The company owns 60 claims, and the remaining 26 claims were optioned from Copper Mountain Consolidated Limited. Access to the property is by the Hope–Princeton highway, 20 miles south of Princeton. Work done in 1967 consisted of an induced polarization survey, a magnetometer survey, a total of six pits and 100 feet of surface trenching, 3,000 feet of road construction, and a total of 1,500 feet of surface diamond drilling in five holes. From 6 to 12 men were employed under the supervision of Alrae Exploration Ltd.

*Copper*

**T**
*Anchor Mines Ltd.*
By David Smith

(49° 120° S.W.) Company office, 1111, 409 Granville Street, Vancouver 2. The T group of 22 claims is 2 miles southwest of Kennedy Mountain on the southeast side of Whipsaw Creek and is accessible by road approximately 15 miles from Princeton. Two men spent two months doing geochemical work, bulldozing two trenches, and drilling and blasting 25 pits or open cuts.

*Gold-Silver-Copper-Zinc*

**Silvertip**
*Silver Tip Explorations Ltd.*
By David Smith

(49° 120° S.W.) Company office, P.O. Box 697, Princeton. The Silvertip 1 and 2 and Mineral Lease M30, comprising the Three Forks (Lot

172), the Contact No. 3 (Lot 1549), and seven other fractions, are at the head of Whipsaw Creek, 21 miles southwest of Princeton. Access is from Highway No. 3 by logging-road, a distance of 12 miles. Work done during 1967 included approximately 10,000 square feet of bulldozer stripping, construction of a powerhouse, crusher building, ball-mill building, two ore bins, and repairs to the road. Work was carried out during a period of six months under the direction of H. P. Huff.

*Copper-Zinc*

**Red Star, Woodpecker** *Spenho Mines Ltd.* By David Smith (49° 120° S.W.) Company office, 701, 640 West Hastings Street, Vancouver 2. The Red Star, Woodpecker, Gayle, Dianne, and other groups, totalling 151 claims, are on the Similkameen River just above the junction of Pasayten River. The claims are accessible via Highway No. 3 from Princeton, a distance of 30 miles. In 1967 geological, geophysical, and geochemical surveys were made, a total of 3,100 feet of surface trenching was done by bulldozer, and eight percussion-drill holes totalling 2,600 feet were drilled. Three men worked for a period of six months under the supervision of S. H. Davis and A. R. Bullis, consultant.

[Reference: Assessment Report No. 878.]

## Copper Mountain-Kennedy Mountain Area

By V. A. G. Preto

The continued development of a large copper deposit on Kennedy Mountain by Newmont Mining Corporation of Canada Limited and renewed extensive exploration and development drilling on Copper Mountain by The Granby Mining Company Limited, culminated by the sale of all the Granby holdings to Newmont, has once again focused attention on the Copper Mountain area. In addition, a considerable amount of exploration has been carried out on properties that surround the two major deposits, the locations of some of which are shown on Figure 21.

Both the Granby and Newmont companies have been exploring ground which, since the turn of the century, has been known to carry copper mineralization but which only recently has become of economic importance as the potential site of large-tonnage low-grade mining operations. On both properties the mineralization which is at present being investigated consists of erratically distributed fine-grained pyrite and chalcopyrite in generally strongly altered volcanic rocks of the Nicola Group which lie to the north and northwest of the Copper Mountain stock. This pluton has, for many years, been regarded as the source of mineralization in the area, and possibly rightly so. There are, however, many other factors which played an essential role in the localization and concentration of sulphides to form deposits of economic importance and which will be thoroughly investigated in the light of the most recent information available in an effort to better understand why some ground adjacent to the stock apparently is of no economic interest whereas some other carries, or has carried, large amounts of metal.

[References: Dolmage, V., *Geol. Surv., Canada,* Mem. 171; Rice, H. M. A., *Geol. Surv., Canada,* Mem. 243; *Minister of Mines, B.C.,* Ann Repts., 1963, p. 62; 1966, pp. 176–177.]

Properties shown on Figure 21 are as follows:—

1. Kenley group (Cumont Mines Limited).
2. Saw, Whip, Ski, M.J., Ram, Elizabeth groups (Kalco Valley Mines Ltd.).
3. Ray group (Adera Mining Limited).
4. Ser, Rad, May groups (Newmont Mining Corporation of Canada Limited).

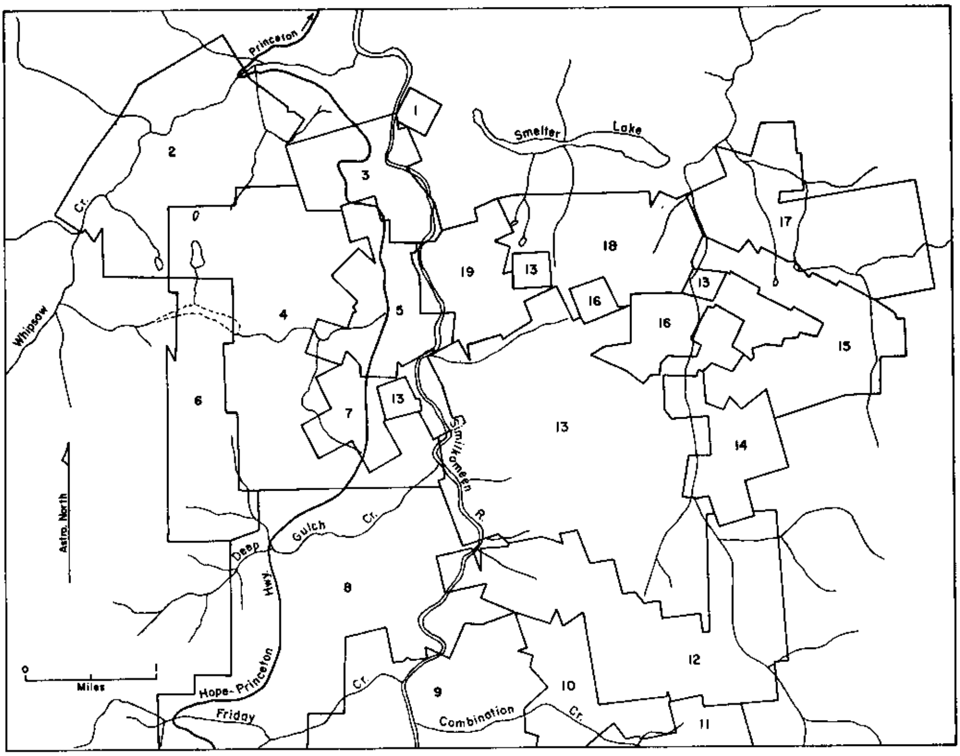



Figure 21. Index map of the Copper Mountain-Kennedy Mountain area.

5. Brooklyn, Magnetic, Ingersoll Belle, Invincible, Columbia Fraction, Red Bute, Tempest, Nubian Fraction, Peerless, Princeton, LaReine, Lela, Bornite, Key West, Red Buck, Mogul, Mogul Fraction, Copper King (Newmont Mining Corporation of Canada Limited).
6. Axe group (Kalco Valley Mines Ltd.).
7. Hamilton group (Cumont Mines Limited).
8. Elm, Oak, Ash, Eva, Deep, Nut groups (Copper Mountain Consolidated Limited).
9. Ilk group, Lease M54B (Kalco Valley Mines Ltd.).
10. Lease M57 (Messrs. P. M. Reynolds and F. W. Lees).
11. Lease M56 (Kalco Valley Mines Ltd.).
12. B.M. group (Cumont Mines Limited).
13. Seventy-nine Crown-granted claims (formerly owned by The Granby Mining Company Limited were purchased by Newmont Mining Corporation of Canada Limited in December, 1967).
14. South group (Cumont Mines Limited).
15. Falun group (Cumont Mines Limited).
16. Virginia group (Cumont Mines Limited).
17. May group (Cumont Mines Limited).
18. Sunlight group (Cumont Mines Limited).
19. Blue Bird group (Cumont Mines Limited).

*Copper*

**Ingerbelle (4, 5)**
*Newmont Mining Corporation of Canada Limited*
By V. A. G. Preto

(49° 120° S.W.) Vancouver office, 604, 744 West Hastings Street. This company holds a total of 66 claims on Kennedy Mountain, along the Hope–Princeton highway, 12 miles south of Princeton. Of these, 48 are recorded claims, which comprise the Ser, Rad, and May groups. The remainder are Crown-granted claims, which include Brooklyn (Lot 236), Magnetic (Lot 235), Ingersoll Belle (Lot 234), Invincible (Lot 278), Red Bute (Lot 238), Tempest (Lot 251), Nubian Fraction (Lot 133), Peerless (Lot 250), Princeton (Lot 153), LaReine (Lot 233), Lela (Lot 401), Bornite (Lot 280), Key West (Lot 402), Red Buck (Lot 279), Mogul (Lot 255), Mogul Fraction (Lot 256), Copper King (Lot 403), and the Columbia Fractional claim (Lot 135).

Work done in 1967 included topographic, geological, and geophysical surveys, extensive trenching, diamond drilling and underground mining, the construction of ancillary buildings, and the establishment of a camp at the adit portal. This work was carried out under the direction of T. N. Macauley, company geologist, and M. Guiguet, manager. In mid-September, 1967, work was commenced on a major programme of surface and underground exploration. Information released by the company indicates that this stage of development will consist of approximately 4,400 feet of drifting and 800 feet of raising, with provision made for a possible additional 1,700 feet of drifting. Underground mining was contracted to Cameron McMynn Co. Ltd. The portal of the adit is located at elevation 3,060 feet on the Princeton claim. Approximately 60,000 feet of diamond drilling is to be done from underground stations. Contracts of this part of the work were let to Degg Drilling Ltd. Surface exploration is to continue concurrently with the underground work. This phase of development consists of approximately 42,500 feet of diamond drilling and of 10,000 feet of percussion drilling. Of these, approximately 20,000 feet of diamond drilling is to be spent on grid drilling of 40 vertical holes spaced 100 feet apart and located on the Invincible and Ingersoll Belle claims. Contracts for surface drilling were let to T. Connors Diamond Drilling. Company records show that in the 12 months of 1967 an average of 16 men was employed by the company and 40 by contractors. Work completed at the year's end included 15 bulldozer trenches totalling 11,000 feet, 60 BQ wireline surface diamond-drill holes totalling 41,000 feet, two AX underground diamond-drill holes totalling 896 feet, and 1,651 feet of underground workings. In November, 1967, Newmont Mining Corporation released information in which it stated that preliminary reserves stand at 40,000,000 tons of material grading 0.70 per cent copper.

The geology of the Ingerbelle property is not easily understood, and the writer's present knowledge of it warrants only a few isolated comments. Mineralization occurs mostly in variably altered volcanic and possibly minor sedimentary rocks of the Nicola Group. Of these, the most favourable hosts are rocks which display a general pale-green to grey-green alteration and which consist for the most part of variably albitized and epidotized andesites. Remnants of less metamorphosed andesitic rocks, now mostly epidote-biotite-clinopyroxene-plagioclase hornfels, within or near the green altered rocks, may also be well mineralized. Primary structures such as bedding and flow layering are very seldom seen in the highly fractured and altered surface exposures. Careful interpretation of drill-core information by company geologists, however, indicates that the strata are probably more or less flat lying.

The main zone of mineralization extends for some 2,400 feet in a northeasterly direction from the Invincible to the LaReine claim, where it stops abruptly against a northwest-trending monzonite dyke. Within this zone, widths of 100 to 500 feet are encountered. An irregular zone, as much as 800 feet wide, extends from approximately the mid-point of the main zone in a southeasterly direction toward the Magnetic and Princeton claims. Other mineralized zones are found elsewhere on the property and noticeably on the Princeton claim near the portal of the new underground workings, and farther to the north on the Red Buck claim. Within all of these zones, metal values are erratically and, as yet, rather unpredictably distributed. Company mapping has identified two prominent sets of fractures, dykes, and faults, one trending northeast and another northwest. Sulphide mineralization, consisting mainly of pyrite and chalcopyrite with minor bornite and occasional molybdenite, occurs along these and many other fractures, as well as finely disseminated through the rock.

Generally porphyritic dyke rocks that are found in the area may be crudely divided into two groups, one consisting of syenite and syenodiorite and another of monzonite. Most of the dykes follow northwesterly and northeasterly trending fractures and shear zones. Minor amounts of sulphide mineralization may be found in the dyke rocks, especially those of monzonitic composition. Veinlets, irregular patches, and shoots of salmon-pink alteration, generally attributed to introduction of potash feldspar, are common and widespread both in metavolcanic and in dyke rocks. It is interesting to note that a large proportion of the pink secondary material gives a negative response to the sodium cobaltinitrite stain test for potash feldspar.

**Ann, Ram** *Ventures Mining Ltd.* (49° 120° N.E.) *See under* Osoyoos Mining Division, page 215.

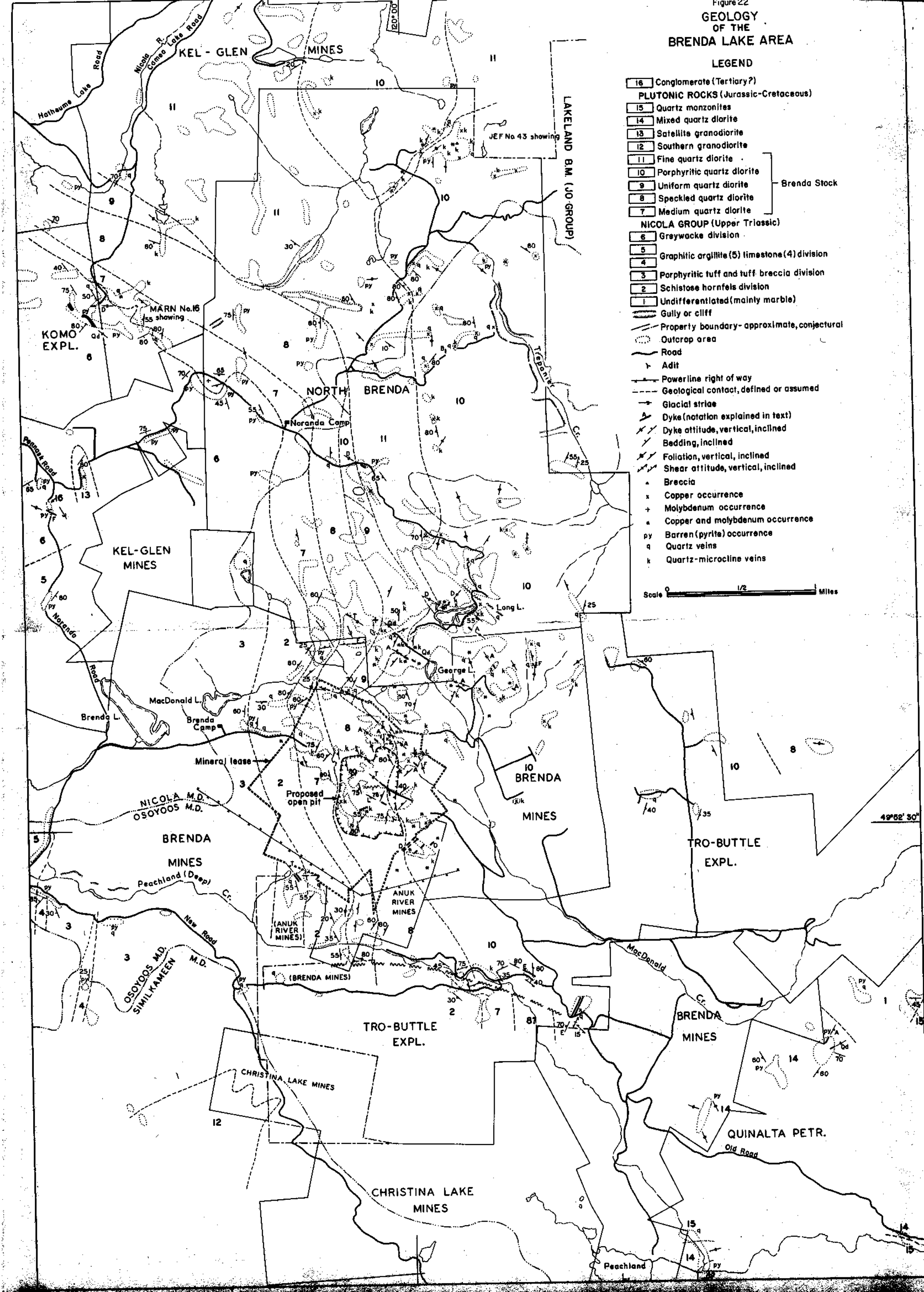


Figure 22
GEOLOGY OF THE BRENDA LAKE AREA
LEGEND
16 Conglomerate (Tertiary?)
PLUTONIC ROCKS (Jurassic-Cretaceous)
15 Quartz monzonites
14 Mixed quartz diorite
13 Satellite granodiorite
12 Southern granodiorite
11 Fine quartz diorite
10 Porphyritic quartz diorite
9 Uniform quartz diorite
8 Speckled quartz diorite
7 Medium quartz diorite
Brenda Stock
NICOLA GROUP (Upper Triassic)
6 Greywacke division
5 4 Graphitic argillite (5) limestone (4) division
3 Porphyritic tuff and tuff breccia division
2 Schistose hornfels division
1 Undifferentiated (mainly marble)
Gully or cliff
Property boundary - approximate, conjectural
Outcrop area
Road
Adit
Powerline right of way
Geological contact, defined or assumed
Glacial striae
Dyke (notation explained in text)
Dyke attitude, vertical, inclined
Bedding, inclined
Foliation, vertical, inclined
Shear attitude, vertical, inclined
Breccia
Copper occurrence
Molybdenum occurrence
Copper and molybdenum occurrence
py Barren (pyrite) occurrence
q Quartz veins
k Quartz-microcline veins
Scale 0 1/2 1 Miles
120°00'
49°52'30"
KEL - GLEN MINES
Hatheume Lake Road
Nicola R.
Cameo Lake Road
LAKELAND B.M. (JO GROUP)
JEF No. 43 showing
MARN No. 16 showing
KOMO EXPL.
NORTH BRENDA
Noranda Camp
Trepanier Cr.
Pennask Road
KEL-GLEN MINES
Noranda Road
Long L.
George L.
MacDonald L.
Brenda L.
Brenda Camp
Mineral lease
Proposed open pit
BRENDA MINES
NICOLA M.D.
OSOYOOS M.D.
Peachland (Deep) Cr.
New Road
ANUK RIVER MINES
(ANUK RIVER MINES)
(BRENDA MINES)
OSOYOOS M.D.
SIMILKAMEEN M.D.
TRO-BUTTLE EXPL.
MacDonald Cr.
CHRISTINA LAKE MINES
QUINALTA PETR.
Old Road
Peachland

# OSOYOOS MINING DIVISION

## BRENDA LAKE

### The Geology of the Brenda Lake Area

By J. M. Carr

*Table of Contents*



*Introduction*

The following account supplements an earlier note on the geology of the area (Ann. Rept., 1966, pp. 179–187) and is based on the results of geological mapping done in 1967. The mapped area (Fig. 22) covers about 40 square miles at the junction of the Nicola, Osoyoos, and Similkameen Mining Divisions. It surrounds Brenda mine, which is a low-grade copper and molybdenum deposit occurring at 5,400 feet elevation some 15 miles northwest of Peachland and now being readied for open-pit mining at a rate of 24,000 tons per day. Principal access to the area is from Peachland by a road 25 miles long passing south of Peachland Lake, but a road under construction near the Old road north of Peachland Lake will reduce the distance to 17 miles. Various side roads give access within the mapped area.

Topographically the area is part of the dissected Interior Plateau and straddles the drainage divide between the Nicola and Similkameen Rivers on the west and tributaries of Okanagan Lake on the east. Elevations in the area range from 3,500 feet at lower MacDonald Creek to 6,000 feet locally near Brenda Lake. Except for incised valleys such as Peachland (Deep) Creek and Trepanier Creek, slopes are moderate and the country is heavily tree-covered. Outcrops, which make up as much as 10 per cent of the high ground if underlain by granitic rocks, are more sparse elsewhere because of a prevalent cover of glacial drift and fluvioglacial deposits, for example, along MacDonald Creek and north of Peachland Lake.

Geologically the mapped area covers part of the western margin of an intrusive mass that, according to Geological Survey of Canada maps, connects the Okanagan batholith to the south with the Pennask batholith to the north. Between the two batholiths and intruded by the connecting mass are stratified country rocks of the Upper Triassic Nicola Group, which occur partly as an uninterrupted expanse to the west and partly as fair-sized isolated bodies farther east within the intrusive mass (*see* Ann. Rept., 1966, Fig. 27). In the mapped area the intrusive mass comprises a zoned and composite quartz diorite body termed the Brenda stock and various other units with compositions ranging from quartz diorite to quartz monzonite, whose relationships are poorly known but which are considered distinct from the stock. Dykes of several kinds and ages cut the intrusive mass, and conglomerate of probable Tertiary age rests locally on the Nicola rocks north of Brenda Lake.

Except at the Brenda orebody, mapping was done mainly by T. M. Elliott, graduate assistant, with assistance from R. B. Anderson. Much help was obtained from companies, including the provision of excellent geological maps made in 1957 by C. S. Ney, of the Kennecott organization. Grateful acknowledgment is made of hospitality received from Brenda Mines Ltd. A colleague, K. E. Northcote, is thanked for his aid in compiling the results of field work, R. Player for taking the photographs on Plates V and VI, and K. S. Crabtree for his careful draughting of the maps and other illustrations.

### *Nicola Group (1–6)*

Stratified rocks assigned to this group occur mostly in the western part of the area where, although not extensively studied, they are mapped as four divisions in successive belts of outcrop from east to west. The stratigraphic and structural relationships between divisions are uncertain.

The easternmost division adjoins a part of the Brenda stock, and, as subsequently described, is of schistose hornfels produced by metamorphism of rocks probably similar to those of the succeeding *porphyritic tuff and tuff breccia* division (3). This division occupies a belt terminating northward against the stock and as much as 1¼ miles wide at the southern limit of mapping on Peachland Creek. Where attitudes are identified, its strata dip westward at steep to moderate angles. The strata are poorly bedded, consist of volcanic material, and probably represent mainly water-lain tuffs and breccias. No volcanic flows have been clearly identified. The eastern rocks of the belt are mainly tuff breccias and the western ones are mainly tuff, both being generally massive grey, brown, or green fine-grained to glassy rocks with a clastic nature shown by occasional layers of gritty to fine-grained well-banded apparently sedimentary material and, in the breccias, by barely discernible rock fragments scattered through the rock. Both in outcrop and under the microscope, the fragments and matrix tend to blend indistinguishably together and they possess compositions estimated variously to be those of dacites and andesites. The rocks are commonly fine grained but porphyritic, containing crystal grains of plagioclase and hornblende, each amounting to as much as 10 per cent of the rock and locally reaching one-half centimetre in size. In breccias on the Anuk property, rounded to irregular quartz grains are conspicuous and are partly granular aggregates rather than single grains. In the same breccias, dispersed volcanic rock fragments reach a size of 2 inches, and are variously rounded, ovoid, or subangular. Some metamorphosed rocks in the north part of this belt are quartzofeldspathic hornfelses which retain a porphyritic texture and are more siliceous than any other rocks examined in this division.

A *graphitic argillite (5) and limestone (4)* division succeeds to the west and is mapped northward for a distance of scarcely more than 2 miles, its outcrops being restricted to a southern group near the New road at the head of Peachland Creek and a northern group about one-half mile north of Brenda Lake. Strata exposed in the southern group possess mainly moderate westerly dips in common with the preceding rocks, whereas those in the northern group dip toward the southeast at a moderate angle in common with the succeeding rocks. In probable westerly sequence, the southern exposed strata include two black limestone beds, each 200 or 300 feet thick and separated by well-bedded limy tuffaceous greywacke and grit, and soft, graphitic black argillite interbedded with tuffaceous greywacke and siltstone beds which are not limy. The limestones are graphitic, recrystallized, schistose, fine-grained rocks containing rare quartz grains and particles of chert. Their schistosity shows minor dragfolds plunging southward at 40 degrees. Seen under the microscope, the limy tuffaceous greywacke comprises closely packed grains of broken zoned plagioclase, discrete crystals of hornblende and of calcite, and particles of chert or cherty rocks. The black argillite and greywacke are similar to those wholly comprising the northern group of outcrops and are much broken and disturbed by small faults, some of which follow the bedding. They are thin-bedded incompetent rocks, and the soft graphitic argillite has in places squeezed discordantly into faults.

Rocks of a fourth *greywacke* division (6) occupy probably a structurally discordant position in relation to the preceding strata. Along the Noranda road they extend with east-northeasterly strike and steep southerly dip across the apparent strike of the two preceding divisions, against which a faulted contact is suspected although not precisely located. Near the old Pennask road, the strata are thin- to medium-bedded volcanic greywackes and siltstones which are light to dark grey in colour but are bleached white along numerous quartz-bearing fractures lying both on and across the planes of bedding. Scour features seen in the beds at this locality suggest that these rocks are right-side-up. Eastward and close to the Brenda stock, these rocks become increasingly metamorphosed to hornfels and their predominant attitude, as shown by preserved bedding, changes abruptly to one of northwesterly strike and westerly dip, which is outward from the stock. Unfortunately, few attitudes are recorded for the northernmost strata mapped. The hornfelsed strata have a dense quartzitic appearance and a dark-brown colour on much of the fresh surface due to recrystallization and the presence of abundant finely distributed biotite throughout most of the rock, which is nevertheless traversed by numerous light-coloured irregular bands or bleached zones. Sericite is developed on cleavage surfaces whose intersections produce a rodded appearance in freshly broken outcrops. Under the microscope, the hornfelsed rocks are almost entirely a fine-grained foliated mosaic of quartz, plagioclase feldspar, biotite, and rarely hornblende, with lenses, layers, and patches that are either richer or poorer in the dark minerals.

*Schistose hornfels* (2) forms the easternmost division and occupies a belt one-quarter mile wide adjoining the Brenda stock for a distance of 3 miles northward from Peachland Creek. At its western boundary, where the rock passes into recognizable porphyritic tuff and breccia, bedding and schistosity possess different attitudes although both are west dipping. Schistose hornfels weathers dark brown and is a grey, siliceous, finely granular rock with scattered plagioclase crystals the size of those in porphyritic tuff. It is characterized by undulating planes of foliation and schistosity, spaced at most a few millimetres apart, on which biotite is heavily concentrated partly as plates 4 millimetres across and on which a fissility develops in weathered rock. Wider-spaced cleavage planes, also with biotite, intersect the foliation to produce a visible lineation or rodded appearance on exposed fissile surfaces. Small lenses of granular quartz and flesh-coloured feldspar occur in the foliation, and larger lenses variously of quartz and pegmatite are aligned mainly northwestward across the foliation. Under the microscope, schistose hornfels appears as a foliated fine-grained quartzofeldspathic mosaic containing disseminated biotite and chlorite, lenticular knots of biotite, single unzoned plagioclase crystals and, locally, grains of quartz. Potash feldspar is sporadically present in small patches.

Nicola rocks in the eastern part of the area have been little mapped and their relationship to those farther west is unknown. At localities east of Peachland Lake and 2 miles farther northeast respectively, they include calcareous rocks (1) which lie close to major intrusions and are metamorphosed to white crystalline marbles containing wollastonite and tremolite. Associated grey banded strata which are quartzofeldspathic hornfelses variously with diopside, hornblende, and biotite, chiefly possess easterly strikes and inward dips, as though the two localities were on opposite limbs of a simple syncline. Bedded rocks on a ridge south of MacDonald Creek, in the eastern part of the mapped area, are associated with porphyritic hornfels bodies probably representing early dacite sills or dykes.

### *Tertiary(?) Conglomerate (16)*

The sole representative of post-Nicola, pre-Glacial strata seen in the area is a thin patch of conglomerate in an outcrop a few yards wide at approximately 5,800 feet elevation, by the roadside about 1¼ miles north of Brenda Lake. Probably Tertiary in age, the conglomerate rests flatly on Nicola rocks, is unsorted, and contains partly well-rounded grains, pebbles, and cobbles mostly of grey feldspar porphyry or porphyritic tuff, grey and black cherty rocks, and quartz diorite, which are accompanied in a gritty argillaceous matrix by angular grains of quartz and kaolinized feldspar. Many pebbles have rusty and manganiferous coatings. The surface of the outcrop is glacially polished and striated.

### *Plutonic Rocks*

(i) THE BRENDA STOCK.—This incompletely mapped body extends for a known distance of 7 miles northward from Peachland Creek and is in contact with Nicola rocks to the west. To the northwest, north, and east its limits are unknown, and to the southeast and south, near Peachland Lake and outside the mapped area near Headwaters Lakes respectively, it is succeeded after a covered interval by quartz diorite and quartz monzonites which make contact with Nicola rocks. As mapped, the stock is composed of four gradational units of quartz diorite in successive belts extending northward and northwestward roughly parallel to the western intrusive contact, and a related, partly discordant unit named the Fine quartz diorite. In easterly and northeasterly directions across the strike of the units, the stock has minimum widths of as much as 4 miles.

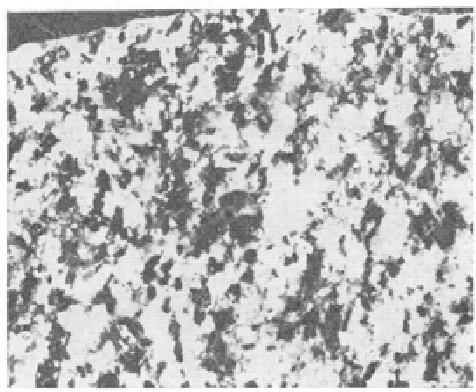
(*a*) *General Description of the Rocks.*—Quartz diorites respectively forming the five units share a general resemblance yet have distinctive field appearances, allowing them to be mapped separately. They each consist of quartz, plagioclase, potash feldspar, hornblende, and biotite together with accessory amounts of magnetite, apatite, and sphene. Combined slight variations in the size, shape, relative distribution, and quantity of these mineral components occur between units and account for the visible differences in the rocks (*see* Plates V and VI).

The rocks are grey in colour, more or less porphyritic owing to the presence of unequal-sized crystals, and tend mostly to be rather fine grained (average crystal size between 1 and 2 millimetres). They have a perceptible foliation which is due to the parallelism of platy and elongate crystals and is recorded from place to place on the map (*see* Fig. 22). Needle-like hornblendes locally are preferentially aligned in the plane of foliation, producing a lineation which is difficult to measure and is therefore not recorded. Co-existing foliations were seen, of which the dominant one alone was recorded and was mostly related to the smaller crystals in the rock. With exceptions, the strike of foliation is more or less parallel to adjacent contacts of units, and the dip is mostly either close to vertical or westward at moderate to steep angles.

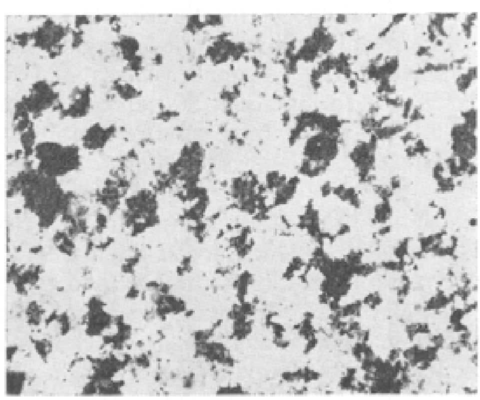
Foreign rock inclusions of rounded or subangular shape are scattered throughout the stock and commonly lie in the foliation. They range in size from less than 1 inch to as much as 2 feet in length. Many now have the composition of a dark fine-grained quartz diorite; others are of porphyritic hornfels and probably represent pieces of the Nicola country rock.

Jointing, or fracturing, and widespread composite aplite-pegmatite lenses are features subsequently described whose formation relates probably to the cooling stage of the host rocks.

Subject to some variation, textures and compositions of all the rocks are similar and best described in terms of the component minerals. Generally a wetted surface of the rock shows the features to best advantage when using a pocket-lens. Quartz forms about 25 per cent by volume of most rocks and has a granular-interstitial habit, being partly as discrete anhedral grains or aggregates of grains, some as large as one-half centimetre, and partly as small wedges and fillings between other minerals. Plagioclase feldspar forms about 50 per cent of most rocks and occurs as white or pale-green tablets, rarely three-quarter centimetre long and generally not exceeding 3 or 4 millimetres. It shows striations due to multiple twinning and, under the microscope, a prevalent compositional zoning. According to optical measurements, the majority of its crystals consist principally of material with compositions between $An_{38}$ and $An_{47}$, which are in the andesine range, and therefore the rocks are properly termed quartz diorites, rather than granodiorites as they have usually been called. Irregularly bounded margins of the crystals consist of a more sodic material of composition approximately $An_{23}$, which is an oligoclase. Internally many crystals show oscillatory zoning involving only slight changes in composition. Small plagioclase crystals in larger ones appear to be the result of accidental inclusion during growth of the feldspar. Potash feldspar forms between 5 and 20 per cent by volume of most rocks, and it consists of orthoclase and microcline which are partly in irregular mutual contact. This pink or flesh-coloured feldspar occurs typically as broad sieve-like masses up to 1 centimetre across and crowded with other crystals, especially of plagioclase and quartz. Cleavage in these scattered masses reflects the sunlight and helps to identify them in outcrop. Small grains and interstitial patches of potash feldspar occur throughout the rocks, and a further small amount is finely intergrown with quartz adjoining plagioclase crystals, as micropegmatite of microscopic size. Hornblende and biotite together form between 10 and 15 per cent of most rocks, and they occur mostly in more or less equal amounts. Hornblende makes bladed, dark and lustrous crystals, rarely as long as 1 centimetre, which commonly enclose small crystals of quartz and plagioclase. Due probably to

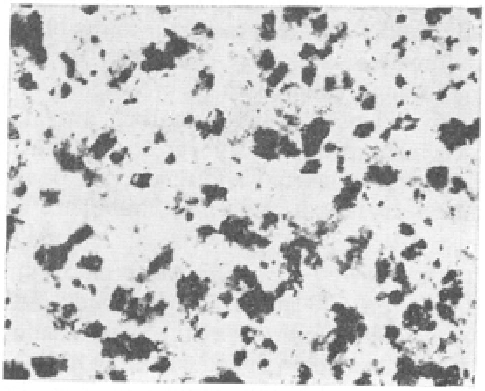


(a)

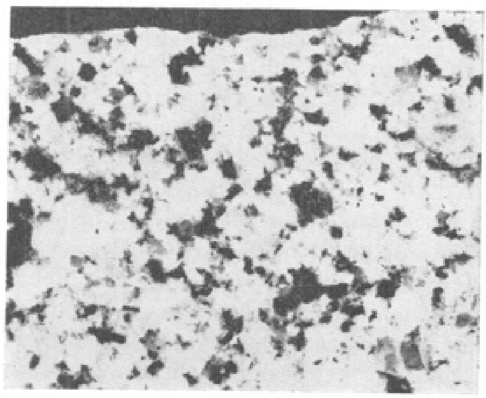


(b)

Plate V. Rocks of the Brenda stock: (a) Medium quartz diorite; (b) Speckled quartz diorite.



(a)



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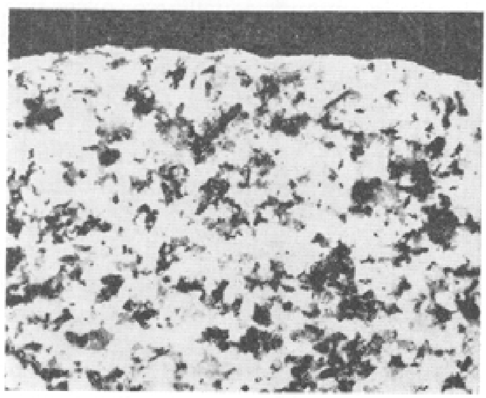

(c)

Plate VI. Rocks of the Brenda stock: (a) Uniform quartz diorite; (b) Porphyritic quartz diorite; (c) Fine quartz diorite.

alteration, hornblende may also contain minute plates of biotite which, if abundant, become detectable in the field. Biotite is mostly in shiny black plates and thin books rarely as wide as 4 millimetres and partly containing small quartz and plagioclase crystals. Under the microscope, some biotite is brown and other is green; apparently the green biotite is later and partly related to rock alteration. Of the accessory minerals, none of which form as much as 1 per cent in most rocks, magnetite is in small to rounded grains partly clustered and tending to be alongside hornblende or biotite, and sphene makes crystals as long as 1 millimetre and is readily visible in some rocks.

(*b*) *Medium Quartz Diorite (7)*.—This westernmost unit of the stock occupies an uninterrupted belt between 500 and 1,500 feet wide along the Nicola contact. The contact, as seen at the creek southeast of the Brenda camp and at the Marn No. 16 showing, is sharp, irregular, and unchilled. Locally it dips outward fairly steeply. Blocks of schistose and hornfelsed Nicola country rock are isolated in the intrusive, which sends dykes of unchilled quartz diorite for some distance into the wallrocks. A rough-weathering rock, the Medium quartz diorite is relatively dark and inhomogeneous, although less so with distance from the outer contact, and it has a medium-grained appearance due to a high content of crystals larger than 2 millimetres (*see* Plate V (*a*)). Foliation is mostly well developed, and the rock is commonly streaky due to local variation of the dark mineral content. Hornblende mostly exceeds biotite in amount, and its crystals may reach a length of 2 centimetres. Quartz is partly wedge-shaped, and the larger grains have a blue colour in some outcrops. Potash feldspar is less abundant in this rock than others. The estimated range of modal compositions of the Medium quartz diorite is as follows: Quartz, 10 to 30 per cent; potash feldspar, 0 to 5 per cent; plagioclase, 45 to 60 per cent; hornblende and biotite, 10 to 30 per cent; magnetite, etc., 1 per cent.

(*c*) *Speckled Quartz Diorite (8)*.—This unit largely contains the Brenda orebody, and it occupies an uninterrupted belt between 800 and 2,000 feet wide in gradational or intermingled contact with the Medium quartz diorite. The same rock is recognized nearly 3 miles farther east as a single mapped outcrop to the north of MacDonald Creek, where it is separated from the main belt by a wide expanse of the Porphyritic quartz diorite.

Characteristic features aiding recognition of the rock include: A speckled appearance due to the interspersion of small biotite and hornblende crystals with larger ones; the presence of biotite in amounts equalling or exceeding those of hornblende, and its occurrence chiefly in sieve-like shapeless plates of size to 4 millimetres; a prismatic or needle-like shape of most hornblende crystals; and a finely granular appearance of most quartz (*see* Plate V (*b*)). Quartz tends to be blue-coloured, as in certain other units. The estimated range of modal compositions of the Speckled quartz diorite is as follows: Quartz, 20 to 25 per cent; potash feldspar, 10 to 15 per cent; plagioclase, 45 to 55 per cent; hornblende and biotite, 15 per cent; magnetite, etc., 1 to 2 per cent.

(*d*) *Uniform Quartz Diorite (9)*.—This unit comprises two segments 2 miles apart on the east edge of the main belt of Speckled quartz diorite, into which its rock appears to grade within one or two hundred feet. It is not known to exist as far south as the Brenda orebody.

Like the Speckled rock, the Uniform quartz diorite is predominantly medium grey in colour. It is distinguished chiefly by the even distribution of its dark minerals, of which hornblende is the best shaped and most abundant (*see* Plate VI (*a*)). Biotite occurs mostly in small plates, which are partly euhedral, and rarely in books as large as 3 millimetres. Quartz is also mostly fine grained but locally makes aggregates as large as one-half centimetre and containing small feldspars. The estimated range of modal composition of the rock is as follows: Quartz, 20 to 30 per cent; plagioclase, 40 to 55 per cent; potash feldspar, 5 to 15 per cent; hornblende and biotite, 12 to 15 per cent; rest, 1 per cent.

(*e*) *Porphyritic Quartz Diorite (10)*.—This unit extends almost continuously for the whole mapped length of the stock and has well-exposed gradational contacts, assignable to an accuracy of 40 feet, with the Speckled and Uniform quartz diorites. The rock is lighter coloured than others, and it generally has few inclusions. Dark minerals are relatively sparse and scattered and, together with quartz which forms ½-centimetre aggregates, they give the rock a porphyritic appearance (*see* Plate VI (*b*)). Biotite is typically in well-shaped books of size to one-half centimetre and it exceeds hornblende in amount. Hornblende makes relatively few crystals as large as 2 millimetres; quartz fails to occur in wedge shapes. The estimated range in mode of the rock is as follows: Quartz, 20 to 30 per cent; plagioclase, 45 to 60 per cent; potash feldspar, 8 to 15 per cent; biotite and hornblende, 10 to 15 per cent; rest, 1 to 2 per cent.

(*f*) *Fine Quartz Diorite (11)*.—This unit comprises two incompletely mapped bodies in the northern part of the area. The bodies are connected narrowly at surface in the vicinity of the Jef No. 43 showing, and the western body extends as far south as drill-holes on the south side of Long Lake, beyond which no Fine quartz diorite is known to occur. The rock is apparently emplaced mainly discordantly to other units of the stock.

In several places it appears to have unchilled, intersheeted intrusive contacts against the Porphyritic quartz diorite. The nature of its contact against the Uniform quartz diorite is uncertain, whilst against the Speckled quartz diorite its edge is marked by a zone of unusual quartz diorites which partly are banded and locally contain numerous dark inclusions variously of hornblendic quartz diorites and of hornfels.

Although appearing rather like the Speckled quartz diorite, the Fine quartz diorite is somewhat finer grained and lighter coloured; it possesses quartz partly as small wedges, hornblende partly in excess of biotite, and biotite in plates and thick books mostly smaller than those in the Speckled quartz diorite. Additional useful features for identification are blue quartz grains, a well-developed foliation, unusually abundant sieve-crystals of potash feldspar, and well-shaped hornblendes and biotites distributed patchily in the rock (*see* Plate VI (*c*)).

The estimated range of modal composition of the Fine quartz diorite is as follows: Quartz, 20 to 30 per cent; plagioclase, 40 to 55 per cent; potash feldspar, 10 to 15 per cent; hornblende and biotite, 10 to 15 per cent; rest, 1 per cent.

(ii) SOUTHERN QUARTZ DIORITE (12).—A separate plutonic body of unknown size in the southwest part of the area has not been mapped in detail and its partial outline is taken from a company map. The sole outcrop visited is of a rather fine-grained quartz diorite similar in many respects to the Fine quartz diorite of the Brenda stock, yet evidently a different rock because (*a*) biotite greatly exceeds hornblende, (*b*) hornblende is not needle-like, and (*c*) quartz is restricted to grains not larger than 1 millimetre.

(iii) SATELLITE QUARTZ DIORITE (13).—This distinctive fine-grained quartz diorite is exposed on the Noranda road about 1 mile west of the Brenda stock, where it probably forms an isolated intrusive plug. It is a light-grey uniform rock with scattered ½-centimetre phenocrysts variously of plagioclase, hornblende, and biotite. It possesses a good foliation, consists mostly of crystals little larger than 1 millimetre, and differs significantly from rocks of the Brenda stock by not having larger enclosing crystals of potash feldspar.

(iv) Mixed Quartz Diorite (14).—This unit is restricted to the southeast part of the area, where it outcrops in three places as much as 1¼ miles apart on either side of the Old road. Despite the intervention of quartz monzonite, which is probably later, all three occurrences of Mixed quartz diorite probably belong to a single stock-like body which is intrusive into Nicola rocks and has unknown relationships to the Brenda stock, from which it is separated by a wide expanse of covered ground near MacDonald Creek.

The Mixed quartz diorite is a streaky, banded, and patchy rock which makes massive lightly jointed outcrops, is mostly fresh, and contains resorbed rounded inclusions now having the composition of a quartz diorite. Its weathered surface commonly is rough and pitted and exhibits lighter-coloured lenses, bands, and streaks in a predominantly dark-grey rock. Pale-coloured pegmatite lenses partly containing quartz veinlets further diversify the appearance of the outcrop. The contact of the quartz diorite against hornfelsed Nicola rocks is not chilled. Foliation in the rock is partly expressed by streaky compositional variations and partly by crystal alignments.

The three main varieties of the Mixed quartz diorite are in intimate association, which may range from inch-wide patches and bands of one variety in another to zones several feet wide of one against another. One variety is a fine-grained dark quartz diorite with a decussate or criss-cross texture due to abundant small hornblende needles and a porphyritic appearance due partly to thin biotite books, which are sieve-like and as large as one-half centimetre, and partly to scattered plagioclase phenocrysts.

A second variety is a medium-grained rather light-coloured quartz diorite with either mainly biotite or mainly hornblende, or both, present in long crystals of size to one-half centimetre. A third variety is a medium-grained dark quartz diorite consisting of as much as 30 per cent by volume of hornblende and biotite, the former in ½-centimetre-long crystals and the latter in equally large sieve-like plates. Quartz in all three rocks forms poikilitic enclosing masses or interstitial wedges and grains and, under the microscope, plagioclase crystals show a complex oscillatory zoning. Where present, orthoclase feldspar forms large enclosing masses or sieve-crystals, similar to those in the Brenda stock.

On the Old road farther east beyond the map limit, quartz diorite is increasingly altered, inhomogeneous, and mixed with granitic rocks, and may not all belong to this unit.

(v) Quartz Monzonites (15).—Compared to quartz diorite, these quartz-rich rocks contain more potash feldspar, which is present in approximately equal amount with plagioclase. They occur mostly in the southeastern part of the mapped area, where they intrude Nicola strata and the Mixed quartz diorite, and they extend beyond the area both to the east and southeast, where they are intimately associated with quartz diorites.

Quartz monzonite, which occurs east of Peachland Lake and about 1¼ miles farther east near the Old road respectively, is a medium-grained grey to pink porphyritic rock containing aplite dykes and quartz veins. It lacks both chilled contacts and a measurable foliation, and generally it contains only a few small resorbed inclusions, although at its contacts it encloses blocks of Nicola strata or Mixed quartz diorite. The quartz monzonite has conspicuous 2-centimetre-long crystals of pink potash feldspar, less obvious ones of plagioclase, and others of quartz no larger than 4 millimetres. Small plates of biotite are accompanied in the rock by equally small crystals of hornblende. Under the microscope, potash feldspar is seen to be partly orthoclase-microperthite and partly microcline, which is locally interstitial to other minerals; plagioclase shows strong oscillatory zoning and has optically measured composition largely in the range of andesine ($An_{37}$); the rock texture is granitic due to the assorted size and general shapelessness of the component crystals; and minor patches of micropegmatite are developed by intergrowth of quartz and potash feldspar. Dark minerals are partly chloritized. The estimated modal composition of this rock is as follows: Quartz, 30 per cent; plagioclase, 30 to 35 per cent; potash feldspar, 30 per cent; biotite, hornblende, etc., 5 to 10 per cent.

A cream- to buff-weathering variety of quartz monzonite outcrops south of MacDonald Creek on a ridge 1½ miles north of the Old road and intrudes the Nicola strata without chilled contacts. It is a light-grey rock which, being impoverished in dark minerals, could be called alaskite. Its texture is sugary and the crystals appear shapeless and mostly of size less than 3 millimetres, although quartz is partly loosely aggregated in masses as large as three-quarter centimetre. Potash feldspar appears white rather than pink, and biotite is present in very small amounts. Under the microscope, plagioclase shows oscillatory zoning, potash feldspar is mostly in the form of twinned orthoclase, and rare crystals of allanite are identified. The estimated modal composition of the rock is as follows: Quartz, 35 per cent; plagioclase, 30 per cent; potash feldspar, 35 per cent; rest, trace.

At the same locality and in apparent gradational contact with the preceding rock is a reddish-coloured fine-grained porphyritic quartz monzonite which is speckled with small more or less elongate biotite crystals and a few sieve-like patches of hornblende. It contains phenocrysts as large as one-half centimetre, variously of plagioclase and potash feldspar, but mostly the rock consists of fine crystals arranged in a sugary aplitic texture. Its estimated modal composition is as follows: Quartz, 35 per cent; plagioclase, 25 per cent; potash feldspar (microcline), 35 per cent; biotite, hornblende, etc., 5 per cent. An unusual feature, whereby the sugary crystals partly occur deep within the larger crystals, suggests that this rock is to some extent the product of recrystallization.

The only other known occurrence of quartz monzonite is at the Marn No. 16 showing in the northwest part of the mapped area. There a light-coloured rather fine-grained quartz monzonite, with some biotite and closely resembling the alaskite described above, is locally present immediately at the edge of the Brenda stock. The rock is unchilled and apparently was emplaced subsequently to the stock.

### *Aplite-Pegmatite*

Narrow lenses composed either compositely of aplite and pegmatite or simply of one or other of these rocks occur in all mapped plutonic units, with the apparent exception of the Satellite quartz diorite and also in the adjoining Nicola country rock. Being of granitic composition, these lenses are coloured variously pinkish-white, pinkish-grey, or pink. In the composite lenses, aplite commonly occurs more or less centrally within a marginal envelope of pegmatite, the mutual contacts being more or less irregular. Pegmatite consists almost exclusively of quartz and potash feldspar (mainly microcline) variously in crystals partly as coarse as 2 inches and in dense finely graphic intergrowths, all tending to possess comb-structure due to their manner of growth inward from the walls of the pegmatite body. Blobs and short lenses of nearly pure quartz occur in the pegmatite, which, under the microscope, further reveals a small content of green biotite, epidote, and allanite. In contrast, aplite is a fine-grained slightly porphyritic rock which has a sugary texture and consists of quartz, microcline, plagioclase, and minor green biotite as grains ranging in average size from 0.05 to 0.3 millimetre. From place to place in individual aplites different intensities of pink coloration are seen, which result from different

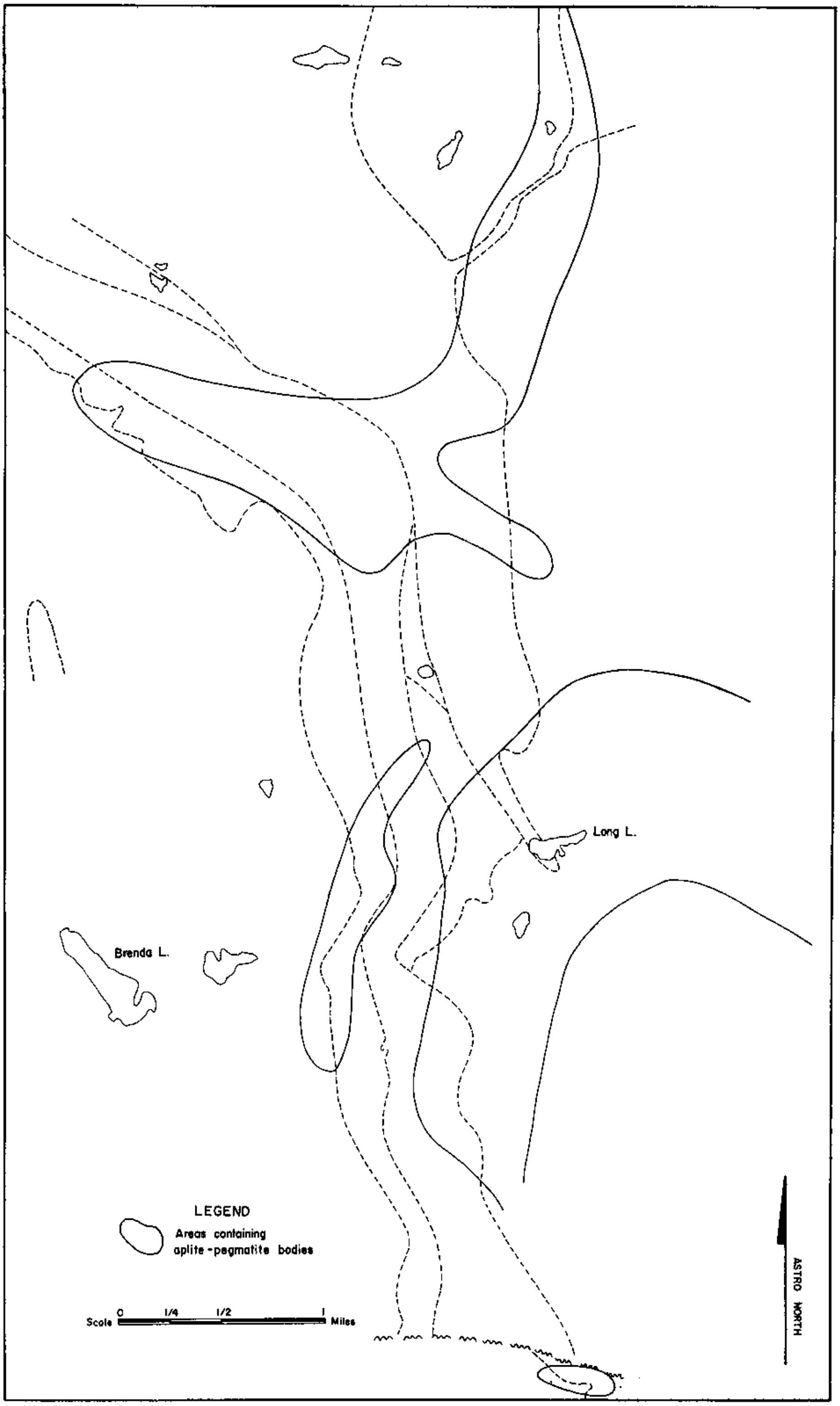


Figure 23. Recorded distribution of aplite-pegmatite bodies in the Brenda stock.

amounts of contained microcline, and this mineral occurs rarely in sieve-like crystals as large as one-half centimetre. Aplite-pegmatite lenses invariably possess sharp walls, and the enclosing rock shows an alteration which is seen under the microscope to involve a partial recrystallization and the formation of new microcline and green biotite.

Aplite-pegmatite lenses mapped in the Brenda stock and the adjacent Nicola rocks are restricted to certain areas which largely transgress unit contacts and cannot be readily explained by the exposed geology (*see* Fig. 23). The lenses occurring west of a northerly line through Long Lake mostly possess northwesterly strikes and moderate to steep easterly dips, whilst those lying east of this line possess strikes mostly to the east of north and dips that are mostly steep in either direction. Lenses are perhaps most abundant in an area extending from the Brenda orebody to Long Lake. Where studied in some detail near the Brenda orebody, the lenses tend to occur in echelon as though mainly following an irregular system of tension fractures of northwesterly strike and easterly dip. Each lens may have a length ranging from a few feet to many tens of feet and a maximum width ranging from 1 inch to 2 feet; examples were seen of a 4-inch-wide lens persisting for 80 feet before pinching out and of a 2-inch-wide lens persisting for 40 feet. Where one lens ends, another may start on a parallel course a few feet to one side. In places minor branches project at small angles from the lens, and rarely a lens encloses isolated fragments of quartz diorite. A lens may undergo repeated jogs by turning abruptly for distances of less than an inch in directions which are generally paralleled by well-developed later cross-fractures. Although numerous in the eastern part of the orebody, aplite-pegmatites fail completely to occur in that part of the orebody lying west of a curved line which passes through the old high-grade showing (*see* Fig. 25) and then continues southeastward to skirt the west side of the Anuk River Mines showing on the Mac claims.

On the Jef Nos. 29, 30, 41, and 43 claims in the northern mapped part of the stock, aplite-pegmatite occurs partly with breccia in such a way as to suggest that it formed simultaneously with the latter. Just east of diamond-drill hole No. NB-12 and south of the access road, breccia is well exposed in a northeasterly direction for approximately 150 feet and across a width of about 40 feet. Immediately to north and south of the breccia, fractured Porphyritic quartz diorite is exposed. The breccia consists of more or less angular blocks and fragments mostly of quartz diorite that are encased mainly in an indurated grey fine-grained clastic matrix chiefly composed of the same minerals that form the quartz diorite. Aplite-pegmatite occurs in three ways, each apparently representing a successive generation of this material: (1) as pre-breccia lenses in blocks of quartz diorite, (2) as separate blocks as large as 1 foot that consist internally of pegmatite and marginally of aplite, (3) as a matrix of pegmatite in place of the usual grey matrix. At the Jef No. 43 showing farther east, aplite occurs in quartz diorite as narrow intersecting lenses partly with pegmatite and as fragments in breccia.

### *Dykes*

Between two and three dozen narrow sheet-like intrusions are shown on the map (*see* Fig. 22). They include types ranging in age from pre- to post-mineral and in composition from highly siliceous to basaltic. Dykes seen in the Nicola rocks are not all shown; for example, sill-like bodies of dark hornfelsed fine-grained porphyritic diorite in greywacke near the old Pennask road. Mapped dykes occur mainly in the Brenda stock and the Mixed quartz diorite and are most numerous from the Brenda orebody to Long Lake. They possess mostly steep dips and various strikes which are mostly northwesterly.

(i) QUARTZ DIORITE (Qd).—Three dykes consisting of light-coloured aplitic-textured porphyritic biotite quartz diorite, or granodiorite, are emplaced in the Brenda stock, although they are not shown on the map. None is longer than 30 feet and wider than 4 feet, and, being unchilled and containing irregular lenses, patches, and veins of aplite-pegmatite, they probably formed early in the cooling of the stock. Two possess northwesterly strikes and lie 1,000 feet apart in the Medium quartz diorite east of MacDonald Lake; the third strikes slightly east of north in the Porphyritic quartz diorite 1,500 feet southeast of Long Lake. Under the microscope the rock of all three dykes shows strongly zoned plagioclase crystals, rarely as large as 4 millimetres; microcline partly in 3-millimetre sieve-like crystals; quartz partly in 2-millimetre grains and larger aggregates; biotite mainly in brown, enclosing plates as large as 4 millimetres and in fine green meshes of later formation; occasional patches of micropegmatite adhering to plagioclase and quartz crystals; and an enveloping groundmass composed of small (0.2 millimetre) grains variously of quartz, plagioclase, and microcline. The estimated range in modal composition of the rock is as follows: Quartz, 30 to 35 per cent; plagioclase, 35 to 40 per cent; microcline, 20 to 25 per cent; biotite, 3 to 5 per cent; accessories (magnetite, chlorite, etc.), trace.

Three types of quartz diorite dyke designated Qd occur at separate localities spaced widely across the map in a northwesterly direction. The first type is represented by a single unchilled dyke in the southeast which strikes northeastward in the Mixed quartz diorite and contains aplite-pegmatite. It differs from the last-described type in its texture, which is less porphyritic, more equigranular, and involves crystals of average size about 1 millimetre, and in its more densely speckled appearance, which is due to biotite forming as much as 10 per cent of the rock. Potash feldspar (as both orthoclase and microcline) is partly finely granular and partly sieve-like in crystals as large as three-quarter centimetre.

A second type is restricted to dykes forming a local swarm to the west of George Lake, mainly in a north-northwesterly shear zone within the Uniform and Porphyritic quartz diorites. Dykes ranging in width up to 15 feet are closely spaced across a 200-foot-wide zone of intricately sheared rock that causes the dykes to branch, split, and jog partly in the systematic fashion indicated on the map. The dykes are pre-mineral, being strongly altered and cut by numerous fractures filled variously with epidote, calcite, quartz, microcline, and limonite, with pyrite and chalcopyrite disseminated locally nearby. At their edges the dykes are chilled to an aphanitic dark andesite porphyry. Internally the rock is dark grey and slightly porphyritic due to scattered crystals of plagioclase and biotite, which occur in a finer groundmass mainly of plagioclase and quartz. Also in the groundmass and giving it a felted appearance are criss-crossing green needles, which are resolved under the microscope as remarkably elongate, matted intergrowths of secondary green biotite. The same green biotite also replaces the margins of a few preserved hornblende crystals, which reach a size of 3 millimetres and probably were originally plentiful in the rock. There are also strongly zoned crystals of plagioclase; irregular, partly interstitial grains of quartz; patches of calcite, sphene, epidote, and chlorite; and disseminated magnetite and pyrite. The estimated quartz content is 15 per cent and the biotite content 10 or 12 per cent, and the average grain size of the rock is less than 1 millimetre.

The third type is represented far to the northwest, in Nicola strata south of the Marn No. 16 showing, by a wide and irregular unchilled dyke of rather fine-grained quartz diorite that strikes parallel to the northwest-trending edge of the adjacent Brenda stock and cannot readily be correlated with any unit of the stock. The rock is fresh, very slightly porphyritic, and heavily peppered with biotite and hornblende, of which the latter is mostly in long disoriented crystals that give the rock a somewhat felted appearance. Although not conspicuous under the pocket-lens, potash feldspar is represented visibly under the microscope by orthoclase in small well-distributed grains.

(ii) DACITE (D).—A few dykes of dacitic composition (marked D on the map) occur mainly in the Brenda stock and are weakly mineralized in part. They fall into three types, one of which occurs chiefly on the Anuk property south of the Brenda mine as dykes in outcrop or inferred from company drill logs. These chilled dykes strike apparently northeasterly, dip toward the east, and are partly emplaced along faults. They are as much as 10 feet wide and consist of a dark fine-grained rock that is easily mistaken for andesite and possesses inconspicuous altered crystals of plagioclase and elongated hornblende as large as 3 millimetres in a dirty grey, faintly granular groundmass. Under the microscope, hornblende is seen to be altered to meshes of green biotite; plagioclase is strongly zoned and turbid; apatite and sphene are identified; and the variably fine groundmass is resolved mostly as plagioclase and quartz and as micropegmatite, chlorite, magnetite, and rare pyrite. Far to the north and chilled against Nicola rocks near the Marn No. 16 showing, a single narrow easterly trending dyke apparently also of this type is mapped, and is lighter coloured and more intensely altered than the Anuk dykes.

A second type of dark dacite occurs as two northwest-trending narrow chilled dykes a mile apart due north of Long Lake. Both dykes contain minor disseminated pyrite, and the northern dyke is epidotized and also traversed by quartz veins. Under a hand-lens the rock of these dykes is vaguely crystalline, darkly felted, and exhibits badly shaped, partly bladed crystals as long as 2 millimetres of plagioclase and altered dark minerals. Under the microscope the rock resembles a fine-grained quartz diorite, consisting mostly of criss-crossing laths and needles of gently zoned plagioclase and brownish-green hornblende respectively, and interstitial sodic plagioclase and quartz. Hornblende is twice as abundant as biotite, which forms small green plates; together with chlorite and magnetite, these dark minerals comprise about 30 per cent of the rock. Calcite and epidote are present as alteration products.

A third type of dacite, more like the quartz porphyries present in many mining camps, is represented by a single mapped dyke possessing a northeasterly strike immediately north of Long Lake. The dyke is buff weathering, fractured, and veined by epidote and by quartz with minor chalcopyrite. On a fresh surface the rock is medium grey, porphyritic, and displays biotitized hornblende, which is either stubby or elongate and as large as one-half centimetre, fleshy to grey plagioclase as large as 3 millimetres, smaller biotite, and still smaller rarer quartz. These crystals, which comprise nearly half the volume of the rock, are partly aligned to produce a foliation and occur in a dense grey matrix that is resolved under the microscope as a fine quartz-plagioclase mosaic. Other features seen microscopically include the rounding and embayment of quartz phenocrysts; the replacement of primary hornblende and biotite by fine green biotite; a turbidity in the plagioclase phenocrysts, which are strongly zoned; the presence of sphene; and the occurrence of epidote by alteration mainly of plagioclase.

(iii) FELSITE (F).—Approximately half a dozen felsite dykes (marked F) are mapped, all but one in a small area of the Brenda stock centred on George Lake. They are characterized by a light colour and low dark mineral content, and chiefly by a cherty aphanitic appearance. Some possess scattered crystals of sizes less than 3 millimetres and may be termed felsite porphyries. Compositionally the dykes range from highly siliceous to non-siliceous, or from dacite and quartz latite to andesite. Their dips are steep, their strikes range between west and north, and their width generally is only a few feet. Some are evidently pre-mineral and others apparently post-mineral in age.

Adjoining a topographic lineament which extends west-southwesterly from Long Lake are two occurrences of one or more dykes that strike parallel to the lineament and are of cherty felsite containing minute, scarcely visible crystals and coloured variously pale greenish, buff, or brown. The eastern occurrence is an irregular dyke 15 feet wide abutting against a previously described quartz diorite dyke (Qd) in a way that leaves doubt as to which was the first emplaced. The cherty felsite is strongly fractured, or crackled, and it possesses iron-stained surfaces lacking visible sulphide mineralization. Under the microscope it is identified mainly as a very fine-grained quartz aggregate containing minute plagioclase grains and wispy sericite, and with chlorite and calcite on fractures. The western occurrence, one-quarter mile distant and on the opposite, northern, side of the lineament, is 8 feet wide, greenish due to sericite, and is seen under the microscope to consist of fine-grained quartz and sericite with minor zoisite.

Two felsite porphyry dykes having the composition of quartz latite (equivalent to quartz monzonite) are mapped widely apart, and are apparently pre-mineral in age. The eastern dyke occurs more than 1 mile east of George Lake in the Porphyritic quartz diorite, and is fractured and locally mineralized by chalcopyrite in quartz. The dyke rock is cherty, battleship grey, pockmarked with minute quartz grains, and contains abundant pink clots that are smaller than one-half centimetre and consist of quartz-feldspar intergrowths indistinguishable from aplite. Under the microscope the clots of aplite and small broken crystals variously of quartz and microcline occur scattered in a groundmass of finely crystalline quartzofeldspathic material. The western dyke has an inferred west-northwesterly strike in Nicola strata some 2¼ miles distant to the west, and is pale and cherty, 8 feet wide, and exhibits a few small feldspar crystals which are variously white and flesh-coloured and are accompanied by minute visible quartz grains and a little disseminated pyrite. Under the microscope the feldspars are identified as both plagioclase and anorthoclase (a sodic microcline), and quartz is seen as highly corroded phenocrysts, all set in a fine inequigranular mosaic composed of quartz, plagioclase, potash feldspar, and sericite.

Narrow north-to-northwesterly felsite porphyry dykes which occur variously in the Speckled and Porphyritic quartz diorites between MacDonald Creek and the Brenda orebody are found nowhere else. The dykes are flow-banded, apparently unmineralized, and are pink-grey cherty rocks with scattered 3-millimetre fleshy or white plagioclase crystals, visible grains of magnetite and rare pyrite, and a few bladed relics of either hornblende or biotite. Under the microscope a total absence of quartz and an abundance of plagioclase in the groundmass suggest that these strongly sericitized and otherwise altered rocks are andesites in composition.

(iv) TRACHYTE (T).—Dykes of trachytic composition are apparently confined to a part of the area extending from the latitude of Long Lake southward to the Brenda orebody and thence southwestward beyond the stock. In this area, underlain variously by Nicola strata and the Speckled and Porphyritic quartz diorites, trachyte dykes that occur in four places are with one exception northwest-trending, steeply dipping, unmineralized dykes of uniform appearance and character. They range in width to 20 feet, possess sharp and somewhat irregular chilled contacts, and are cut by fractures filled partly by epidote and apparently also albite. At their intersection with a trachyte dyke, quartz-bearing fractures rapidly pinch out. The trachyte is a strikingly porphyritic rock with an aphanitic pinkish-grey groundmass and pink tabular feldspar crystals partly larger than 1 inch and locally comprising as much as half the rock by volume. These crystals commonly possess dark centres and are accompanied by smaller crystals of hornblende and by magnetite, sphene, and patchy green epidote. Under the microscope the large feldspars are identified as orthoclase with turbid plagioclase cores and clear albitic rims, and the finely crystalline, quartz-free groundmass is largely a mixture of both feldspars. Well-shaped green hornblende crystals which enclose magnetite, apatite, and sphene are altered in some dykes to greenish-brown biotite, calcite, and chlorite, whilst epidote is distributed variously throughout the rock as a further product of alteration. The modal composition of a typical specimen of one of these dykes is estimated as follows: Plagioclase, 35 per cent; potash feldspar (orthoclase and microline), 55 per cent; hornblende, 5 per cent; sphene, 2 per cent; apatite, 2 per cent; magnetite, 1 per cent.

Rare inclusions in one of these dykes, which cuts the Brenda orebody, are of interest in suggesting the kinds of underlying rock through which the dyke magma may have passed in reaching its present position. The inclusions are of two kinds, one being a slab of green hornblende-rich rock 3 inches long and one-half inch wide which is oriented parallel to adjacent crystals in the dyke and is seen under the microscope to be a tight aggregate mainly of interlocking disoriented hornblende crystals, partly as large as 2 millimetres and individually exhibiting zoning. Apatite, sphene, and magnetite form not only minute crystals enclosed in the hornblendes, but also larger ones existing freely in the aggregate. An intergranular cement is supplied partly by small amounts of shapeless feldspar, which is mainly plagioclase. In both its composition and texture the slab is similar to ultramafic accumulates such as commonly are formed in the lower levels of saucer- or funnel-shaped plutonic bodies by crystal settling or segregation.

The second kind of inclusion is represented by a more or less angular block of altered quartz diorite measuring 2 by 1½ feet and itself containing inclusions of dark-green hornfels. Both in outcrop and under the microscope, the quartz diorite shows considerable similarity to the Medium quartz diorite and may consequently indicate the underlying presence of a marginal unit of the stock.

An exceptional trachyte dyke strikes northerly near this other dyke in the Brenda orebody, and is a different and probably older type. It is 3 feet wide, dark, glassy, without visible crystals except altered ones of hornblende, and contains chalcopyrite and pyrite as trace amounts in the altered dark minerals. Under the microscope it consists very largely of orthoclase in fine plumose growths which are accompanied by plagioclase, chlorite, apatite, calcite, epidote, magnetite, and sphene.

(v) QUARTZ ANDESITE (A).—Quartz andesite dykes marked A on Figure 22 are widely dispersed in the Brenda stock and possess various strikes, which are mostly northwesterly. They are mostly narrow and chilled, and, being generally altered and in some cases cut by mineralized quartz veins, they may all be pre-mineral in age. The dykes consist of dark-coloured rock containing scattered flow-aligned phenocrysts of plagioclase and hornblende no larger than 2 millimetres. Under the microscope these crystals are seen to be strongly altered to sericite and green biotite, and calcite and epidote, respectively, and the fine-grained chloritic groundmass is seen to include quartz in small amount both as primary grains and secondary recrystallized patches. Magnetite is disseminated relatively abundantly in the rock and may be accompanied by introduced pyrite.

A northeasterly trending dyke which cuts the Mixed quartz diorite in the southeastern part of the area is included with this type, although it differs from the rest in containing fresh hornblende as abundant mainly small crystals that are accompanied by equally numerous partly altered ones of plagioclase.

(vi) LAMPROPHYRE (L).—Chilled lamprophyre dykes are known only at and near the Brenda mine, where they occur partly in faults. Never more than a few feet wide and tending to split and to branch, they possess northwesterly or west-northwesterly strikes and fairly steep southerly dips. Although strongly altered, all are apparently unmineralized, except for one seen underground whose margin is penetrated by a chalcopyrite stringer for a distance of approximately 1 inch. The dykes consist of a very dark fine-grained rock which partly exhibits small lustrous blades of hornblende and commonly possesses minute calcite-filled vesicles or patches, scattered specks of pyrite, and fractures filled either by chlorite or calcite. The microscope shows a felted sparsely porphyritic texture with brown or green hornblende amounting to one-quarter or one-third of the rock and forming well-shaped crystals rarely as large as 3 millimetres. These may be altered either to green biotite or to calcite and chlorite, and they are accompanied by abundant plagioclase laths and by a more sodic plagioclase interstitially and as veins. Also present are magnetite, epidote, and, in part, quartz.

(vii) EOCENE(?) ANDESITE (E).—Two closely spaced dykes trending north-northeasterly in sheared and mineralized Porphyritic quartz diorite on the Old road 2 miles southeast of the Brenda mine, and a third dyke which follows a west-northwesterly fault some 2,000 feet farther west are probably of Eocene age because of similarities to a dated dyke in the Highland Valley. These unmineralized dykes (marked E on Fig. 22) attain widths of 30 feet and consist of a light-grey, sparsely vesicular, fresh andesite porphyry in which crystals variously of clear plagioclase, black platy biotite, and rare needle-like hornblende reach a size of 2 millimetres and are aligned roughly parallel to the dyke walls. Near their walls the dykes enclose small angular to rounded fragments of a quartz diorite that is seen under the microscope to be silicified, biotitized, and accompanied by detached fragments of quartz and feldspars which are apparently also derived from quartz diorite. Together with the broken aspect of many crystals in the chilled marginal andesite, the fragmentation suggests that an explosion initiated the intrusion of these dykes.

Dykes resembling these in appearance and crystal assemblage occur on the New road near the Silver King property, 4 miles farther south and beyond the mapped area (*see* p. 212). Although called dacites, these dykes may be andesites which have been modified by the abundant introduction of quartz as agatiferous streaks, lenses, and patches throughout the rock. They have northerly trends, occur numerously as a swarm in strongly sheared quartz diorite, or granodiorite, and show alteration partly to chlorite and carbonates.

(viii) BASALT (B).—Two or more basalt dykes occur with unknown attitude in the core of Noranda drill-hole No. NB-21, which is 1¾ miles due north of Long Lake (*see* Fig. 22 and location on Fig. 26). Intersected altogether for many tens of feet, these dykes are chilled in the Porphyritic quartz diorite and consist of dark glassy rock which has a scoriaceous, minutely vesicular, and brecciated appearance. The rock contains small grains and crystals, seldom larger than 1 millimetre, and variously of plagioclase, quartz, and a serpentinous brown mineral, and it also encloses fragments of quartz diorite which are mostly less than 1 inch in size and either angular or irregular in shape. Under the microscope the rock is a glassy basalt with enstatite altered to serpentinous bastite, fresh augite, and foreign quartz crystals which have been incorporated and show reaction rims. Many crystals in

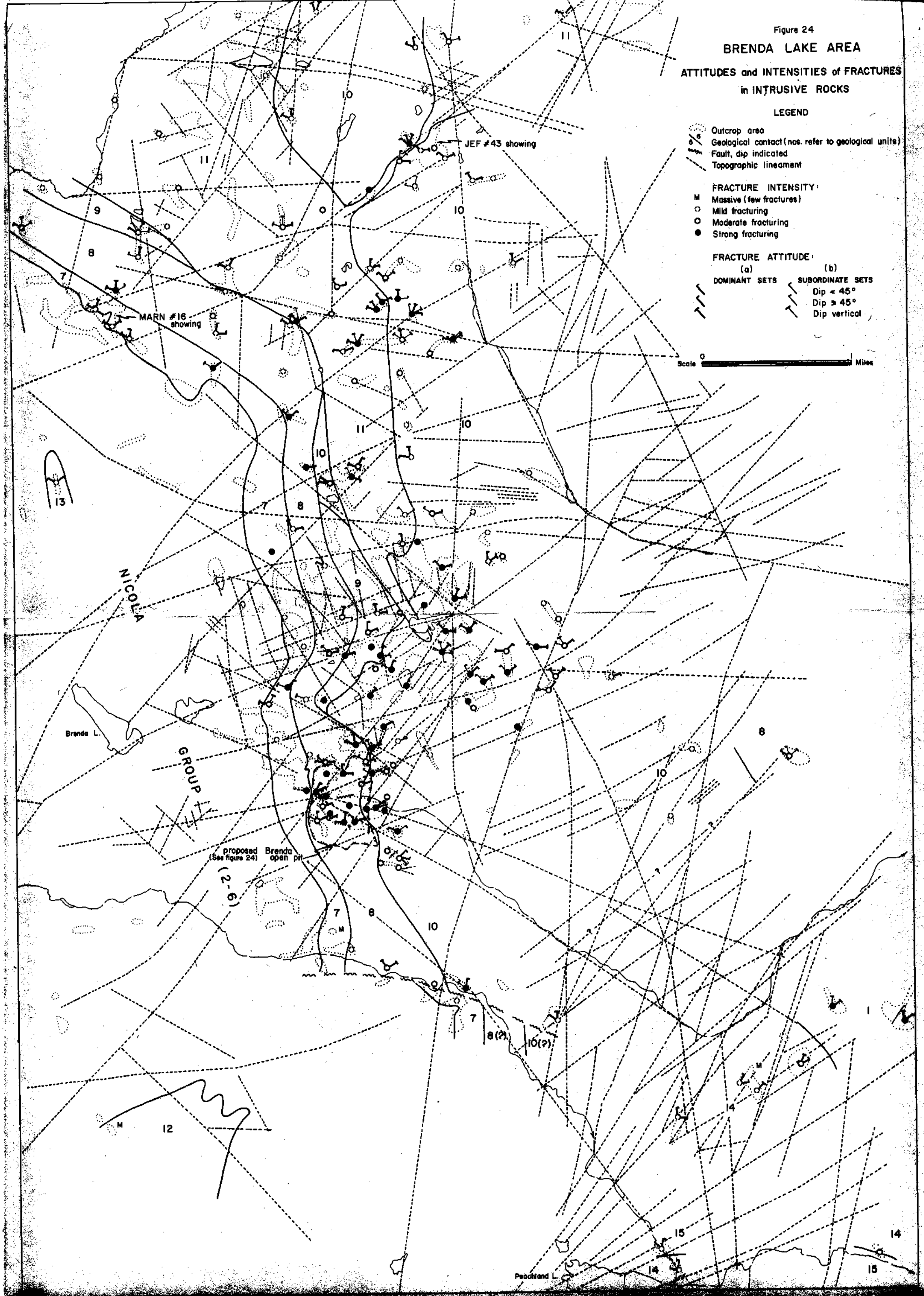
Figure 24
BRENDA LAKE AREA
ATTITUDES and INTENSITIES of FRACTURES in INTRUSIVE ROCKS
LEGEND
Outcrop area
Geological contact (nos. refer to geological units)
Fault, dip indicated
Topographic lineament
FRACTURE INTENSITY:
M Massive (few fractures)
Mild fracturing
Moderate fracturing
Strong fracturing
FRACTURE ATTITUDE:
(a) DOMINANT SETS
(b) SUBORDINATE SETS
Dip < 45°
Dip ≥ 45°
Dip vertical
Scale 0 1 Miles
JEF #43 showing
MARN #16 showing
NICOLA GROUP (2-6)
Brenda L.
proposed Brenda open pit
(See figure 24)
Peachland L.
8(?)
10(?)

the rock are broken as if by explosion. The rock is almost certainly post-mineral in age, and may be late Tertiary.

*Fractures and Faults*

Fractures are to some degree present in all the rocks and are planes of breakage with no evidence of appreciable movement on them. As such, they both resemble and include joints. More or less closely spaced parallel fractures form a set, of which as many as six may occur, all with different attitudes, and locally give the rock a columnar jointed appearance. Individual fractures may persist for many feet on strike, and those of a set may occur either in bunches or more or less evenly across the whole outcrop. Rarely a bunch curves to join a different set in the space of a few tens of feet. Where fracturing in one or more sets is intense, as many as 30 fractures per yard may be counted in each set. At fractures the rock may be altered to veins of quartz, feldspar, epidote, and other minerals, as described under "Rock Alteration and Mineralization." Fractures of particular sets may locally be more veined and mineralized than others. Apparent offsets of mostly less than 1 inch are observed at relatively few intersections of fractures either with one another or with aplite-pegmatites. Consequently fracturing was accomplished mostly without displacement of the wallrock, and filling was achieved largely by replacement. The general lack of offsets is illustrated by a photograph of intersecting mineralized fractures in the Brenda orebody (*see* Plate II (*b*), p. 111). Further discussion of possible modes of origin of the fractures is deferred to page 209.

Based on roughly quantitative measurements taken systematically whilst mapping, Figure 24 shows the attitudes and intensities of fractures in exposed plutonic rocks throughout the area. Observed fractures were measured irrespective of whether they are empty or filled, barren or mineralized, and those of moderate or steep dip received most attention. A zone of most intense fracturing appears on the figure to extend northeastward from the Brenda mine and is more or less dominated by northeasterly striking fractures. At the mine the dominant fractures strike east-northeasterly, dip more or less steeply southerly, and undergo a slight swing in strike, which produces a gently arcuate pattern that is convex northward (*see* Fig. 25).

Although relatively few faults are mapped, many no doubt exist and are largely undetected beneath overburden. Some are intersected by drill-holes and numerous others are recorded underground at the Brenda mine. In the Nicola rocks, faults and shear zones which largely pre-date the stock are indicated by schistosities occurring marginally to parts of the stock and also in the graphitic argillite and limestone division. Emplacement of pegmatite locally in the axial regions of small shear folds in the marginal Nicola rocks suggests that movements in these rocks continued during consolidation of the stock. In the stock the majority of faults probably had only a small movement because mapped contacts are not displaced, except on Peachland Creek, where a fault is consequently inferred. Shearing is recorded in places, mostly not at recognized faults, and is marked by crushed, altered, and locally mineralized quartz diorite across widths ranging from a few feet to 200 feet. Individual faults at the Brenda mine cannot readily be projected on strike farther than a few hundred feet. They strike in various directions, but mostly north of east, and generally they dip rather steeply toward the south and east. As exposed mainly underground, they commonly contain a chloritic gouge and breccia partly as wide as 3 feet, in places with vein material that is partly crushed and includes quartz, calcite, epidote, sulphides, hematite, and locally graphite, and slickensides, most of which are nearly horizontal. Some minor faults appear white and sericitic, or kaolinitic, and are associated with epidote, quartz, and sulphides. Little can be said regarding the age of the faults, except that it appears to span the period of mineralization. Company drill logs indicate that many faults within the orebody are mineralized, or coincide with well-mineralized sections of quartz diorite, whereas a few are barren. Faults in drill-holes in other parts of the area are variously mineralized or barren.

Figure 24 includes a plot of topographic lineaments evident on vertical air photographs of the area. The significance of the lineaments is generally unknown, although a few partly coincide with known or suspected shear zones; for example, the MacDonald Lake-Long Lake lineament. From an examination mainly of infrared photography, Chapman (1968, Figs. 1 to 3) concludes that the Brenda mine is located at the common intersection of three lineaments trending east-northeast, west-northwest, and roughly northwest respectively. Parts of the first two lineaments are recognized and plotted (*see* accompanying Fig. 24), and the third is unrecognizable from an examination of panchromatic air photographs.

### *Rock Alteration and Mineralization*

The plutonic rocks are altered on faults and fractures to various assemblages of quartz, potash feldspar, green biotite, chlorite, calcite, sericite, and kaolinite. Where faults and fractures are very closely spaced, as at the Brenda mine, a weak pervasive alteration is present in the rock and is seen mainly as a slight green coloration of plagioclase. The bulk of alteration is, however, confined to the planes of breakage, and it partly takes the form of veins contained in envelopes of more or less altered rock.

Veins on fractures may be several inches wide, and they occur in an envelope of weak alteration which extends outward for only a fraction of an inch. Under the microscope the altered rock of the envelope shows hornblende changed variously to calcite, epidote, chlorite, and green biotite; biotite changed to green biotite and chlorite; quartz locally recrystallized; and plagioclase that is flecked by sericite and probably kaolinite. The vein walls are occupied locally by seams and patches variously of biotite, chlorite, and epidote. Veins of several types commonly occur in one outcrop and are all later than the aplite-pegmatite bodies.

Quartz-microcline veins are marked *k* on Figure 22 and consist essentially of grey or milky-white quartz and pink to red potash feldspar, which is mostly microcline but includes orthoclase. These veins occur abundantly at the Brenda mine and less numerously elsewhere in a wide belt which trends northerly through the Brenda stock and barely encloses the Nicola rocks southwest of the mine. Except in the Nicola rocks, many of the veins are mineralized. Veins with enough feldspar to appear granitic are as previously described (*see* Ann. Rept., 1966, p. 182), whereas others are more like ordinary quartz veins and have feldspar only in rare patches and along their walls. The granitic-looking veins are one-quarter inch wide on average and may be as wide as 2 inches. They have interlocking walls, are medium grained and more or less vuggy, and may break centrally to expose rough crystal faces and also patches and nests variously of radially grown epidote, calcite that is white, yellow, pink, or brown, and sulphides. Under the microscope a vein appears as a crudely foliated inequigranular mosaic of quartz that encloses microcline, meshes of green biotite, patches of chlorite and calcite, and ragged edges of altered wallrock. This vein cuts a sieve-like mass of orthoclase into two parts which remain optically continuous and thus demonstrate an absence of movement on the vein. At the Jef No. 43 showing and farther southwest, veins partly form irregular stockworks in breccia. Where pegmatite partly forms the breccia matrix east of drill-hole No. NB-12, short veins merge with pegmatite at one end and pinch out on fractures variously in quartz diorite blocks or in grey matrix at the other. This suggests that the material required to form these veins was acquired from the pegmatite.

The quartz-microcline veins of non-granitic appearance are rarely as wide as 4 inches and commonly are crossed by slender fractures occupied by later mineralized quartz.

A rare instance of alteration causing a distinct enrichment of potash feldspar occurs at old exploratory pits west of the base line near ordinate 8S at the Brenda mine. There quartz diorite is locally changed to irregular veins of coarse pink orthoclase and a patchy vuggy mixture of orthoclase and green biotite with minor amounts of quartz, epidote, and sphene. The altered rock is cut by mineralized fractures, which are seen under the microscope to contain feldspar, sericite, chlorite, and quartz.

Quartz veins without microcline are marked *q* on Figure 22 and they occur widely in the plutonic units and Nicola strata, being most numerous in the belt occupied by quartz-microcline veins. The quartz veins may be of various ages and types, and they are not all mineralized. Some include various amounts of minerals, such as epidote, chlorite, and calcite, which cause some veins to be more or less banded in grey or green.

Other kinds of veins on fractures are unmapped, and they include unmineralized slender veinlets of late-generation calcite that were observed lying on slickensided molybdenite at the Brenda mine; narrow epidote veinlets, which are widespread and generally unmineralized; and mineralized brown oxidized carbonate veinlets, which are probably ankerite, that were seen to cut quartz at the old high-grade showing at the Brenda mine. Pink zeolite is tentatively identified on fractures in quartz diorite on the Old road near an Eocene(?) andesite dyke.

Veins in faults consist of quartz partly with calcite and epidote. They are commonly brecciated and seamed by later gangue minerals and sulphides. Those in the adit of the Brenda mine are rarely wider than 1 foot. At the old high-grade showing a mineralized lens has a maximum width of 5 feet, is exposed for about 25 vertical feet, and is a mass of close-spaced mostly subparallel quartz veins in strongly altered quartz diorite.

Alteration at faults is generally strong, and across short distances it produces either a dark chloritic rock or a light-coloured rock that probably is rich in kaolinite. Quartz, epidote, and calcite are commonly abundant in both kinds of altered rock, which may be brecciated, sheared, veined, and mineralized.

In addition to the Brenda mine, about 70 copper and molybdenum occurrences are shown on Figure 22, and they mostly appear to be small and weakly mineralized. All except two are in the Brenda stock, and the majority of them are in a belt 1¼ miles wide which extends northward from the mine and is underlain mostly by the Uniform, Porphyritic, and Fine quartz diorites. The exceptions are two reported occurrences, respectively in the Satellite quartz diorite and in Nicola rocks adjoining the Brenda stock near the road from the camp to the mine. The last-mentioned occurrence and several others were discovered by drill-holes whose locations are shown on Figure 26. Holes not shown are reported also partly to have intersected mineralization, and consequently Figure 22 fails to show the complete distribution of known mineralization in the area. Minor copper occurrences reported in drilling east of Peachland Lake preparatory to dam construction are amongst those not shown. Throughout the area, copper occurs variously as chalcopyrite, malachite, and azurite, and rarely as tenorite, covellite, and chalcocite. Molybdenum occurs as molybdenite without any accompanying yellow bloom of ferrimolybdite. Bornite, galena, and pyrrhotite are reported in very minor amounts at the Brenda mine

(Chapman, 1968, p. 2, and according to company geologists). Pyrite accompanies many copper and molybdenum occurrences, and it is also present alone or, if in Nicola rocks, with pyrrhotite at about 30 occurrences which are shown as barren (*see* Fig. 22). In addition to its normal presence in the rocks, magnetite is locally concentrated at the walls of mineralized veins in barely appreciable amounts. Specular hematite is fairly widespread in quartz veins, although only in small amounts.

Mineralization at the Brenda mine has previously been described and is almost entirely contained in veins on either fractures or faults (*see* Ann. Rept., 1966, p. 182). In quartz-microcline veins which occupy the majority of fractures, chalcopyrite greatly exceeds either pyrite or molybdenite, and all three sulphides occur more or less separately as crystalline grains, bunches, and platy networks. Because very little dissemination occurs beyond the fractures, the proportion of sulphide exposed in freshly broken ore is high and the ore appears impressive. In quartz veins on fractures, the sulphides are finer grained and seam-like, and molybdenite lies partly in subsidiary fractures which transect the veins. In quartz veins on faults, the ore occurs variously as fine to coarse granular seams and bunches or, in brecciated veins, as irregular networks with carbonates and second-generation quartz. Veinlets in the altered wallrock contain sulphides which include spectacular platy molybdenite. Sulphides and gangue are partly crushed and pulverized, and both molybdenite and pyrite are polished on shear surfaces. The proportion of these sulphides relative to chalcopyrite appears larger on faults than fractures. Under the microscope in a polished section, chalcopyrite surrounds and is apparently later than pyrite, and it shows no clear evidence of a different age relative to molybdenite, although Chapman (1968, p. 2) states molybdenite to be later than chalcopyrite. A study of company drill logs and assays suggests that a loose relationship exists in the orebody between copper and molybdenum, which occur together in widely variable ratios. Partial oxidation of sulphides and leaching have reduced the amount of mineralization present in fractures within a few inches of surface, and on faults to greater depths.

In June, 1968, the company released revised estimates of ore reserves at the Brenda mine as follows: 177 million tons grading 0.183 per cent copper and 0.049 per cent molybdenum (equivalent to 0.082 per cent $MoS_2$). This includes 26 million tons grading 0.212 per cent copper and 0.063 per cent molybdenum (0.105 per cent $MoS_2$) that is available initially for mining. Production is expected to start in 1969. The orebody outcrops at elevations between about 5,150 and 5,475 feet, and it has been outlined by drill-holes whose core was used as samples and is therefore not available for examination. The orebody is 2,800 feet long in a north-northeasterly direction and as much as 1,300 feet wide (Fountain, 1968, Fig. 1), and it lies within the outline of the proposed open pit, which is shown on Figures 21 and 23. The orebody is narrow at the ends, and it possesses a fairly straight eastern edge which corresponds closely as far south as line No. 10S with the contact between the Speckled and Porphyritic quartz diorites (*see* Fig. 25). The western edge bulges and partly overlaps the mapped limit of aplite, and according to company information it cuts off rather sharply in grade. At places in the orebody, mineralization is reported to persist to depths of as much as 900 feet. As confirmed by a small number of drill-holes, induced polarization surveys show that the orebody is largely surrounded in plan by an envelope of mostly weak mineralization with relatively narrow extensions to the northwest, north-northeast, and southeast respectively (Fountain, 1968, Fig. 1). The northwest extension underlies roughly the Old road and nearby creek, and it extends into Nicola rocks, which have been drilled and are pyritic, but are otherwise only weakly mineralized. Shears are mapped in

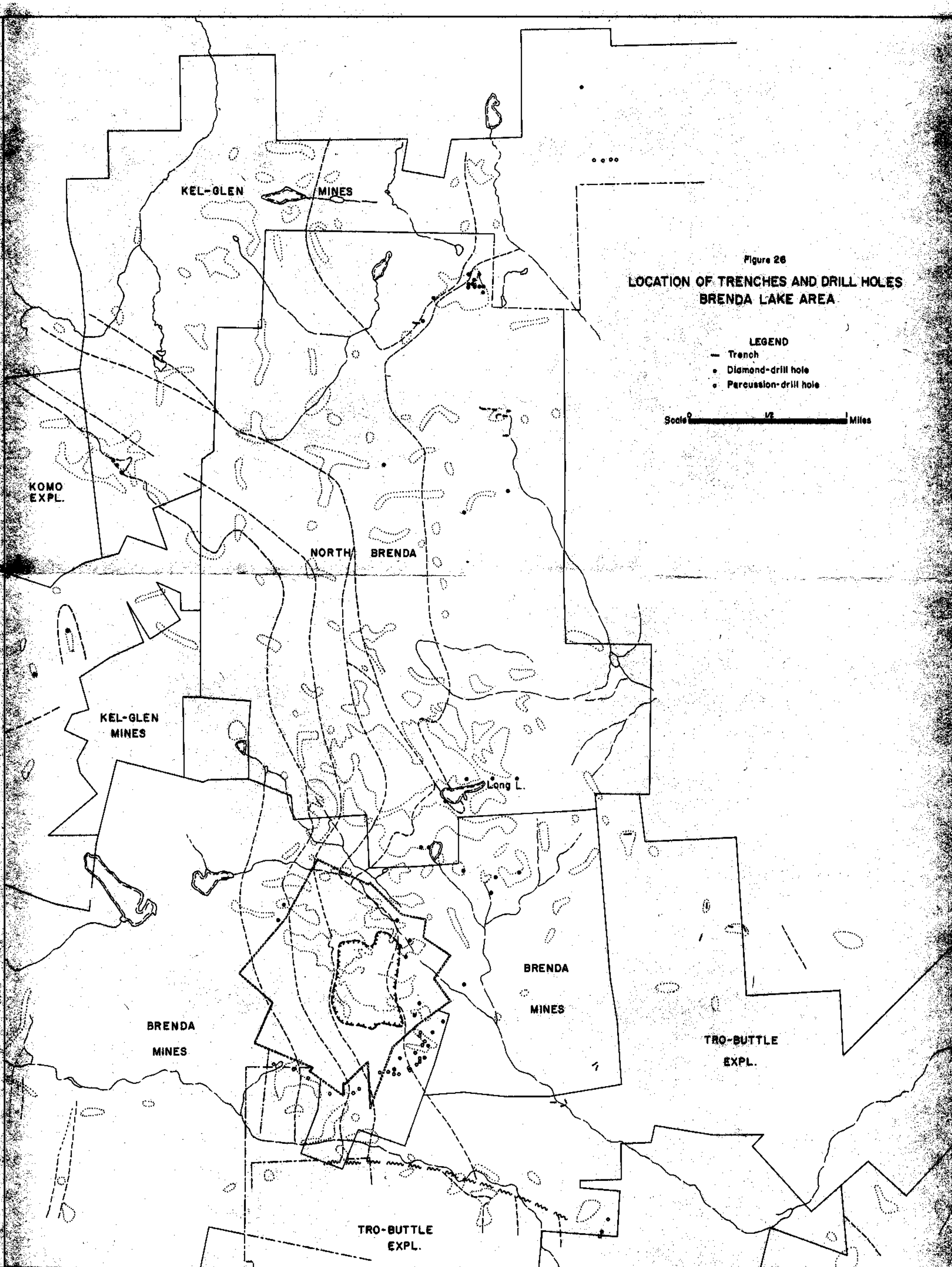
Figure 26
LOCATION OF TRENCHES AND DRILL HOLES
BRENDA LAKE AREA
LEGEND
Trench
Diamond-drill hole
Percussion-drill hole
Scale 0 1/2 1 Miles
KEL-GLEN MINES
KOMO EXPL.
NORTH BRENDA
KEL-GLEN MINES
Long L.
BRENDA MINES
BRENDA MINES
TRO-BUTTLE EXPL.
TRO-BUTTLE EXPL.

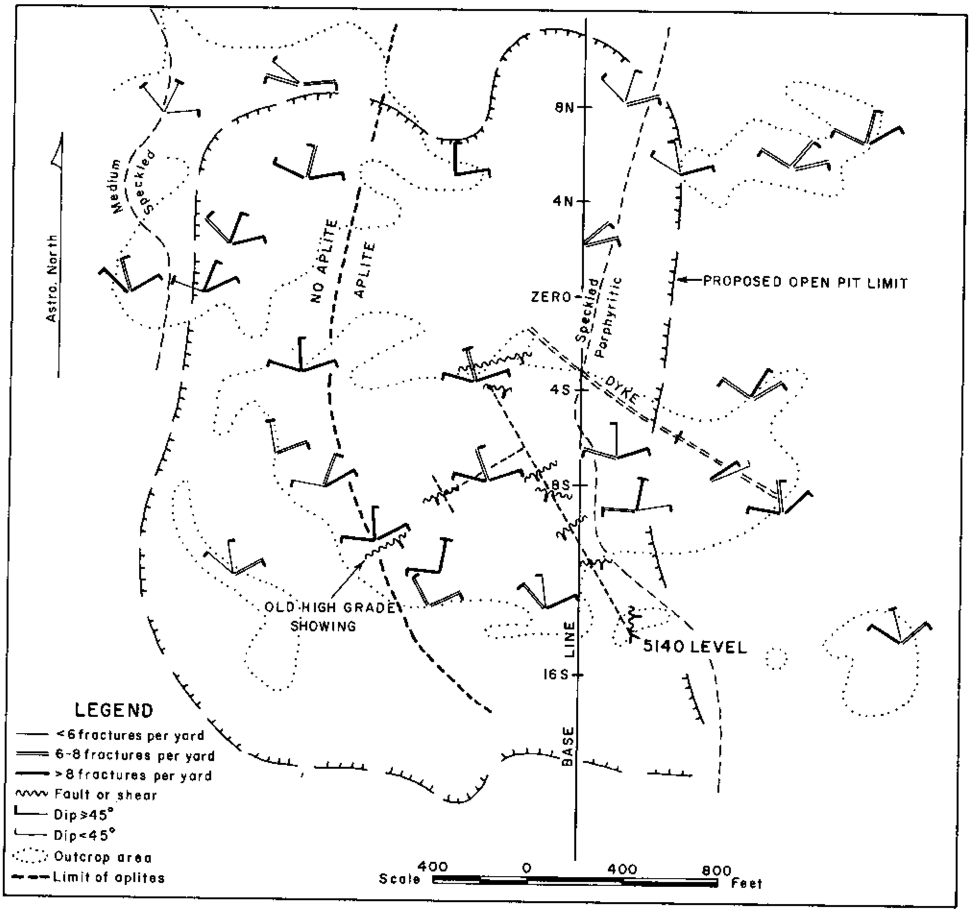


Figure 25. Generalized fracture pattern, Brenda mine.

quartz diorites at the creek, and the extension is believed by company geologists to represent a shear zone. The north-northeast extension reaches MacDonald Creek, where trenches and a drill-hole indicate that strongly fractured Porphyritic quartz diorite contains mineralization somewhat better than the average in the orebody. The southeastern extension reaches showings on the Mac claims, formerly in the Anuk River Mines property and now part of the Brenda property. These showings have been drilled, and they are in fractured quartz diorite with subcommercial mineralization.

About 1 mile northeast of the mine, induced polarization anomalies were drilled by holes located approximately as shown (*see* Fig. 26). Nearby outcrops of quartz diorite are strongly fractured partly in northeasterly directions, and they contain chalcopyrite. The holes are reported to have intersected copper-molybdenum mineralization which is not of commercial grade.

Showings on the North Brenda property about 4 miles north of the mine were briefly described in the 1966 Annual Report, and they have subsequently been explored by a small amount of stripping and numerous diamond-drill holes (*see* Figs. 22 and 26). A described eastern showing on or near the Jef No. 43 claim is apparently part of a mineralized breccia zone that is intersected in drill-holes for a length of 450 feet and a maximum horizontal width of about 85 feet. The zone is arcuate in plan and concave toward the west, and it narrows drastically northward. Its dip is possibly westerly and steep. In the zone, breccia with a biotite-rich matrix and apparently of explosion type is developed in Porphyritic quartz diorite partly near to narrow intersections of Fine quartz diorite. The rocks are cut by veins variously of quartz-microcline and quartz with epidote and calcite. A strong chloritic alteration occurs in and near the breccia, partly on numerous faults and shears which may also show a sericitic or argillic alteration. Specular hematite, pyrite, chalcopyrite, and molybdenite occur partly in the veins or other fractures and partly disseminated in strongly altered rock. The best mineralization seen in the drill core is estimated to contain as much as 0.4 per cent copper for several tens of feet; nowhere was a molybdenite concentration seen to compare with that exposed at the original showing.

A described western showing (*see* Ann. Rept., 1966, p. 184) was probably a large boulder which has since been removed. It lay about 200 feet to the northeast of present drill-hole No. NB-12 and near to a new showing of weakly mineralized breccia that is immediately east of the drill-hole. The new showing is midway along a western zone of mineralization that extends northeasterly for an explored distance of 2,400 feet and is variously on or near the Jef Nos. 29, 30, 41, and 43 claims. Outcrops, trenches, and drill-holes are spaced at average intervals of 800 feet along the western zone, whose northern trenched exposure lies about 600 feet west of the northern part of the eastern zone. The western zone coincides more or less with a dyke-like body of Fine quartz diorite which may be discontinuous and is converted to breccia at the south end of the zone across an exposed width of 100 feet. At the north end and close to the eastern zone, the body of Fine quartz diorite is as much as 200 feet wide in drill-hole No. 19. Copper-molybdenum mineralization in the zone is weaker than that of the eastern zone, and the best seen was in strongly fractured Porphyritic quartz diorite in a trench at the north end of the zone.

On the Kel-Glen property in the northwestern part of the area, a showing described previously as on the Marn No. 18 claim is in fact on the Marn No. 16 claim, and it has subsequently been stripped and drilled by as many as three diamond-drill holes and a number of percussion-drill holes (*see* Ann. Rept., 1966, p. 173; Assessment Rept. No. 875). At the showing, which is at the immediate edge of the Brenda stock, chalcopyrite and pyrite blebs and molybdenite plates are scattered in irregular widely spaced fractures and slender quartz veins for a distance of as much as 150 feet along the contact, across an unknown width. The adjacent Nicola rocks contain pyrite, quartz veins, and, according to company drill logs, rare seams of chalcopyrite. These logs record pyrite numerously and chalcopyrite and molybdenite rarely in quartz diorite.

### *Discussion of Structure*

The Nicola strata are insufficiently mapped for their structure to be stated definitely. The dips of foliation and bedding west of the Brenda stock are directed westerly and outward from the stock, except along the Noranda road in a northeast-trending zone of northeasterly strikes and steep southerly dips. Should this zone be part of the west limb of a syncline, as previously suggested (*see* Ann. Rept., 1966, p. 179), then the axial portion of the syncline must be strongly dislocated to explain the unmatching rocks on opposing limbs. More likely perhaps, the zone is an asymmetrical structure adjoining an unidentified rupture or fault which may separate the southern divisions of Nicola rocks from the northern greywacke division.

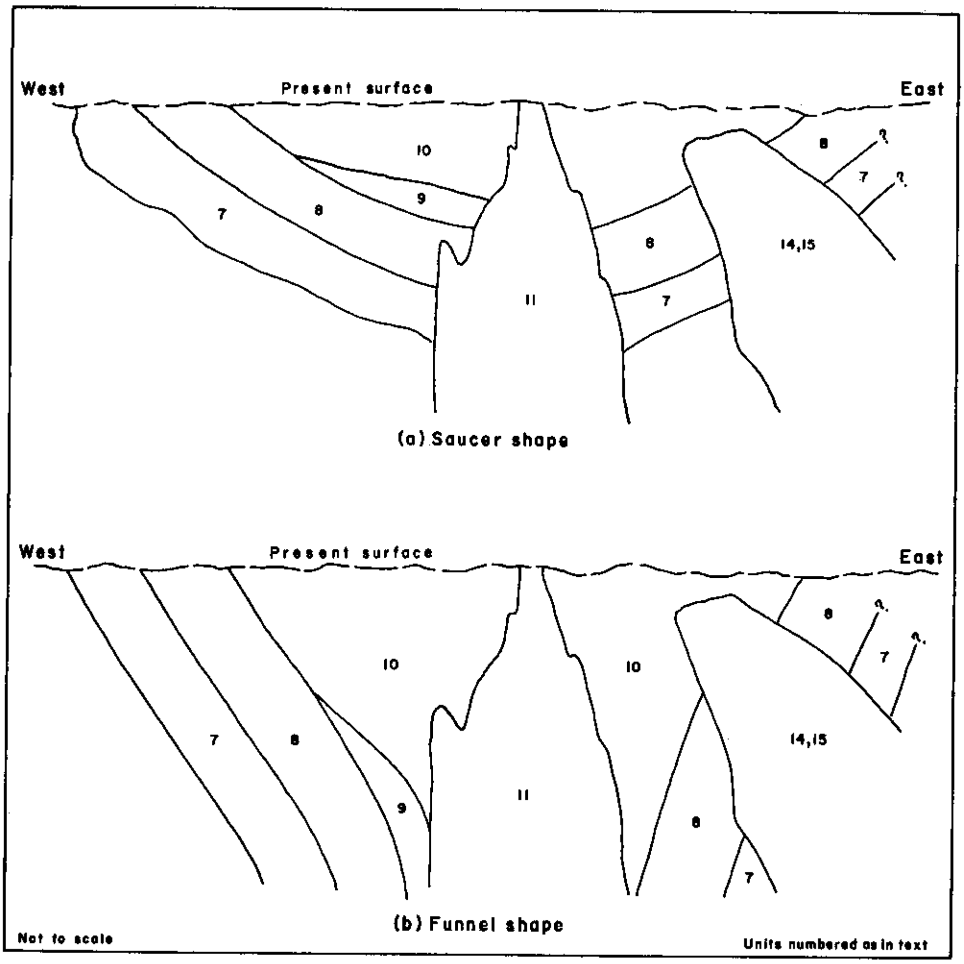


Figure 27. Diagrammatic hypothetical vertical sections of the Brenda stock and associated intrusions.

Of the plutonic rocks, only the Brenda stock is sufficiently investigated for its structure to be discussed. Positioned between batholiths to north and south respectively, the stock has a probable northerly elongation which allows its structure to be envisaged in vertical east-west section (*see* Fig. 27). In the two alternative sections presented, that is, saucer-shaped or funnel-shaped, a series of gradational quartz diorites which includes the Uniform quartz diorite is broken across by intrusions variously of Fine quartz diorite, Mixed quartz diorite, and quartz monzonite. A saucer-shaped structure is preferred because it allows a shallow floor and basement of country rock to exist under much of the stock, as seems necessary to explain the subsequent structural developments. Evidence for a shallow floor and basement is found as inclusions carried up by a trachyte dyke (*see* p. 199).

Events in the development of the stock are recorded by stages, as follows:—

*Stage No. 1.*—Emplacement of the gradational quartz diorite series in block-faulted tilted Nicola strata.

*Stage No. 2.*—Emplacement of mainly discordant Fine quartz diorite bodies, derived from the previous magma source.

*Stage No. 3.*—Segregation of aplite-pegmatite widely in the stock; explosive brecciation in places along a narrow dyke-like body of Fine quartz diorite; start of intrusion of chilled dykes, the earlier being of quartz diorite and the later of various compositions.

*Stage No. 4.*—Widespread fracturing and high-temperature rock alteration which produced quartz-microcline veins and green biotite; possibly the start of copper-molybdenum mineralization.

*Stage No. 5.*—Faulting and alteration, which produced quartz veins partly in faults.

*Stage No. 6.*—Faulting, brecciation of quartz veins, and mineralization.

*Stage No. 7.*—Faulting, and intrusion of dykes successively of lamprophyre, Eocene(?) andesite, and basalt; also denudation, deposition of Tertiary(?) conglomerate, and possibly pre-Tertiary as well as Quarternary weathering, minor surface oxidation and leaching of mineral deposits.

Between Stages Nos. 1 and 6, many successive events are linked, and the various intervals between these stages appear to have been short for the following reasons: (*a*) At Stage No. 2, the gradational quartz diorites were still hot enough to prevent marginal chilling of the Fine quartz diorite; (*b*) at Stage No. 3, the quartz diorites still remained partly unconsolidated and were able to supply material which formed the aplite-pegmatites; (*c*) events of Stage No. 4 began in association with aplite-pegmatites of Stage No. 3—namely, fracturing which caused jogs, green biotite alteration, and the formation of quartz-microcline veins (*see* pp. 195 and 202); (*d*) at Stage No. 5, the formation of quartz veins probably required only a slight change in conditions from those existing when quartz-microcline veins were formed in Stage No. 4; (*e*) faulting at Stage No. 6 was probably a continuation or rapid renewal of the previous faulting.

Because of the probable rapidity of the events outlined here, there is difficulty in accepting the view that mineralization took place long after emplacement of the Brenda stock (Chapman, 1968, p. 3). That view is based on the different apparent ages of co-existing hornblende and biotite in the rocks, as obtained by the potassium-argon radiometric method (White and Carter, 1968). For each of two samples of quartz diorite which are reported to have been collected at the Brenda mine and farther west toward the camp respectively, the results were identical within the accepted limits of experimental error, and they gave ages of 180 million years for hornblende and 145 million years for biotite. White and Carter conclude that mineralization is as young as 145 million years, or Upper Jurassic, and its host rocks date back to 180 million years, or Lower Jurassic.

Because mineralization coincides very largely with planes of breakage in the rocks, a high degree of structural control is indicated. The mapped distributions of aplite-pegmatites, fractures, quartz-microcline and quartz veins, dykes, and mineralized occurrences suggest that structural activity in the stock was concentrated in linear belts with mostly indefinite boundaries. These structural belts apparently functioned by transmission to the stock of movements on shear zones in the underlying basement rocks. Shear zones of the kind envisaged to occur beneath the stock are represented in the exposed Nicola rocks by the schistose hornfels division and the graphitic argillite and limestone division respectively. Schistose hornfels bordering the stock was actively deformed as late as Stage No. 3 because pegmatite bodies were then emplaced in the axial regions of small folds in these rocks.

Deformation on underlying shear zones may have controlled emplacement of quartz diorite magma, and if repeated it would account satisfactorily for most of the small-scale structural features seen in the stock, including partly the foliation of quartz diorites, tension fractures occupied by aplite-pegmatite, explosion breccias, fractures and faults, and dyke intrusion. Movements following emplacement of magma would impose foliations on the plastic semi-consolidated quartz diorites. Later movements in Stage No. 3 would act on semi-brittle material to produce tension fractures, which filled at once with aplite-pegmatite. Movements in Stage No. 4 took place apparently at a time when the quartz diorites experienced final crystallization and a consequent volume loss which led to contraction. Fractures forming in response to contraction would adopt patterns conforming largely to stresses imposed from below, and residual fluids escaping into the extensive fracture system would corrode the wallrock and deposit material to form the quartz-microcline veins and possibly sulphides. Subsequent movements produced faults in rocks still hot enough to sustain hydrothermal alteration and mineralization, which may have been partly derived from the basement in view of graphite that is locally present on faults. A direct physical connection between these faults and the basement is indicated by the intrusion of dykes having compositions unrelated to that of the stock.

Four structural belts recognized in the stock are a major north-trending belt, a lesser northwest-trending belt, a northeast-trending segment of the main belt, and a minor north-trending belt which spans the segment and contains most of the Brenda

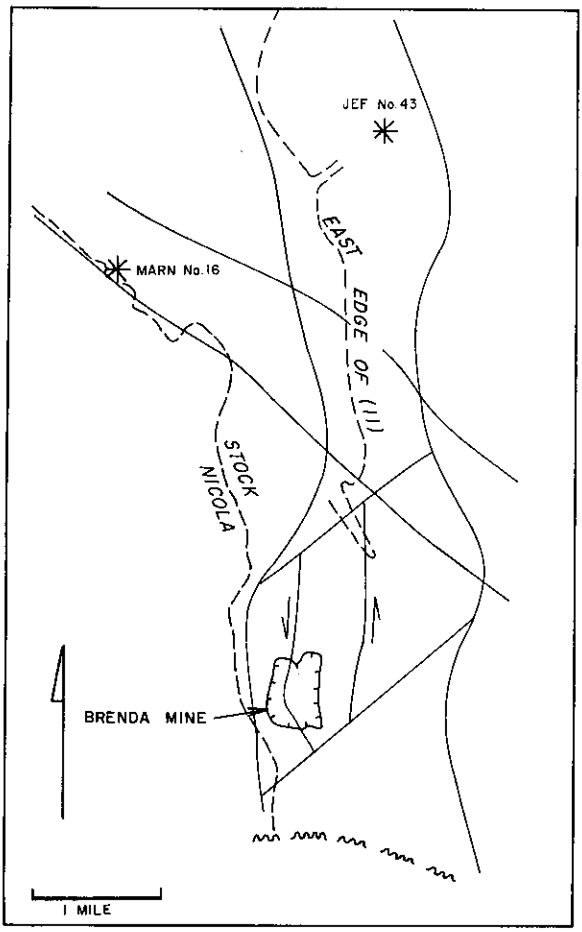


Figure 28. Structural belts in the Brenda stock.

orebody (*see* Fig. 28). The major belt is partly as much as 1¼ miles wide, and it encloses most of the copper-molydenum occurrences. Its west edge corresponds roughly with the east side of the main Fine quartz diorite body and farther south with the edge of the stock. The lesser belt extends from the major belt northwesterly as far as the Marn No. 16 showing, and it corresponds partly with the edge of the stock. Its position is discontinuously shown by the aplite-pegmatite distribution on Figure 23. The northeast-trending segment of the major belt is defined approximately by a zone of most intense fracturing which is about 1¼ miles wide and extends through the Brenda mine. The minor north-trending belt is defined by northwest-striking aplite-pegmatites and dykes; it extends across the segment from the Mac showings to Long Lake, is about 1 mile wide, and covers all but the western part of the mine. Its position is indicated on Figure 23 by part of the southern area of aplite-pegmatite.

Given sufficient field data on the attitudes of dykes, dyke jogs, faults, offsets, and slickensides, it should be possible to reconstruct the various movement patterns in the belts. This has been done only for the minor north-trending belt, whose data indicate that stresses were directed left-handed along the length of the belt. In other parts of the major belt, an opposite, right-handed, movement appears probable according to very limited information, whilst for the northwest-trending belt no information is available.

Topographic lineaments, as recorded on Figure 25, show few possible correlations with structural belts, and apparently the belts can be recognized only after detailed geological mapping.

[References: Cairnes, C. E., Mineral Resources of Northern Okanagan Valley, B.C., *Geol. Surv., Canada,* Sum. Rept., 1931, Pt. A, pp. 66–109; Rice, H. M. A., *Geol. Surv. Canada,* Mem. 243, 1947, Princeton Map-area; Little, H. S., *Geol. Surv., Canada,* Map 15-1961, Kettle River (West Half); *Minister of Mines, B.C.,* Ann. Repts., 1965, p. 163; 1966, pp. 179–187; Nasmith, H., Late Glacial History and Surficial Deposits of the Okanagan Valley, B.C., *B.C. Dept. of Mines,* Bull. 46, 1962; Ney, C. S., Geological and Geophysical Report on the Brenda Prospect, Osoyoos Mining Division, B.C., Assessment Report No. 189, 1957; Chapman, E. P., Jr., Geology of the Brenda Molybdenum Copper Deposit, *C.I.M.M.,* Vancouver, B.C., 1968; Fountain, D. K., The Application of the Induced Polarization Method at Brenda Mine, B.C., *C.I.M.M.,* Bull., Vol. 61, No. 670, Feb., 1968, pp. 153–157; Assessment Reports Nos. 850, 861, 864, 875, 876, 886, 911, 932, 942, 980, 1121, 1151, and 1187; White, W. H., and Carter, N. C., The Age of Some Mineral Deposits in British Columbia, *C.I.M.M.,* Vancouver, B.C., 1968.]

*Copper-Molybdenum*

**Brenda Mine** *Brenda Mines Ltd.* By David Smith (49° 120° N.E.) Company office, 1030 West Georgia Street, Vancouver 5; mine office, Peachland. B. O. Brynelsen, president; G. Montgomery, mine manager; P. Stym, mine superintendent; H. Teter, construction superintendent. This company owns 117 mineral claims and fractions which includes seven Crown-granted claims and two mineral leases, Nos. 58 and 59. These claims lie in an area 1 mile east of Brenda Lake. The original camp established at MacDonald Lake was accessible by 26 miles of forestry road. In 1967, with the aid of a grant from the British Columbia Department of Mines and Petroleum Resources, 11 miles of highway was constructed which, when an additional 4 miles out of Peachland is improved, will provide the mine with 17 miles of good highway access.

In early 1967 sampling and concentrating tests on bulk samples obtained from underground operations were completed in the 100-tons-per-day pilot mill. Work on site was kept to a minimum while economic and feasibility studies were made. The open-pit area and the proposed mill-site were cleared, and a power-line was brought into the property.

Late in 1967 mining of overburden and waste rock was started in the pit, and by the end of the year 170,000 tons of waste rock and overburden had been removed.

Equipment includes four Caterpillar 35-ton trucks, an overhead loader, and two airtrac drills. Construction in 1967 included a heavy-duty service shop at the pit, a large camp to house construction workers, and mine roads on the property. A crew of 102 men, of whom 70 were contractors, was employed. Residence is at camps provided at the mine. It is also possible to commute from Peachland.

*Copper-Molybdenum*

**North Brenda**
*Noranda Exploration Company, Limited*
By J. M. Carr

(49° 120° N.E.) Company office, 1050 Davie Street, Vancouver 5. B. O. Brynelsen, manager. The company holds 152 recorded claims, partly named Jef and Coulee, which adjoin the north boundary of the Brenda Mines property and are accessible by road from Brenda Lake (*see* Fig. 22). Work in 1967 was supervised by A. Soregaroli and R. Heim, and it included geological mapping and 2,696 feet of diamond drilling in six holes. The locations of these and earlier holes are shown on Figure 27, and the geology and showings on the property are described in the accompanying text, pages 205 and 206.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 163; 1966, p. 184.]

*Copper-Molybdenum*

**Jo**
*Lakeland Base Metals Ltd.*
By J. M. Carr

(49° 119° N.W.) Company office, 404, 510 West Hastings Street, Vancouver 1. L. N. Udell, president; A. C. Skerl, consulting geologist. The company holds about 31 recorded claims in the Jo group on the west slope of Mount Gottfriedsen adjoining the east boundaries of the North Brenda and Kel-Glen Mines properties. The claims are accessible by 6 miles of jeep-road from the Noranda camp (*see* Fig. 22). Work in 1967 was by a small crew under J. D. Fiske, and it consisted of soil-sampling. In April, 1968, the company was wound up voluntarily and its assets were acquired by BrenMac Mines Ltd.

[Reference: Assessment Report No. 1187.]

*Copper-Molybdenum*

**Marn, Visc, Cam, Rob, Bob**
*Kel-Glen Mines Ltd.*

(49° 120° N.E.) *See under* Nicola Mining Division, page 176.

**FWP, Slim**
*Largo Mines Ltd.*

(49° 120° N.E.) *See under* Nicola Mining Division, page 176.

*Copper-Molybdenum*

**Flea, Nel**
*Lakeland Minerals Ltd.*
By David Smith

(49° 120° N.E. and 49° 119° N.W.) Company office, 404, 510 West Hastings Street, Vancouver 2. The Flea and Nel groups, totalling 55 claims, are in the Brenda Lake area. Access is by gravel road from Peachland, a distance of 20 miles. Some soil-sampling was carried out during 1967. A small crew worked for a month under the direction of A. C. Skerl, consultant.

*Copper-Molybdenum*

**Top, Tam**
*Arlington Silver Mines Ltd.*
By J. M. Carr

(49° 119° N.W.) Company office, 1110, One Bentall Centre, 505 Burrard Street, Vancouver 1. B. I. Nesbitt, president; H. A. Quinn, consulting geologist. This company owns about 125 recorded claims named Top and Tam which span Trepanier Creek in the vicinity of Venner and Pigeon Creeks, about 10 miles east of the Brenda Mines Ltd. property. The property adjoins the Collex claims, which were explored in 1966 by Cambri Mining & Development Ltd. Work in 1967 included magnetometer surveying, soil-sampling, prospecting, and geological mapping.

[Reference: Assessment Report No. 928.]

*Copper-Molybdenum*

**Ski, Marie, J.W.**
*Falaise Lake Mines Ltd.*
By V. A. G. Preto

(49° 119° N.W.) Company address, 625, 925 West Georgia Street, Vancouver 1. D. R. Cochrane, consulting engineer. The company owns 22 recorded mineral claims comprising the Ski, Marie, and J.W. groups and centred on upper Trepanier Creek near its junction with Macdonald and Lacoma Creeks. Work done in 1967 consisted of electromagnetic and geochemical surveys over the entire group of claims. Three men were employed for a period of two weeks.

## PEACHLAND

*Copper-Molybdenum-Lead-Zinc*

**Silver King**
*Anuk River Mines Ltd.*
By J. M. Carr

(49° 119° N.W.) Company office, 709, 850 West Hastings Street, Vancouver 1. N. Zora, managing director; H. S. Lazenby, geologist. This company holds on option from the joint owners, Quinalta Petroleum Ltd. and Fleetwood Resources Ltd., 108 claims in the Rat group on the new Brenda road immediately north of Glen Lake. The property lies about 2 miles due south of Peachland Lake and is south of the mapped Brenda Lake area. Elevations on the property range from 4,200 to 5,200 feet and the distance by road from Peachland is about 14 miles. Work in 1967 was supervised by G. E. Garroway and H. S. Lazenby, and it included geological and geochemical surveying, trenching, and 1,001 feet of surface diamond drilling in three holes.

One shaft and four adits, which occur variously on the Rat No. 1 and Rat No. 22 claims, were made last century and are included in workings formerly known as the Silver King and Alma Mater. According to hearsay, shipments of unspecified amounts containing silver and gold were made at that time. In 1963 molybdenite is reported to have been discovered on old dumps by R. S. Taylor and J. E. Nott. Dr. M. C. Robinson records that the old tunnels contain a number of quartz veins with pyrite and in places galena and possibly molybdenite (Assessment Report No. 718). These workings were not examined by the writer, whose observations on the property were confined to roadside outcrops farther west and to the recent drill core, which was very briefly examined. On the road, which here skirts the northern limit of the Rat claims, sheared and rather mafic quartz diorite, or granodiorite, is succeeded eastward and southward by admixed quartz diorite and granite which contain pegmatites and are considerably smashed. Northerly grey dacite dykes were seen in the first-mentioned rock and are of a type known to be generally post-mineral in the region. North of the road, quartz porphyry forms a sizeable body and is probably an earlier dyke striking roughly north-northwest. Shear zones farther east on the road possess strikes variously to the east-northeast and north, and those reported in the workings are variously along these same directions. Except for minor pyrite, no mineralization was evident in the shear zones seen on the road. In drill core, mineralization was apparently sparse and consisted of black sphalerite with minor amounts of chalcopyrite and elsewhere of pyrite in scattered cubic development. The host rock in all three holes is sheared quartz diorite, or granodiorite, with few or no quartz veins but containing epidote, calcite, and chlorite seams and veinlets.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1898, p. 1130; 1899, p. 748; Assessment Reports Nos. 718 and 1110.]

*Silver-Lead-Zinc-Copper*

**Silver Bell, Sue** (49° 119° N.W.) Owner's address, 2021 Pandosy Street,
By David Smith Kelowna. This property consists of a total of 16 claims, of which the key claim is the Silver Bell No. 1. The property was formerly known as the Lakeview. The property is under agreement to Pine Pacific Mines Ltd. and Slave Pacific Mines Ltd. Access to the property is by road from Peachland, a distance of 3 miles. In 1967, 17 surface trenches totalling 1,500 feet were bulldozed and seven pits totalling 90 feet were blasted in rock on the Silver Bell No. 1 claim. The work was done by the owner, R. H. Fulks, of Kelowna.

*Copper-Molybdenum*

**Lily, Poppy, Rose** (49° 119° N.W.) Company office, 625, 925 West
*Falaise Lake Mines Ltd.* Georgia Street, Vancouver 1. The Lily 1 to 12, the
By David Smith Rose 1 to 4, and the Poppy 1 and 2 are on Peachland Creek, a distance of 8 miles by road from Peachland. During 1967 three men worked for three weeks under the supervision of D. R. Cochrane, geologist. Electromagnetic, magnetometer, and geochemical surveys of the claims were made.

*Copper-Molybdenum*

**Jass, Reto** (49° 119° N.W.) Company office, 404, 510 West
*Lakeland Base Metals Ltd.* Hastings Street, Vancouver 1. L. N. Udell, presi-
By J. M. Carr dent; A. C. Skerl, consulting geologist. This company holds 44 recorded claims in the Jass group, and others in the adjoining Reto group, all immediately north of Munro Lake at elevations mostly above 5,000 feet. Access is from the sawmill 3 miles west of Peachland, then southward by the Piggeries road to Darke (Fish) Lake and westward by a rough road to the property, a total distance of about 16 miles.

Work on the property in 1966 was done successively by BrenMac Mines Ltd., Brenda Mines Ltd. (which held briefly an option), and the present company. It included trenching, percussion drilling amounting to about 2,000 feet, and soil-sampling. Work in 1967 was done by a small crew under J. D. Fiske, and it consisted of soil-sampling, which reportedly failed to extend a previously known anomaly.

The main showing is at about 5,300 feet elevation 1 mile north-northwest of Munro Lake and was discovered by A. D. K. Burton in 1966 following geochemical indications. As seen by the writer, it consists of several large and deep trenches occurring within about 800 feet total distance on a broad west- or southwest-facing spur of high ground on which the prevailing biotite-granodiorite partly makes outcrops. The granodiorite is a light-grey, moderately fine-grained, uniform rock of speckled appearance and, except for no hornblende, it resembles the Brenda granodiorite (porphyritic variety) on the Brenda property 10 miles farther north. In the eastern trenches the strongly fractured rock is weathered and lacks cement on fractures to depths of 10 feet or so. One conspicuous fracture set has a strike between northeast and east with mostly a steep southerly dip, and cross-fractures have various attitudes. Compared to rocks at the Brenda mine, the proportion of fractures containing quartz and orthoclase is less and so is the amount of cross-fracturing. Quartz and orthoclase form partly drusy veinlets mostly one-eighth to one-quarter inch wide, near which the rock is silicified and sericitized. Pyrite, chalcopyrite, and molybdenite, all partly oxidized, are disseminated in and close to the veinlets. Grades visually estimated from exposures are distinctly low, but the occurrence of deeply weathered chloritic faults allows the possibility of better-grade sections from which leaching may have removed mineralization at surface. The faults strike variously east, northeast, and north, possess dips mostly to the south and east, and show, in one case at least, fairly massive granulated pyrite across several inches.

*Copper-Silver*

**Cache, Glad, Asp**
*Koporok Mines Ltd.*
By J. M. Carr

(49° 119° N.W.) Company office, 810, 718 Granville Street, Vancouver 2. David H. Burnett, president; W. C. McLoughlin, general manager; G. H. Haddrell, field representative, Peachland; A. D. K. Burton, of Alrae Exploration Ltd., consulting engineer. This new company holds as many as 100 recorded claims variously in the Cache group, which is on Baldy Mountain between Darke Lake Provincial Parks Nos. 1 and 2 and the Glad and Asp groups, which are farther south and near the southwest corner of Park No. 1. Work in 1966 and 1967 included line-cutting, road-building, claim-surveying, induced polarization surveying, trenching, and blasting.

Showings on the Cache group are accessible by road from the east, and they lie at various elevations on the east slope of Baldy Mountain, which is the northeastern portion of the ridge that underlies the Jass claims of Lakeland Base Metals Ltd. Some of the showings were briefly visited in August, in company with Mr. Haddrell. Baldy Mountain is underlain by biotite-granodiorite apparently similar to that on the Jass claims, except locally darker. At least one northwesterly dyke of quartz latite occurs, some 40 feet wide, and reportedly lightly mineralized in places with chalcopyrite. This dyke resembles the trachyte dykes on the Brenda Mines Ltd. property, except that conspicuous crystals of quartz accompany the large potash feldspar crystals. Where mineralized, the granodiorite is altered to a greenish colour due to sericitization. A lower showing on the Cache group was found by Haddrell north of a prominent creek at about 4,400 feet elevation. It consists of chalcopyrite, pyrite, and specular hematite as disseminations, seams, and small masses mainly in the hangingwall of a fault which strikes north 46 degrees east and dips at 70 degrees northeastward. As exposed by stripping, the best mineralization is restricted to within a few feet of the fault and dies out within a length of 20 or 30 feet as the fault weakens to the northeast. Southwestward into the hillface, any extension of the fault and its attendant mineralization is obscured by overburden. Quartz veining is present in minor amounts at the showing and more abundantly in stripped-off fractured rock with malachite some 200 to 300 feet farther southwest, which is probably south of any extension of the fault. Upper showings on the Cache group lie uphill some distance to the west, where an old short adit is blocked and partly destroyed by recent trenching. At the adit closely spaced easterly or northeasterly fractures dip northward in silicified granodiorite that is mineralized with tetrahedrite, pyrite, and chalcocite, the latter probably of secondary origin. Mineralization, which is locally strong, apparently persists for 20 feet northward to a fault which strikes north 80 degrees east and dips steeply to the north. Another old adit believed to exist in the same general vicinity was not rediscovered; according to hearsay, it provided small shipments of wire silver in the 1920's.

Farther south at these higher elevations on the Cache claims, trenches were made across a northeasterly fault estimated to be in line with that at the lower showing. Siderite veins, specular hematite, chalcopyrite, malachite, and pyrite were visible in places, as were narrow sheeted zones of pyritic gossan striking eastward and containing quartz stringers.

About 2 miles farther south, on the Glad claims at about 4,000 feet elevation, a showing discovered by Haddrell was trenched and blasted to expose granodiorite containing rare slender veins of tetrahedrite, galena, and quartz which are emplaced along and near a minor gently east-dipping shear zone. Abundant wide to narrow quartz veins with small amounts of malachite occur a short distance downhill to the east. A subsequent discovery of a silver-bearing galena vein is reported by Haddrell a claim length or so south of this showing. Rather more than one claim length to the north of the showing, an impressive amount of quartz occurs as a stockwork of shattered veins in sericitized granodiorite on the Silica claim, which is under other ownership and is enclosed by the Glad claims. The quartz is accompanied by masses of creamy-coloured potash feldspar, by muscovite, and rare nests of limonite probably produced mostly from specularite. Traces of malachite are present. Passing a short distance west of the Silica and Glad showings is a pronounced north-trending gully, in which company trenching has in one place exposed part of a wide unmineralized light-coloured biotite-andesite or dacite dyke of a type known to occupy pre-mineral faults on other properties in the Southern Interior. A possible extension of the assumed northerly fault can be seen on air photographs to pass closely east of the lower Cache showing.

*Copper-Molybdenum*

**DIK, Len, Chub, Mel, Go**
*Brenda Mines Ltd.*
By David Smith

(49° 120° N.E. and 49° 119° N.W.) Company office, 904, 510 West Hastings Street, Vancouver 2. The DIK, Len, Chub, Mel, and Go groups, comprising 53 claims, are under option from BrenMac Mines Ltd. The property is between 4,500 and 6,000 feet elevation on the north slope of Mount Kathleen. Access is by road from Peachland, a distance of 20 miles.

Some soil-sampling was done on the DIK, Len, and Chub claims. Chalcopyrite and molybdenite occur in fractures and as disseminations in an east-striking zone in granodiorite. Four men worked for a period of four months under the supervision of A. C. Skerl, consultant.

## SUMMERLAND

*Molybdenum*

**Ann, Ram**
*Ventures Mining Ltd.*
By David Smith

(49° 120° N.E.) Company office, 201, 846 West Hastings Street, Vancouver 1. The Ann and Ram groups, totalling 60 claims, straddle the boundary of the Osoyoos and Similkameen Mining Divisions but are mostly in Osoyoos Mining Division. They are accessible by road from Summerland, a distance of 10 miles. Work during 1967 consisted of geological mapping, a geochemical survey, and blasting some surface trenches. A crew of four men was supervised by Alrae Exploration Ltd.

## OSOYOOS LAKE

*Silver-Copper*

**Lakeview-Dividend, Treasury**
*Pine Pacific Mines Ltd.*
By Stuart S. Holland

(49° 119° S.E. and S.W.) Company office, 1111, 736 Granville Street, Vancouver 2. Mineral leases constituting the old Lakeview-Dividend property on the west side of Osoyoos Lake are under agreement to the company from Duncan P. Simpson, of Osoyoos.

In 1967 a magnetometer survey was made of the Lakeview-Dividend and Treasury claims, 25,000 square feet of bedrock was stripped, three trenches 200 feet long were excavated, and four diamond-drill holes totalling 1,300 feet were drilled. The work was supervised by R. K. Germundson, geologist.

*Copper*

**Silver Coin**
*Coin Explorations Ltd.*
By V. A. G. Preto

(49° 119° S.W.) Company address, P.O. Box 230, Osoyoos. The company owns 24 recorded mineral claims comprising the Silver Coin group and centred on the southwest side of Kruger Mountain, 2 miles southwest of Kilpoola Lake. In 1967 work included mapping of the surface workings at a scale of 1 inch equals 400 feet and geological mapping of the Silver Coin 5 to 16 claims at a scale of 1 inch equals 200 feet by B. T. Furneaux, of Rayrich Mine Services Ltd. Soil-sampling of the entire block of claims on a 400-foot grid was done under the direction of J. A. Mitchell. Two men were employed by contractor for a period of two months.

[Reference: Assessment Report No. 1183.]

*Copper*

**Copper Coin**
*Coin Explorations Ltd.*
By V. A. G. Preto

(49° 119° S.W.) Company address, P.O. Box 230, Osoyoos. The company owns 24 recorded mineral claims comprising the Copper Coin group and centred on the north side of Kruger Mountain, 1½ miles east of Blue Lake. In 1967 work was supervised by Rayrich Mine Services Ltd. and included surveying of the surface workings at a scale of 1 inch equals 200 feet and digging of 19 hand trenches. Soil-sampling of claims, Copper Coin 3 to 24, on a 400-foot grid was carried out under the direction of J. A. Mitchell. Four men were employed by company and contractor for a period of two months.

[Reference: Assessment Report No. 1182.]

## HEDLEY

*Molybdenum-Copper*

**JM**
*Anaconda American Brass Limited*
By David Smith

(49° 120° S.E.) Company office, Britannia Beach. The JM group of 78 claims, owned by Anaconda American Brass Limited, is on McNulty Creek 5 miles north of Hedley and is accessible by road. Four men worked for two months under the supervision of J. M. McAndrew, geologist, geological mapping and making a geochemical survey. Molybdenite and disseminated chalcopyrite are reported to occur along fractures in fine-grained andesite.

*Gold*

**Nickel Plate**
*G.M. Explorations Limited*
By David Smith

(49° 120° S.E.) Company office, 1825, 355 Burrard Street, Vancouver 1. The old Nickel Plate mine property consists of a total of 83 claims, of which the key claims are the Kingston, Warhorse, and Bulldog. The mine is near Hedley and access is by road from Highway No. 3, a distance of 10 miles. During

1967 surface geological mapping was done over an area half a square mile, and three surface drill-holes totalling 637 feet and 14 underground drill-holes totalling 2,319 feet were diamond drilled. Six men worked a six-month period under the direction of A. G. Ditto, project manager.

*Gold-Molybdenum*

**Nighthawk, Good Hope**
*Highpoint Mines Limited*
By David Smith

(49° 120° S.E.) Company office, 1500, 355 Burrard Street, Vancouver 1. The Nighthawk and Good Hope groups of 31 Crown-granted claims are 4 miles by road from Hedley. During 1967 some geological mapping and 500 feet of bulldozer trenching were done. Two men worked for two weeks under the direction of John Lamb, consultant.

[Reference: Assessment Report No. 971.]

*Copper*

## KEREMEOS

**Kopr, Papex, Paychex**
*Apex Exploration and Mining Company, Ltd.*
By N. D. McKechnie

(49° 119° S.W.) Company office, 306 Martin Street, Penticton. N. E. Giddy, president; H. S. Wish, secretary; W. J. Weymark, consulting engineer. The property comprises 107 recorded mineral claims, the Kopr, Papex, Paychex, Wampus, Jill, Prosper, Stormy, Summit, and Giddy groups, and four mineral leases, Nos. 49, 50, 52, and 53, situated on the southeastward slope of Apex Mountain at the headwaters of Cedar, Loak, and Keremeos Creeks and about 25 miles southwest of Penticton. The claims are crossed by a forestry access road which leads from the Keremeos–Penticton highway along Cedar and Loak Creeks to the cirque below Apex Mountain lookout and thence to the lookout road about 1 mile north of the summit.

In 1967 work consisted of trenching and diamond drilling at the Papex showing and on the Australian claim (Lot 690 (S.), Mineral Lease 50), about 3 miles north and west of the Papex, at the northeast corner of the claim group. On the Apex claim (Lot 659 (S.), Mineral Lease 53) about 3,000 feet southwest of the Australian showings, there are some 1,600 feet of interconnected horizontal workings from a southwestward-trending adit which connects with a 120-foot shaft. Work was planned here but had not begun at the time of the writer's visit. The Apex workings in 1945 produced, from stoping at the side of the shaft, 109 tons of ore, from which were obtained 185 ounces of gold, 54 ounces of silver, and 1,518 pounds of copper.

The Papex showing is described in the 1966 Annual Report, page 189; the following remarks are supplementary. The unmineralized fault zone, which is the principal structural feature now, is exposed for widths of 80 to 100 feet in two trenches of 100 feet difference in elevation and about 120 feet apart horizontally. The dominant plane of faulting strikes north 45 degrees east and dips 75 degrees to 80 degrees northwestward. The strike and dip given for this fault in the 1966 report prove to be of subsidiary planes. In the footwall of the north 45 degrees east fault, a 10-foot-wide unmineralized fault strikes north 80 degrees east and dips 75 degrees northward. It is exposed at two points on strike about 300 feet apart; the intersection with the north 45 degrees east fault is not exposed. The strike and dip are parallel to those of the principal unmineralized fault exposed at the Kopr showing (*see* Ann. Rept., 1966, p. 189) some 2,000 feet to the south-southwest.

Two intrusive rocks now are exposed at the Papex showing. Syenite porphyry forms the hangingwall of the north 80 degrees east fault at its eastward exposure and the footwall is hornblende monzonite. Sheared hornblende monzonite also is exposed in the north 45 degrees east fault. The hornblende monzonite is similar to the " diorite " of the Kopr showings. Both rocks show some development of saussurite and uralite, more so in the hornblende monzonite than in the syenite porphyry. Disseminated pyrite is the only mineralization.

At 120 feet in the footwall of the north 45 degrees east fault a 10-foot width of skarn carrying magnetite and sparse chalcopyrite is bounded by two faults which are subparallel to the north 45 degrees east fault. The fault contacts are with Shoemaker chert.

Although the relationship between the faulting at the Papex and Kopr showings apparently is less direct than was suggested in the 1966 report, the prospecting situation remains that the mineralized blocks within the fault zone represent segments of mineralization in the Old Tom greenstones and that, in consequence, the most likely rocks to prospect are the Old Tom greenstones along but outside the fault structures.

Attempts to drill through the fault structure at the Papex were abandoned because of mechanical difficulties.

The mineral showings on the Australian claim are on the north side of the cirque, near the top of Apex Mountain at about 6,300 feet elevation. These and showings on neighbouring claims have been known since about 1900 and are mentioned in Annual Reports of 1900 to 1902, 1911, and 1945. All of them lie within a generally northeasterly striking band of Old Tom greenstones lying east of the summit of Apex Mountain. The Old Tom rocks there are underlain by highly siliceous rocks of the Independence Formation (*Geol. Surv., Canada,* Map 628A, Olalla).

The Australian workings consist of three trenches ranging in length from 100 to 300 feet and lying about 30 feet in elevation one above the other. At about 60 feet below the lowest trench an old adit has been driven some 125 feet northeastward to a point under the lowest trench. Thirty feet higher in elevation a second old adit has been driven about 10 feet northeastward.

The principal rock type is a volcanic breccia altered variously to amphibolite-biotite-andesine assemblages; there is some minor garnet-epidote skarn at limestone contacts. Two thin beds of limestone striking north 10 to 20 degrees east and dipping about 45 degrees eastward, and 4 and 8 feet thick respectively, cross the trenches. Two thin beds of a light-coloured siliceous breccia now composed chiefly of two generations of quartz which replace hornblende and clinopyroxene may represent old bedding faults, although they are not mineralized with sulphides. Sulphide mineralization occupies two fracture zones in the amphibolite breccia; one, exposed in the middle trench, strikes north 3 degrees east, dips 50 degrees westward, and is 2 feet wide; the other, in the lowest trench, strikes north 75 degrees east, dips 75 degrees southward, and is 4 feet wide. This mineralization is exposed also at the portal of the 10-foot adit which, however, trends across instead of along it. The sulphides in both fractures are pyrrhotite with minor chalcopyrite. At the portal of the 10-foot adit the sulphides are cut by stringers of augite diorite striking north 5 degrees west and dipping 80 degrees eastward, striking north 20 degrees east and dipping 60 degrees northwestward.

Westward about 100 feet from the 10-foot adit a northward-striking fault, confirmed by a diamond-drill hole, truncates the amphibolite breccia. Westward the rock is a coarse agglomerate composed of large siliceous blocks, up to several feet across, in a dark matrix. It is intruded by augite diorite. Outcrop distribution indicates that the augite diorite contact is offset along a northwestward-striking fault which, however, is not exposed. The agglomerate exposures show that it underlies an area widening northward from 400 to 800 feet and bordered by an again inferred northwestward-striking fault. West of this fault and at elevations between 6,500 and 6,550 feet are northeastward-striking agglomerate, limestone, basalt flow, siliceous breccia, and carbonaceous shale dipping 60 to 65 degrees southeastward. Unmineralized faults here strike northeastward and dip southeastward at 60 to 75 degrees. In the footwall of a faulted limestone contact a mineralized skarn is exposed in an old shaft; it strikes north 70 degrees east, dips 75 degrees southeastward, and is 6 feet wide. It pinches out about 20 feet southwest of the shaft; there are no exposures in line of strike to the northeast. The sulphide mineralization is chalcopyrite with pyrrhotite. This is the old Acadia showing, and it is about 1,700 feet west-northwest by west of the Australian showing.

The writer made a brief reconnaissance through the Apex adit and in the vicinity on surface. The rocks are Old Tom greenstones, locally well silicified, and containing discontinuous beds of limestone striking north 80 degrees west and dipping 65 degrees southward. Sulphide mineralization occurs near but not in the limestones, and it is different from that at the Australian, Acadia, Papex, and Kopr showings; it is arsenopyrite, chalcopyrite, bornite, pyrrhotite, and pyrite, in varying proportions. Unmineralized faults are well developed. In view of the grade indicated by the small tonnage produced from these workings, it may be worth while to attempt to work out the post-mineral fault movements by detailed geological mapping of the workings and their vicinity.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 188–189; Assessment Report No. 1044.]

*Copper*

**Homestead**
*G.M. Explorations Limited*
By David Smith

(49° 119° S.W.) Company office, 1825, 355 Burrard Street, Vancouver 1. G.M. Explorations Limited holds Mineral Lease M47, which consists of the Homestead Fraction, Warrior Fraction, and Rear Guard Fraction. These and other claims held by the company are near Olalla, and access is by road from Highway No. 3A, a distance of one-quarter mile. Work was done on the Homestead Fraction during 1967 and consisted of soil-sampling and two X-ray drill-holes totalling 170 feet. Three men worked for a period of one month under the supervision of S. Terry, geologist.

*Silver*

**Horn Silver Mine**
*Utica Mines Ltd.*
By N. D. McKechnie and David Smith

(49° 119° S.W.) Company office, 904, 510 West Hastings Street, Vancouver 2; mine office, P.O. Box 47, Keremeos. Isaac Shulman, president; S. Radvak, manager; Egil Lygvard, geologist. The property comprises two Crown-granted and 41 recorded mineral claims situated on the western slope of Mount Richter, 16 miles south and east of Keremeos and 4 miles north of the International Boundary. Access to the mine plant at 2,622 feet elevation is by a 2½-mile road which leaves the Keremeos–Richter Pass highway at the foot of Mount Richter.

During the year a 300-tons-per-day mill was erected near the foot of the mountain, at about 1,700 feet elevation. Toward the end of the year the capacity had been raised to 400 tons per day.

In the course of mill construction a silver-bearing vein was discovered at the site. It is called the " H " vein, and from projection could be part of the mine structure. It has been opened by an adit on the 1700 level and, according to a company announcement, the first 150 feet of drift on vein averaged 50 ounces silver and 0.22 ounce gold per ton over mining width.

Mine development has been chiefly auxiliary to stope preparation. A footwall vein, the " B " vein, opened just below the 2600 level, was found to carry appreciable native silver and somewhat more chalcopyrite than has been usual in the mine. Quartz in the Silver Bell adit at 3,233 feet elevation is on the plane of dip, 32 to 38 degrees, with the " B " vein and a diamond-drill hole intersection between the two. The slope distance would be about 750 feet.

Up dip, the main structure intersects a chloritized shear striking subparallel but dipping about 10 degrees northward. The shear carries feldspar, carbonate, and sulphides, but no quartz. Associated with the shear are thin mineralized fractures striking north 60 to 80 degrees west and dipping at about 5 degrees and at about 25 degrees northward. The 25-degree dipping fractures cut the 5-degree fractures. Mr. Lygvard states that selected samples of the mineralization have assayed as high as 600 ounces silver to the ton, and that these veins have been observed to cut faults which truncate quartz veins. They may be contemporary with the fracturing and subsequent mineralization of the quartz veins.

Surface geochemical samples have been taken in gullies on the property as far as Richter Creek. Some anomalous assays have been obtained from samples near the syenite-sediment contact and also in areas underlain by the syenite.

Development in the mine had been intermittent prior to the decision to construct a mill. Early in 1967 a mining crew was gradually assembled and the mine prepared for production. Because of the flat-lying veins, a method similar to room-and-pillar has been adopted. Slushers are used to move the ore from the stopes to the ore-passes.

The 2422 adit is the main haulage level and is equipped with side-dump ore cars and a diesel locomotive. From the surface ore dump, 25-ton Euclid trucks haul the ore to the coarse-ore bin at the mill. Further exploration is being carried out, and from a lower adit just above the mill a drift is being driven along a strongly mineralized vein.

On August 6, 1967, the mill was started and production commenced on August 14th. Two-stage crushing is used—a 20- by 36-inch overhead crusher feeds a 3-foot short-head Symons crusher of 450 tons per day capacity. The concentrator has a rated capacity of 300 tons of feed per day. A 7- by 10-foot Denver ball mill operates in closed circuit with a 12-inch hydrocyclone classifier and a 16- by 24-inch duplex mineral jig. The rougher and cleaning flotation circuit includes 14 Denver cells. Concentrate passes to a thickener 18 feet in diameter and 10 feet deep and final underflow to a 6-foot-diameter two-disk filter. Mill tails pass by gravity to a tailings thickener 60 feet in diameter. The tailings dam is below the mill and above the highway.

Water supply and pollution control have received maximum attention. Water supply is thus in two systems—fresh water and reclaim water. Fresh-water source is a 10-inch well on the property feeding to a water tank above the mill. Overflow from the thickener is pumped to a second tank just below the fresh-water tank.

In 1967 the mill has worked to capacity and exceeded the daily rated figure. Production for 1967 was 38,900 tons milled.

In 1967 the number of persons employed was 90, not including contract crews working on mill construction. No housing is provided, and employees commute from Osoyoos, a distance of 10 miles, and Keremeos, a distance of 14 miles.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, pp. 162–163; 1966, p. 190; *Geol. Surv., Canada*, Sum. Rept., 1929, Pt. A, p. 47; *Geol. Surv., Canada*, Map 341A, Keremeos.]

*Copper-Molybdenum*

**Golconda**
*Mollycot Mines Ltd.*
By N. D. McKechnie

(49° 119° S.W.) Head office, 801 Rogers Building, 470 Granville Street, Vancouver 2; mine office, Olalla. The property is on the south fork of Olalla Creek, a southeastward-flowing tributary of Keremeos Creek, about 1½ miles by road west of the settlement of Olalla. It includes the Copper King Crown-granted mineral claim (Lot 3065 (S.)) and the recorded claims Voight, North Star, Trout Fraction, Alma Nos. 1 and 2 Fractionals, and Alma Nos. 3 to 7 mineral claims.

The property is mentioned in Annual Reports from 1899; the principal references are in those for 1910, 1917, 1918, 1922, 1923, 1927, 1946, and 1960.

The present operators began rehabilitation of the Golconda underground workings and surface plant in 1966; the property had been closed since 1961.

Underground work has been confined to stoping in the old stopes. A new adit is projected from the Olalla Creek slope at an elevation of 125 to 150 feet below the old workings.

Surface stripping, at 2,900 feet elevation, on the Copper King Crown-granted mineral claim, 220 feet south-southeast of the north corner, disclosed a vein structure which has been opened for a strike length of 160 feet. It is a fracture zone in pyroxenite which is occupied by quartz bodies ranging in size to a maximum of 6 feet wide by 40 feet long. The zone strikes north 85 degrees west and dips 43 to 60 degrees southward. Shearing is not well developed; shear planes striking north 65 degrees west and dipping 88 degrees northeastward are exposed at the west end of the stripping; they are cut by quartz. At about 15 feet in the footwall of the main structure a small shear is exposed striking north 60 degrees east and dipping 45 degrees northwestward; this shear terminates in a small quartz body striking north 75 degrees west and dipping 75 degrees southward. Two small exposures of syenite, one in the hangingwall and one in the footwall, strike north 65 degrees west and north 75 degrees east and dip 89 and 77 degrees northward respectively. The quartz is sparsely mineralized with pyrrhotite and chalcopyrite. Molybdenite was not recognized.

The relationship of this showing to the vein structure in the mine workings (Ann. Rept., 1960, p. 61) is not clear. The principal direction of dip at the surface showing, however, is southward, whereas the prevailing dip in the workings is northward. If there is any relationship, therefore, it is not direct.

At about 400 feet westward from and nearly on line of strike with the stripping, a 1-foot quartz vein is exposed in pyroxenite. The vein strikes north 85 degrees west and dips northward alternately at the angles 45 degrees and 80 degrees; the steeper dip appears to be dominant. The quartz exhibits comb structure and is very sparsely mineralized with chalcopyrite.

*Copper-Molybdenum*

**Sup, Tom**
*Noranda Exploration Company, Limited*
By David Smith

(49° 119° S.W.) Company office, 1050 Davie Street, Vancouver 5. The Sup and Tom groups, totalling 14 claims, are on the ridge between Susap and Hunter Creeks, 7 miles due south of Keremeos. The Sup 2 to 8 claims are under option from J. E. Nott, of Penticton. Access to the property is by road and foot-trail south from Keremeos.

Work during 1967 consisted of mapping the geology of six claims, running 3.6 miles of electromagnetic survey, geochemical soil-sampling on six claims, and hand blasting 20 pits and open cuts. It is reported that molybdenite and chalcopyrite occur as fracture fillings in diorite. Three men worked for a period of one month under the supervision of A. Soregaroli, regional geologist.

## VERNON MINING DIVISION

### KETTLE RIVER

*Copper-Molybdenum*

**Bisson, Lucky, Molly, XL**
*Noranda Exploration Company, Limited*
By David Smith

(50° 118° S.W.) Company office, 1050 Davie Street, Vancouver 5. The Bisson, Lucky, Molly, and XL groups, totalling 40 claims, are near Bisson Lake, west of Kettle River. Access is by road from Vernon, a distance of 35 miles. The property was under option to Noranda Exploration Company, Limited, from Lesowski brothers and Wm. Magie. Work during 1967 consisted of geological mapping, geophysical and geochemical surveys, and 30 feet of surface trenching. Five men worked for a period of three months under the supervision of A. Soregaroli, regional geologist.

[Reference: Assessment Report No. 1022.]

### VERNON

*Gold*

**Kalamalka**
*Coin Canyon Mines Ltd.*
By David Smith

(50° 119° S.E.) Company office, 201, 540 Burrard Street, Vancouver 1. The Kalamalka group of eight claims is on Craster Creek, 2½ miles south of Lavington and 11 miles by road east of Vernon. The property was under option to Coin Canyon Mines Ltd. from A. S. Penney, of Vernon.

Work in 1967 consisted of 596 feet of surface diamond drilling. Quartz veins in the diorite are mineralized with pyrite and gold. Between 1935 and 1944, 7,267 tons of ore mined produced 2,898 ounces of gold and 3,474 ounces of silver. Work was carried out for a period of one month under the direction of F. L. Croteau, geological consultant.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1934, p. 32.]

### OKANAGAN LAKE

*Copper-Molybdenum*

**AT**
*Noranda Exploration Company, Limited*
By David Smith

(50° 119° S.W.) Company office, 1050 Davie Street, Vancouver 5. The AT group of 50 claims lies between the head of Terrace Creek and DunWaters Creek, a tributary of Shorts Creek. Access is by logging-road, a distance of 17 miles northeast of Westbank. Work during 1967 consisted of a geochemical survey and blasting 20 feet of pits and open cuts. It is reported that molybdenite and chalcopyrite mineralization occur in fractures in porphyritic quartz monzonite. Four men worked for a period of two weeks under the supervision of A. Soregaroli, regional geologist.

[Reference: Assessment Report No. 1071.]

*Molybdenum*

**Pat**
*Noranda Exploration Company, Limited*
By David Smith

(50° 119° S.W.) Company office, 1050 Davie Street, Vancouver 5. The Pat (Whiteman Creek) group of 28 claims is near the head of Whiteman Creek, 6 miles west of Okanagan Lake. During 1967 the geology of the area was mapped and a geochemical survey of 20 claims was carried out. Three men worked for a period of three weeks under the supervision of A. Sorregaroli, regional geologist.

[Reference: Assessment Report No. 1039.]

*Gold-Silver*

**Spike, Lid, Nail, Friday** (49° 119° N.W.) Company office, 105, 287 Bernard
*Dawood Mines Limited* Avenue, Kelowna. S. S. Gilmour, consultant. The
By K. E. Northcote Spike, Lid, Nail, and Friday groups, totalling 26 claims, are located 1 mile west of Wilson Landing on Okanagan Lake and are accessible by logging-roads. The property contains the old Blue Hawk mine on Jennie Creek and is presently under option to Caroka Development Ltd.

In a geological report prepared by S. E. Asano it is stated that the claims are underlain by greenstones, quartzites, argillites, and limestones of the Cache Creek group and that gold, silver, and lead mineralization is in quartz veins in and near the old Blue Hawk mine.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1933, pp. 196–197; *Geol. Surv., Canada*, Paper 37-21, p. 23.]

*Silver-Lead-Zinc*

### LIGHTNING PEAK

**Waterloo No. 3** (49° 118° N.E. and N.W.) The Waterloo No. 3 Crown-
By P. E. Olson granted mineral claim (Lot 4815) is at 5,640 feet elevation on the north side of Lightning Peak, 17 miles south of the Monashee Pass. The property was worked in 1954 and 1955 by the Paycheck Mining and Development Company Limited, who built a 60-ton mill near the Waterloo mine. This mill served several properties in the area.

During 1967 D. Pearce, of Nelson, cleaned the abandoned mill and shipped 2 tons of lead concentrates and 42 tons of zinc concentrates to the Trail smelter.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1954, p. 119; 1955, p. 45.]

## GREENWOOD MINING DIVISION

*Silver-Lead-Zinc*

### BEAVERDELL

**Highland-Bell Mine** (49° 119° S.E.) Head office, 300,
*Mastodon-Highland Bell Mines Limited* 999 West Pender Street, Vancouver
By P. E. Olson 1; mine office, Beaverdell. B. Goetting, manager; P. Lessard, mine superintendent; R. Williams, mill superintendent. The company owns 32 Crown-granted and 14 recorded mineral claims on the west slope of Wallace Mountain. The mine is developed by the 2900 main haulage level, and mining is done on the 3000, 2900, and 2800 levels, the latter serviced by two winzes. A minor amount of production came from the Lass No. 2 level in the old workings, but this work was abandoned before the end of 1967. Production was maintained at approximately 120 tons per day, 10 tons of which is removed by hand-sorting at the mill. Total mine production was 34,020 tons.

The mill operated fairly continuously at a rate of 100 tons per day, producing 3,894 tons of concentrate (713,911 ounces of silver), which was shipped to the Trail smelter.

Development work provided 4,656 feet of advance, and diamond drilling amounted to 27,460 feet. The high diamond-drill footage arises from a continuing need to hunt for ore in a rather complex geological setting.

Fifty-six men were employed, 30 of whom work underground. The company generates its own electricity with diesel generators located in an annex building at the mill. The West Kootenay Power and Light Company completed a power-line to Beaverdell in December.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 191.]

*Silver-Lead-Zinc*

**Wellington, Bounty, Tiger, Ruby Silver, Etc.**
*Silver-Lee Mines Limited*
By N. D. McKechnie

(49° 119° S.E.) Company office, 509, 602 West Hastings Street, Vancouver 2. K. E. Wickstrom, president; C. VanOostdam, manager. The company holds 27 claims, including the Crown-granted claims Bounty (Lot 2348), Ruby Silver, Wellington (Lot 2621), Tiger (Lot 2097), Kokomo Fraction (Lot 3067), and Bellaclava (Lot 3837 (S.)). The claims are on Wallace Mountain, south of the property of Mastodon-Highland Bell Mines Limited and about 1½ miles southeast of the village of Beaverdell.

The property is underlain by the Cretaceous(?) Beaverdell quartz diorite stock, which on the east is intrusive into sedimentary and volcanic rocks of the Permian and (or) Triassic Anarchist Group. To the northwest, toward Beaverdell, the quartz diorite is intruded by Oligocene(?) Coryell quartz monzonite.

In 1966 some stripping near the Tiger-Kokomo Fraction boundary exposed a fault zone in quartz diorite, striking north 40 degrees east, dipping 40 degrees northwest, and some 20 to 25 feet wide. The fault is intruded by a dark-green fine-grained massive dioritic rock which intrudes parallel or subparallel to the plane of faulting and is most evident where the fault zone is brecciated. Very sparse pyrite and galena mineralization occurs in blocks of white pegmatite which occur in the fault. The largest block seen was about 3 by 5 feet; the proportion of this rock in the fault zone is low. The pegmatite presumably is displaced by fault movements which did not affect the fine-grained diorite, the youngest, therefore, of the three rock types. The diorite is sparsely mineralized with very fine-grained pyrite. On the hangingwall side of the fault zone a thin shear is exposed striking north 87 degrees west and dipping 80 degrees south. A small shaft, or pit, not recent work, is at the junction of the fault and the shear.

At the Bellaclava claim on the westward side of LaPorte Creek, about 2½ miles southwest of the Tiger-Kokomo Fraction stripping, an old adit is being cleared as a diamond-drilling base. The adit trends about north 55 degrees west and is 135 feet from portal to face. The rock is Beaverdell quartz diorite. Two 1- to 2-inch quartz stringers mineralized with galena, sphalerite, and pyrite are exposed in the face and for about 20 feet back from it. One stringer, the older, strikes north 40 degrees west and dips 50 degrees southwest; the other and younger strikes north 40 degrees east and dips 40 degrees northwestward.

Stripping, soil-sampling, and some diamond drilling were done on the Tiger and Kokomo claims, and the Wellington No. 5 level was rehabilitated.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 138–148; *Geol. Surv., Canada*, Mem. 79, 1915; Map 15-1961.]

## ROCK CREEK

*Nickel*

**Old Nick**
*Copper Ridge Mines Ltd.*
By P. E. Olson

(49° 119° S.E.) Company office, 904, 510 West Hastings Street, Vancouver 2. The Old Nick property consists of 256 mineral claims which straddle the Osoyoos–Greenwood highway immediately west of the Rock Creek bridge. The main claims are the Old Nick 1 to 4, which were optioned by Copper Ridge Mines Ltd. from Brian Fenwick-Wilson.

Five diamond-drill holes totalling 2,911 feet and 35 percussion holes amounting to 4,156 feet were drilled. The drilling and some mapping were done under the direction of C. H. Donaldson, the company engineer.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 192.]

*Gold-Copper*

**Jul, War Eagle, LeRoy**
*Rayore Mines Ltd.*
By David Smith

(49° 119° S.E.) Company office, 925 West Georgia Street, Vancouver 1. The Jul group consists of five claims, the Jul 1 to 3, War Eagle, and LeRoy. The property is near McKinney Creek, 4½ miles from Rock Creek, and is accessible by road. Three men spent two weeks, under the supervision of S. L. Sandner, geological mapping and making electromagnetic and magnetic surveys.

*Gold*

## KETTLE RIVER

**Barnato**
*Amcana Gold Mines Limited*
By P. E. Olson

(49° 118° N.W.) Company office, 825, 510 West Hastings Street, Vancouver 1. The Barnato Crown-granted mineral claim (Lot 2848) is on the west side of the east fork of the Kettle River, about 25 miles north of Westbridge.

Four diamond-drill holes were put down on the property but footage was poor due to poor rock conditions. These holes were designed to intersect the Barnato vein at an elevation of 4,100 feet. Some stripping was done by bulldozer in the same area. Work was under the direction of J. Millican, of Grand Forks.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 193.]

*Copper*

**Ket, Susi**
*American Smelting & Refining Company*
By David Smith

(49° 118° N.W.) Company office, 504, 535 Thurlow Street, Vancouver 5. The Ket and Susi groups, totalling 24 claims, are on Copperkettle Creek. Access is from Rock Creek via Kettle River, a distance of 45 miles. Work done in 1967 consisted of geological mapping and induced polarization and magnetometer surveys. It is reported that chalcopyrite, bornite, and pyrite occur as veinlets and disseminations in skarn and granodiorite. Two men spent a month under the supervision of S. Anzalone, geologist.

*Copper*

## MIDWAY

**Lois, Bruce**
*The Granby Mining Company Limited*
By P. E. Olson

(49° 118° S.W.) Company office, P.O. Box 490, Grand Forks. The company owns the Bruce (Lot 918) and the Lois group of recorded mineral claims, which is 3 miles northwest of Midway. During 1966 induced polarization and magnetometer surveys were run on the Lois No. 21 and Lois No. 23 mineral claims, and later two holes were diamond drilled in this area. In 1967 an area north of the previous year's work was geologically mapped and surveyed by magnetometer and induced polarization surveys.

*Copper*

## GREENWOOD

**Toney, Chem, Vendela, Vicki, Anton**
*Utah Construction & Mining Co.*
By P. E. Olson

(49° 118° S.W.) Company office, 718, 510 West Hastings Street, Vancouver 2. The property consists of the Toney Crown-granted mineral claim (Lot 1907) and 19 recorded mineral claims, which are located about 2 miles southwest of Greenwood at an elevation of 3,500 feet. The property is held under agreement by Utah Construction & Mining Co. from K. G. Ewers and associates.

Geological mapping and an induced polarization survey of the Toney claim were done under the direction of M. J. Young. A soil-sampling project was carried out over the same area, after which two diamond-drill holes totalling 615 feet were drilled to test anomalies that had been found.

[Reference: Assessment Report No. 1067.]

*Copper-Molybdenum*

**Iva Lenore, Salamanca** (49° 118° S.W.) Company office, 718, 510
*Utah Construction & Mining Co.* West Hastings Street, Vancouver 2. Crown
By P. E. Olson Silver Development Ltd. has 40 mineral claims, including the Iva Lenore (Lot 1262) and Salamanca (Lot 2902) Crown-granted mineral claims, under option. The property is 2 miles west of Greenwood at an elevation of 3,000 to 4,200 feet. Utah Construction & Mining Co. optioned the property from Crown Silver Development Ltd. in 1966 and has done all work on the property since that time. A large body of low-grade copper-molybdenum mineralization has been indicated by diamond drilling.

In 1967 one hole was diamond drilled to a depth of 350 feet.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 193.]

*Copper*

**Richmond** (49° 118° S.W.) Company office, 808, 602
*Silver Standard Mines Limited* West Hastings Street, Vancouver 2. The Rich-
By P. E. Olson mond fractional Crown-granted mineral claim (Lot 2918), on the International Border about 10 miles southeast of Greenwood, is under option to Silver Standard Mines Limited from R. F. Sandner, of Greenwood.

William St. C. Dunn was in charge of work, which included geological mapping by R. H. Seraphim, 7 line miles of induced polarization survey, and 1,500 feet of percussion drilling in five holes.

*Copper*

**Cabin** (49° 118° S.W.) Company office, 808, 602
*Silver Standard Mines Limited* West Hastings Street, Vancouver 2. The prop-
By P. E. Olson erty comprises 20 mineral claims centred around the old Sappho workings, which are about 3 miles south of Boundary Falls. The property is reached by a dirt road which follows McCarren Creek. The old Sappho workings, which are now caved and full of water, are at an elevation of 3,000 feet. Silver Standard Mines Limited had an option on the property from J. W. McLean, Jr., and P. Gouthro, of Greenwood, but the option was relinquished at the end of the exploration programme.

Work was done on the Cabin No. 1 and No. 2 claims. The surface workings were mapped, topographic and geological maps were made, a magnetic survey was run, and five trenches totalling 1,800 lineal feet were bulldozed to explore magnetic anomalies. Work was under the direction of R. H. Seraphim.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1964, p. 110.]

*Copper*

**May Alice** (49° 118° S.W.) Company office, 808, 602 West Hastings Street, Vancouver 2. The May Alice and May Alice 1 to 8 recorded mineral claims, on the south side of Motherlode Creek about 4 miles west of Greenwood at an elevation of 3,500 to 4,000 feet, were optioned by Silver Standard Mines Limited from Richrock Mines Ltd.

*Silver Standard Mines Limited*

By P. E. Olson

An induced polarization survey and 330 feet of percussion drilling in two holes were done, after which the option was dropped. Some copper mineralization in skarn occurs on the property.

*Copper*

**Copper Queen, King Solomon** (49° 118° S.W.) Company office, 1023, 409 Granville Street, Vancouver 2. Fifty claims were under option to McIntyre Porcupine Mines Limited from several owners. The property is at an elevation of 4,500 feet near the head of Motherlode Creek, about 10 miles west of Greenwood. The key claims are the Copper Queen (Lot 387) and King Solomon (Lot 388) Crown-granted mineral claims.

*McIntyre Porcupine Mines Limited*

By P. E. Olson

Geologic mapping, soil-sampling, induced polarization surveys, bulldozer stripping, and about 1,800 feet of diamond drilling in four holes were done under the direction of J. W. MacLeod. Mineralization is chalcopyrite in skarn.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1897, p. 587; 1899, p. 768; Assessment Report No. 1082.]

*Gold-Silver*

**Amandy, Roderick Dhu** (49° 118° S.W.) J. A. Millican, of Grand Forks, owns a group of eight recorded claims, the Skipper Nos. 1 to 8 and holds a mineral lease on the Amandy (Lot 2795), Roderick Dhu (Lot 598), Alice (Lot 698), and Lady of the Lake (Lot 1171) Crown-granted mineral claims on the northwest side of Jewel Lake, where some work had been done around the turn of the century. The claims range in elevation from 3,000 feet at Jewel Lake to 5,000 feet at the northwest edge of the Roderick Dhu.

By P. E. Olson

The owner took some random magnetometer readings across the property and put down two short (27- and 34-foot) diamond-drill holes near known mineralization on the Roderick Dhu.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1921, p. 184; 1931, p. 125.]

## PHOENIX

*Copper-Gold-Silver*

**Phoenix Mine** (49° 118° S.W.) Company office, P.O. Box 490, Grand Forks. J. S. Kermeen, mine manager; J. Jewitt, mine superintendent; G. Hingley, mill superintendent. The company owns around 200 recorded and Crown-granted mineral claims centred around the old town of Phoenix. The main workings are on the Old Ironsides (Lot 589) and Stemwinder (Lot 588) Crown-granted mineral claims.

*The Granby Mining Company Limited (Phoenix Copper Division)*

By P. E. Olson

During 1967 production was as follows:—

| Location | Tons of Ore | Tons of Waste |
|---|---|---|
| Old Ironsides pit | 742,646 | 3,032,104 |
| Stemwinder pit | 57,704 | 314,105 |
| Totals | 800,350 | 3,346,209 |

(The waste figures include 337,867 tons of material grading between 0.3 and 0.5 per cent copper, which is stockpiled near the mill.) The mill treated 713,513 tons of ore grading 0.845 per cent copper.

Open-pit mining has covered an area of 292 acres. It has covered all of the old Phoenix workings and townsite except some parts of the town that extend down Twin Creek. A dam was constructed across Twin Creek, behind which all future tailings will be impounded, and water will be reclaimed for reuse at the mill.

A 5-yard electric shovel and a 9-inch electric rotary drill were added to the company's equipment.

Diamond drilling was done on some of the property adjoining the main pits. In the pits, vertical holes are drilled to a depth of 35 to 40 feet and blasted with AN/FO, which is mixed in a special blending-truck at the holes. Using this equipment, a 9-inch hole drilled to a depth of 40 feet can be loaded in about a minute. Where wet holes are encountered, blasting is done with commercial slurries. Secondary blasting is done with pulverized AN/FO, which is made at the property.

Mill capacity is 1,700 tons per day. Concentrates are trucked to Vancouver and then shipped to Japan for smelting.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 194.]

*Copper-Gold*

**Marshall**
*San Jacinto Explorations Limited*
By N. D. McKechnie

(49° 118° S.W.) Registered office, 625, 925 West Georgia Street, Vancouver 1; field address, P.O. Box 216, Penticton. The company holds by agreement Mineral Lease 138 (Brandon, Lot 2382; Brandon Fraction, Lot 2403; Marshall, Lot 2388; Little Annie, Lot 2389; Custer Fraction, Lot 1605; and Little Brown, Lot 2390), Mineral Lease 229 (Marshall Fraction, Lot 2404), and the recorded mineral claims Tio Buracho 1 to 6, Tio Buracho Fractional, and Glenside Fractional. The group lies at the head of Providence Creek north of Providence Lake, 3½ miles east and north of Greenwood. It adjoins the Phoenix Copper company property on the north. The Greenwood–Phoenix road passes near the south boundary and roads passable to motor-vehicles lead from it to various parts of the property.

The claims comprising Mineral Leases 138 and 229 were Crown granted between the years 1901 and 1907 and, as the Marshall group, were included in the early holdings of The Granby Consolidated Mining, Smelting and Power Company Limited (Ann. Rept., 1905, p. 176).

The claims are underlain by Middle to Lower Triassic sedimentary and minor volcanic rocks, the eastern half entirely by limestone. Sharpstone conglomerate is exposed near the southwest boundary. Intrusive rocks are confined to a number of tabular bodies of quartz monzonite and granodiorite ranging up to 50 feet in width. The limestone contact trends a few degrees east of north. Reliable bedding strikes and dips are scarce; the sequence from sharpstone conglomerate on the west to limestone on the east suggests a general eastward dip of the beds. The intrusive rocks in general are parallel or subparallel to the strike of the bedding. South of Providence Lake the Greenwood East Half map shows an east-striking fault which separates the rocks underlying the Marshall group from those of the Phoenix Copper mine.

The principal mineral showings are on the Marshall claim; one is on the Little Annie. Trenching on the Glenside Fraction exposed some rusty material near its southern boundary; the trench had sloughed there at the time of the writer's visit.

The rock exposed on the Marshall claim is chiefly a reddish chloritic siltstone, possibly tuffaceous. A thin-section showed crystalline quartz-feldspar fragments in a matrix of pyroxene, biotite, and quartz alternating in finer- and coarser-grained bands. The finer-grained bands contain the larger proportions of quartz and feldspar. Limestone, part of the large eastward masses, crosses the southeast corner of the claim. A trench here exposes altered aphanitic basalt or andesite underlying the limestone. In thin-section the rocks are seen to be comprised chiefly of chlorite and saussurite with phenocrysts of altered feldspar and ferromagnesian minerals. Flow lines are discernible around the phenocrysts. This rock is not seen in contact with the siltstone to the west. Some 600 feet westward of the main limestone contact and in the southern half of the claim, a north-trending lenticular body of limestone is exposed at intervals for a length of 350 feet and a maximum width of 75 feet. Most of the mineralization occurs near this body. Westward from this limestone about 100 feet there is a small exposure of sharpstone conglomerate in a trench; no contacts were seen.

The siltstone and the basalt-andesite rocks are well altered with development chiefly of chlorite, carbonate, and biotite. The intrusive rocks are noticeably fresher in appearance; the one thin-section examined showed minor alteration of quartz monzonite.

The mineralization occurs in northward-striking fractures and is of interest chiefly because two exposures contain appreciable gold. Most of the fractures strike about north 5 degrees east and dip 85 degrees westward; one well-developed fracture strikes north 40 degrees east and dips 50 degrees southeastward. There are 10 mineralized exposures over a width of 400 feet eastward and westward of the lenticular body of limestone. Of the ten, seven show no continuity between trenches 150 to 200 feet apart; three form an apparently continuous zone traceable for 400 feet on strike. Widths vary from a few inches to about 10 feet. Sulphide mineralization is pyrrhotite with pyrite and chalcopyrite. Two exposures about 1,600 feet apart lie near the eastern limestone contact, but in each case well-defined structures are lacking.

On a gangue-mineral basis, the mineralization falls into three groups: (1) pyrrhotite and pyrite in a magnetite-amphibolite gangue; (2) pyrrhotite, pyrite, and chalcopyrite in a garnetite gangue; (3) pyrrhotite, pyrite, and chalcopyrite in a quartz-feldspar gangue with biotite, and minor scapolite, tourmaline, and garnet. The third association contains gold. The amphibolite-sulphide association is exposed near the western end of the southernmost trench, just north of the south boundary of the Marshall claim. The amphibolite is an optically positive hornblende tentatively identified as cummingtonite. The mineralization is 8 feet wide; it is not exposed in a parallel trench 150 feet to the northward. The garnetite-sulphide association, with or without magnetite, is common to 10 of the remaining 12 exposures; chalcopyrite is the only mineral of possible value. The gold-bearing mineralization is exposed at two points—in a trench some 200 feet north of the south boundary and 1,150 feet west of the east boundary of the Marshall claim in a 3-foot wide vein striking due north, and at a point 300 feet north of the south boundary and 350 feet west of the east boundary of the Marshall claim, near the limestone contact. The structure at the second point is not clear. One picked sample from the western exposure assayed 0.35 ounce per ton in gold; three picked samples from the eastern exposure assayed, respectively, 3.82 ounces per ton, 4.74 ounces per ton, and 0.12 ounce per ton in gold.

Soil-sampling and a magnetometer survey by the company showed weakly anomalous copper readings and small magnetometer anomalies extending from the eastern exposure on a line of north 25 degrees east, about parallel to the limestone contact. The only other mineralized exposure on this line, however, was of pyrite and chalcopyrite with magnetite in garnetite and assaying only trace in gold. An induced polarization survey indicated a possible trend north to northwestward. It had not been tested at the time of the writer's visit.

P. Gouthro and J. W. McLean, Jr., of Greenwood, leased the property from the company in 1967. They mined 97 tons of ore and shipped this ore to the Trail smelter. The ore graded approximately 1 ounce of gold per ton.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1901–07; Assessment Reports Nos. 827 and 882; *Geol. Surv., Canada*, Greenwood East Half (in press); Map 45-20, Greenwood-Phoenix.]

*Gold-Silver-Copper*

**Winnipeg** (49° 118° S.W.) Registered office, 1322, 510 West Hastings Street, Vancouver 2. The property consists of the mineral claims Rand 1 to 8, the fractional mineral claims Rand 1 to 4, all held by record; three mineral leases, M237 (Joe Joe, Lot 759 (S.), and Sissy, Lot 1068), M238 (Hard Cash, Lot 1062, and Nabob Fraction, Lot 1063), and M239 (Hecla, Lot 859; Calumet, Lot 1314; and War Cloud Fraction, Lot 1316), and two Crown-granted mineral claims, Winnipeg (Lot 599) and Golden Crown (Lot 600). All are grouped as the Sabina group and are held by agreement by Sabina Mines Ltd. The group is located about 2½ miles southeast of the Phoenix copper mine and about 1 mile west of the Greenwood–Grand Forks highway between Skeff and Snowshoe Creeks at about 4,400 feet elevation. The immediate area is marked on older maps as Wellington Camp.

*Sabina Mines Ltd.*

By N. D. McKechnie

The showings on the Winnipeg and Golden Crown claims were developed and worked during the years 1895–1908 and 1938–41. Shafts to 500 feet depth at the Golden Crown and 1,000 feet at the Winnipeg had been sunk by 1901, and by 1902 some 4,500 lineal feet of underground workings existed at the Winnipeg. Recorded production amounts to 2,742 tons from the Golden Crown, which yielded 1,239 ounces of gold, 2,250 ounces of silver, and 83,891 pounds of copper; from the Winnipeg 58,772 tons yielded 11,675 ounces of gold, 36,550 ounces of silver, 190,618 pounds of copper, and 381 pounds of lead.

The Winnipeg showings are in a small body of intrusive rocks of basic to intermediate composition near its western contact with Permian or older volcanic rocks (*Geol. Surv., Canada*, Greenwood East Half (in press)). The Golden Crown workings are in the volcanic rocks about 1,000 feet northwest of the Winnipeg; they were not visited.

The underground workings at the Winnipeg were inaccessible. The Annual Reports of 1897 and 1899 describe parallel veins 75 to 100 feet apart and striking north 70 to 80 degrees west. At the Winnipeg shaft a surface rock cut exposes a mineralized fault zone in dark-grey fine-grained diorite in which the ferromagnesian minerals are wholly altered to chlorite. The rock is mineralized with pyrrhotite and with pyrite and chalcopyrite which vein the pyrrhotite and which are accompanied by minor quartz. The sulphides are irregularly distributed over a width of about 2 feet. The fault strikes north 40 degrees west and dips 75 degrees southwestward and is somewhat sinuous. A parallel dyke of fine-grained greenish monzonite 2 to 3 feet wide is exposed in the hangingwall side of the fault. A thin-section of the monzonite shows crushed zones with nodes of actinolite and calcite stringers. In the massive parts of the rock the ferromagnesian minerals are wholly altered to chlorite. Despite the fracturing, mineralization in the monzonite is confined to occasional grains of pyrite. In a trench 400 feet southeastward from the shaft and about 40 feet higher in elevation, mineralized diorite is exposed for a width of 1 foot. The rock is darker than that at the shaft, but the mineralization is similar. The strike at the trench is north 25 degrees west and the dip is 75 degrees southwestward. The hangingwall side of this mineralization is not well exposed; a small exposure of monzonite lies about 12 feet from the vein. On the footwall side two monzonite dykes are exposed at about 40 and 70 feet from the mineral zone. At 120 feet in the footwall an altered diorite porphyry is exposed for a distance of 7 feet; it is composed chiefly of plagioclase phenocrysts almost wholly altered to sericite and calcite and of ferromagnesians wholly altered to chlorite and calcite. The contacts are not exposed, and the rock was not recognized elsewhere in the vicinity of the workings; mineralization is confined to occasional quartz threads with pyrite. New bulldozer trenches about 400 feet northwest of the shaft, near other old workings, exposed diorite and monzonite but little mineralization.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1895–1903, 1938–41.]

*Copper*

**Midnight, Goldrop, War Eagle, Etc.** (49° 118° S.W.) Company address, *The Granby Mining Company Limited* P.O. Box 490, Grand Forks. The company holds a considerable number of claims immediately surrounding the Phoenix mine. They include the Midnight, Joker, Goldrop, Grey Eagle, War Eagle, and others.

By Stuart S. Holland

In 1967 induced polarization surveys were made on the Midnight and the Snowshoe, and 29 percussion holes totalling 2,380 feet were drilled on Grey Eagle and War Eagle. J. Paxton was in charge of the work.

*Copper*

**Keno** (49° 118° S.W.) Company office, 404, 510 West Hastings Street, Vancouver 1. Bomarc Mining Co. Ltd. had 35 Crown-granted and recorded mineral claims under option from various owners. These claims are grouped around the Keno Crown-granted mineral claim (Lot 1319). The main workings are on the Keno, 2 miles south of Phoenix.

*Bomarc Mining Co. Ltd.*

By P. E. Olson

Mineralization comprising chalcopyrite, pyrite, and magnetite on small quartz veins and disseminated through lime silicate skarn were explored by six bulldozed trenches totalling about 2,000 feet in length. Work was supervised by C. H. Donaldson.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 161.]

*Copper*

**Colleen** (49° 118° S.W.) Company office, 625, 925 West Georgia Street, Vancouver 1. The Colleen group consists of 13 recorded mineral claims situated 3 miles south of Phoenix at an elevation of 4,000 feet. The claims embrace the Sibley Crown-granted mineral claim (Lot 2223).

*Rayore Mines Ltd.*

By P. E. Olson

Geophysical work done on the property includes an electromagnetic survey (39,700 line-feet), a magnetometer survey (34,500 line-feet), and a short orientation survey with self-potential equipment. Some soil-sampling was done in selected areas. A. Gerun mapped the geology of six claims.

*Copper*

**Oro Denero** (49° 118° S.W.) Company office, 104, 569
*West-Coast Resources Ltd.* Howe Street, Vancouver 1. John Luttin, president;
By N. D. McMechan W. E. McArthur, Jr., project manager. The property consists of five Crown-granted mineral claims, Emma (Lot 591), Jumbo (Lot 592), Minnie Moore (Lot 593), Oro Denero (Lot 692), and Mary B (Lot 1568), and 16 recorded claims, all held in the name of Guaranty Trust Company of Canada, 624 Howe Street, Vancouver 1. Access to the property is by a jeep-road which leaves the Greenwood–Grand Forks highway 1½ miles north of its junction with the Phoenix cut-off. The jeep-road connects with old Canadian Pacific and Great Northern Railway grades which cross the Oro Denero and neighbouring claims.

Under an option agreement, Furukawa Mining Co. Ltd., of Japan, in 1967 drilled 42 diamond-drill holes on 50-foot centres within an area measuring 400 by 500 feet and adjoining the old Oro Denero workings on the south and west sides. Upon completion of a study of the results of this drilling, Furukawa dropped the options.

Mining at the Oro Denero, mostly between 1903 and 1910, was from three open pits. From two of these ore was drawn to two adits at elevations of 3,340 and 3,400 feet respectively. The workings lie within an area 700 feet long by 300 feet wide trending about north 30 degrees west. The relative sizes of the pits show that of the 136,477 tons recorded production, all but about 15,000 tons came from the southernmost pit, adjacent to the drilled area.

The Oro Denero workings lie within a northeasterly trending body of skarn which is chiefly garnetite. On the eastern side the skarn is flanked by easterly dipping crystalline limestone. Toward the western side, limestone intersections in drill-holes and bedding in small outcrops show westerly dips. The skarn, then, is on or near the crest of an antiform. The skarn is intruded by igneous rocks of differing ages, some of which themselves show alterations to skarn (*see* Ann. Rept., 1965, p. 171).

Sulphide mineralization, pyrite, pyrrhotite, chalcopyrite, occurs alone or with calcite in fractures in the skarn. Magnetite is prominent in some parts of the skarn, rare in others; hematite also occurs.

The old workings and the present drilling area are crossed by a number of unmineralized faults which may be grouped into three principal sets: strike north 45 degrees east, dip 75 degrees southeastward; north 60 degrees west, 80 to 85 degrees northeastward; north 15 degrees east, 80 to 85 degrees eastward. The workings are in separate blocks bounded by these faults.

Other than relationship to fractures in the skarn, no consistent structural control of mineralization is evident in the old workings. The southernmost pit trends north 55–60 degrees west and is on a near-vertical dip. It is traversed by a north 60 degrees west fault and by a northward-striking older fault; the former truncates a pulaskite dyke which cuts the mineralized skarn. Movement on these faults has brought sharpstone conglomerate to surface in a wedge at the southeast side of the pit. On the hangingwall side of the north 60 degrees west fault, ore was mined for a length of nearly 300 feet; downward the pit narrows toward the fault, suggesting that the ore dipped steeply toward it. On the footwall side of the north 60 degrees west fault and at the northwestward end, there is a pit area about 50 by 100 feet in largest dimensions which has been mined to a shallower depth than the hangingwall side. What relationship, if any, this material had to that on the hangingwall of the fault is not now apparent.

The next largest pit lies about 50 feet north of the northwest end of the above pit. It is crossed by three north 45 degrees east faults, of which the two best developed, about 250 feet apart, mark the northward and southward ends of the pit. The skarn here is crossed by northerly striking altered augite diorite dykes which dip about 20 degrees west. These dykes show some alteration to skarn and locally have gradational contacts with the garnetite. The skarn contains magnetite and is sparsely mineralized with pyrite and chalcopyrite. No appreciable amounts of sulphides were noticed in the diorite.

The third pit is a small one, 40 feet long by 20 feet wide, located at about 100 feet northwest of the northward end of the previous pit. Sulphide mineralization is in garnetite with magnetite and is pyrite and chalcopyrite. The skarn is in nearly horizontal contact with an overlying limestone in which solution cavities are filled with calcite. Skarn and limestone are on the hangingwall side of a fault striking north 30 degrees west and dipping 45 degrees southeastward.

Of the 42 holes drilled southwest of the pits, the cores of 12 were examined by the writer. The rock is garnetite with limestone toward the west side. Drill-hole intersections on the hangingwall of the limestone indicate a strike of north 57 degrees east and a dip of 55 degrees northwestward. Near parallel to the limestone and 20 to 50 feet in the hangingwall is a band of garnetite 2 to 30 feet thick having distinct contacts with the garnetite on both walls. It has a finely crystalline texture and in thin-section is distinguished by the garnets having isotropic centres and strongly anisotropic shells yielding a biaxial positive interference figure. It appears to be a distinct rock type within the main skarn, but its significance is not known. Augite diorite extends across the drilled area at an elevation of 3,150 to 3,200 feet striking north 78 degrees east and dipping 15 degrees northward. It intrudes the skarn and is unaltered.

In the cores examined, magnetite is rare and some hematite was recognized. Pyrite, pyrrhotite, and chalcopyrite are erratically distributed in fractures in the skarn; calcite stringers sometimes contain coarse pyrite and (or) chalcopyrite.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1896–1911, 1916, 1917, 1965; *Geol. Surv., Canada,* Maps 828, 6-1957; Assessment Reports Nos. 67, 117, and 178.]

*Copper-Zinc*

**Cyclops, Silver Chief**
*Giant Explorations Limited*
By P. E. Olson

(49° 118° S.W.) Company office, 1825, 355 Burrard Street, Vancouver 1. Giant Explorations Limited is a subsidiary of Giant Mascot Mines Limited, of the same address. The Cyclops claim and two other recorded mineral claims adjoin the Oro Denero mine on the south and are at an elevation of 3,500 feet. The company holds the property by agreement from W. J. Cudworth.

Five trenches totalling 430 feet were made by bulldozer and three shallow adits were dug on the Cyclops claim near skarn outcrops. Exploration of these claims resulted from recent activity on the Oro Denero property.

*Copper*

**Pac**
*The Granby Mining Company Limited*
By Stuart S. Holland

(49° 118° S.W.) Company address, P.O. Box 490, Grand Forks. The Pac group of 58 recorded claims is 2 miles east of Phoenix. In 1967 the geology of about half the area was mapped, a magnetometer survey was run over about 18 claims, an induced polarization survey was run over about 10 claims, and five holes totalling 1,743 feet were diamond drilled. The work was supervised by J. Paxton, geologist.

## EHOLT

*Copper*

**Stan** (49° 118° S.W.) Company office, 1300 Elveden House, Calgary,
*KRC, Inc.* Alta. KRC, Inc. owns 58 recorded mineral claims located half a
By P. E. Olson mile immediately east of Eholt. A soil-sampling programme was done on a 200-foot grid pattern on the central 24 claims of the group.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 195; Assessment Reports Nos. 889 and 1162.]

*Copper*

**Moe** (49° 118° S.W.) Company address,
*The Granby Mining Company Limited* P.O. Box 490, Grand Forks. The Moe
By P. E. Olson group consists of 27 recorded mineral claims 2 miles northeast of Eholt. The company owns the recorded claims and has optioned some nearby Crown-granted claims. Six men spent one month, supervised by J. Paxton, mine geologist, running a magnetometer survey over most of the property and drilling two diamond-drill holes totalling 695 feet on the Moe No. 7 and Moe No. 8 mineral claims.

*Copper*

**Argo** (49° 118° S.W.) Company office, 625, 925 West Georgia
*Rayore Mines Ltd.* Street, Vancouver 1. The property consists of six recorded
By P. E. Olson mineral claims near the head of South Pass Creek, 4 miles northeast of Eholt at an elevation of about 5,000 feet. A magnetometer survey of the property was made. Work was supervised by D. M. Fritz, field geologist for the company.

## GRAND FORKS

*Copper*

**Dee** (49° 118° S.W.) Company office, 625, 925 West Georgia
*Rayore Mines Ltd.* Street, Vancouver 1. Rayore Mines Ltd. holds the Dee 1
By P. E. Olson to 12 recorded mineral claims on the south side of May Creek, a tributary of July Creek from the west. A natural-gas pipe-line traverses the property in a northwesterly direction. The claims range in elevation from 2,500 to 3,500 feet. A magnetometer survey of the property was made. Work was supervised by D. M. Fritz, field geologist for the company.

## CHRISTINA LAKE

*Chromium*

**Mastodon** (49° 118° S.E.) Company office, 826, 470
*Hunter Point Exploration Ltd.* Granville Street, Vancouver 2. The Mastodon
By P. E. Olson property, consisting of 116 mineral claims, is adjacent to the United States border, 2 miles southeast of Cascade. In addition to owning recorded mineral claims, Hunter Point Exploration Ltd. holds six Crown-granted mineral claims by agreement with Chromex Nickel Mines Ltd. The main workings are on the Mastodon Crown-granted mineral claim (Lot 2384), at an elevation of 3,500 feet. Chromite occurs as lenses and disseminations in highly serpentinized dunite intrusives.

During 1967 seven holes totalling 4,000 feet were diamond drilled on the Mastodon. M. Hretchka, the company manager, directed exploration work with the assistance of R. Steiner, company geologist.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1922, p. 170; 1931, pp. 121–122.]

*Molybdenum*

## McRAE CREEK

**Moly, Ruby, Garnet** (49° 118° S.E.) Company office, 404, 509 Richards Street, Vancouver 2. The property, consisting of 64 contiguous mineral claims on the north side of McRae Creek, north of the Canadian Pacific Railway flag stop of Lafferty, is under option to Brycon Explorations Ltd. from the Okan-Wolverton syndicate. Most of the work was done on the Moly 1 and 2 and the Garnet 3 and 4 mineral claims.
*Brycon Explorations Ltd.*
By P. E. Olson

Work, which was under the direction of Steve Sersli, comprised geological mapping of an area 3 by 3 miles, a self-potential survey and soil-sampling of an area 1,400 by 1,600 feet, 1,200 lineal feet of bulldozer trenching, an area of 5,000 square feet of bedrock stripped, and 600 feet of diamond drilling in five holes.

[Reference: *B.C. Dept. of Mines,* Bull. 9, 1940.]

# TRAIL CREEK MINING DIVISION

*Gold*

## ROSSLAND

**Midnight** (49° 117° S.W.) Company office, 1322, 510 West Hastings Street, Vancouver 2. A. Pompu, manager. The company owns the Midnight Crown-granted mineral claim (Lot 1186) and 13 recorded mineral claims and fractions west of the Rossland-Paterson highway 2 miles west of Rossland.
*Cinola Mines Ltd.*
By P. E. Olson

A new level started in September, 1966, was driven fairly continuously throughout 1967. This level has been named the 3100 level, which is the elevation of the workings. This drift is rather sinuous but does pass below the workings extending below the main adit about 150 feet above the 3100 level. About 1,000 feet of drifting and raising was done, including a short raise to the older workings. Several gold-bearing veins were encountered but received only slight attention. These veins have visible gold scattered in them but tend to be lenticular and discontinuous.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 199.]

*Gold*

**I.X.L.** (49° 117° S.W.) The I.X.L. Crown-granted mineral claim (Lot 679) is under lease to J. A. Ruelle and associates, of Rossland, from the John S. Baker Investment Company of Tacoma, Wash. The property is 2 miles west of Rossland at an elevation of 3,200 feet. A small shipment of high-grade ore was made to the Trail smelter.
By P. E. Olson

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 174; 1966, p. 199, *see* Midnight.]

*Molybdenum-Copper*

**California, Deer Park, Etc.** (49° 117° S.W.) Company office, 300, 890 West Pender Street, Vancouver 1. During 1967 Cominco Ltd. worked in the Rossland area on 17 Crown-granted claims which have been owned by the company for several years. They fall into two groups: (1) California group of six claims on the south and southwest slopes of Red Mountain, including the California, San Francisco, Mariposa, Big Bend Fraction, Big 4 Fraction, and Aetna Fraction Crown-granted claims, and (2) Deer Park group on the southeast slopes of Deep Park Mountain, including
*Cominco Ltd.*
By James T. Fyles

the Deer Park, Grand Prize, Ollie Fraction, Annie E. Fraction, Gold Hunter, Sunday Sun No. 2, Wide West, Buckeye Fraction, Alabama, Sunset No. 2, and Old Hundred. The work included bulldozer stripping, soil-sampling, magnetometer surveys, and geological mapping and was under the direction of company geologists D. W. Heddle and R. G. Bagshaw.

*Copper-Molybdenum*

**Mayflower, Blue Bird, Homestake** (49° 117° S.W.) Company office, 1403, 1030 West Georgia Street, Vancouver 5.
*Rossland Mining Co. Ltd.*
By P. E. Olson

Rossland Mining Co. Ltd. has acquired 54 mineral claims previously held by Northwood Mining Limited, who explored the area in 1964. Important Crown-granted mineral claims on the property include the Mayflower (Lot 1274), Blue Bird (Lot 1053), and Homestake (Lot 936), which lie immediately south of Rossland.

Soil-sampling surveys were made over an area of 3½ square miles, with samples taken every 200 feet. This programme was designed to outline potential molybdenum-bearing zones.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1936, p. E 49; 1965, p. 178.]

*Gold-Silver-Copper*

**LeRoi, Josie, Iron Mask** (49° 117° S.W.) Company office, 625, 925 West Georgia Street, Vancouver 1.
*Falaise Lake Mines Ltd.*
By P. E. Olson

The company has optioned 72 mineral claims from Cominco Ltd., including the LeRoi (Lot 240), Josie (Lot 536), and Iron Mask (Lot 688) Crown-granted mineral claims lying immediately north and east of Rossland.

The company drilled 22 diamond-drill holes, totalling 6,509 feet, on the Iron Mask, LeRoi, and Josie mineral claims, and had magnetometer and Ronka electromagnetic surveys run on other Crown-granted mineral claims, including the Monte Cristo (Lot 802) and Red Mountain (Lot 1000) lying north of Rossland, and the Florence (Lot 1354), Palo Alto (Lot 950), and Crown Point (Lot 981) lying east of Rossland.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1911, p. 172.]

## The Geology of Red Mountain

By James T. Fyles

Red Mountain is a prominent hill about 1½ miles northwest of Rossland which rises to an elevation of 5,100 feet, about 1,000 feet above the town. The geology of the molybdenite deposit being mined by Red Mountain Mines Limited was studied by Eastwood in 1966 (*see* Ann. Rept., 1966, p. 200). To expand this work and to provide a background for future geological studies in the area, a short reconnaissance and the sketch-map, Figure 29, based on an air photograph, were made in late June, 1967.

The oldest rocks are dark-grey to black argillites or siltites (unit 1 of Eastwood) exposed in the valley along Jumbo Creek above the Cascade highway. They have been extensively metamorphosed to various types of hornfels. As seen in the field, the hornfels includes light- and dark-grey siliceous types and more commonly greenish- and purplish-brown types. Some have relict bedding while others are massive. The hornfels contains quartz, pyroxene, biotite, and locally hornblende, garnet, and epidote, all of which are very fine grained and can be identified with

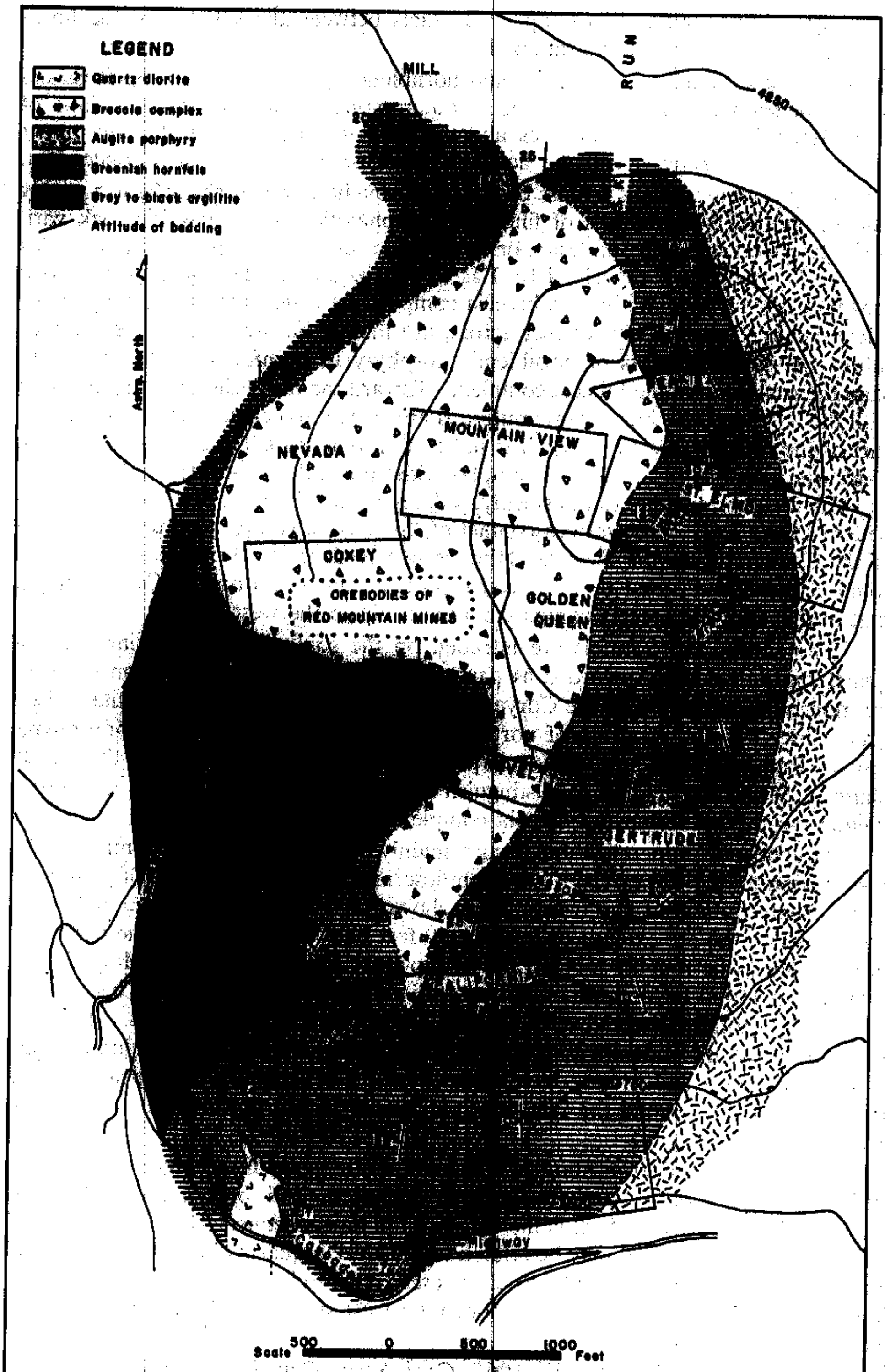


Figure 29. Geology of Red Mountain.

certainty only under the microscope. Contacts between the siltites and the hornfels are gradational and non-stratigraphic.

A thick sill-like mass of augite and hornblende porphyry called the Rossland sill lies beneath the siltite and hornfels, outcropping around the eastern slope of Red Mountain. Surface exposures and diamond drilling indicate that the upper contact of the porphyry with the hornfels is intrusive and essentially concordant.

The hornfels contains a mass of breccia throughout which are irregular poorly defined and dyke-like masses of fine-grained aphanitic and porphyritic rock variously described as diorite, andesite, or hornblende porphyry. This breccia complex on the Coxey claim is described by Eastwood (p. 204). The general outline is shown on Figure 29. Within the breccia complex the fragments, which range from a few inches to several tens of feet across, are mainly hornfels, but some are grey siltite. A dyke-like mass of hornblende porphyry in hornfels extends southward from the south end of the breccia complex. Toward the north the breccia converges with the Rossland sill, but because outcrops are scarce in a critical area in the lower part of the ski run (*see* Fig. 29), it is not certain that the sill and the breccia join. The eastern contact of the breccia complex with undisturbed hornfels on the Novelty and Giant claims appears to dip steeply, judging from drill cores of Cascade Molybdenum Mines Ltd. The western contact of the breccia complex on the lower part of the Coxey and on the Nevada claims is poorly defined. Low westerly dips in some of the hornfels and the low west dip of the orebodies on the Coxey suggest that in this area the breccia complex may also dip to the west.

The siltites and hornfels are intruded on the south by an irregular mass of quartz diorite generally regarded as part of the Nelson intrusions and on the west by monzonite belonging to the Coryell complex, which is younger than the Nelson (*see* Little, 1963). A group of northerly trending mafic dykes and lamprophyres crosses Red Mountain and shows up prominently in the open pits on the Coxey claims. Some are difficult to distinguish from the diorites, andesites, and hornblende porphyries within the breccia complex, which are older.

Molybdenite mineralization occurs mainly within the breccia complex. Its distribution on the Coxey claim has been described by Eastwood (p. 206), and the approximate outline of the orebodies is shown on Figure 29. Diamond drilling indicates that the ore extends only about 50 feet below the surface. The orebodies are thought to be roughly tabular and to dip west with the hillside. Molybdenite, however, is found beyond the orebodies outlined on the Coxey and has been tested extensively on the Giant, Novelty, Golden Queen, and St. Elmo claims. The true distribution of molybdenite is unknown and may not be determined until much more exploration and mining have been done. Consequently geological controls of mineralization beyond the fact that it is mainly within the breccia complex are very uncertain.

Molybdenite mineralization is obviously a late event in a complex history of sedimentation, volcanic activity, granitic intrusion, and brecciation. It seems possible that the Rossland sill is the cause of the breccia zone. Hornfels developed later than the breccia and may be related to the Nelson quartz diorites. Mineralized quartz diorite breccia on the Coxey claim (*see* Eastwood, p. 205) and breccia along the eastern margin of the Coryell monzonite west of Jumbo Creek indicate later periods of brecciation.

[References: Little, H. W., 1963, *Geol. Surv., Canada,* Paper 63-13; *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 200–207.]

*Molybdenum*

**Coxey**
*Red Mountain Mines Limited*
By P. E. Olson

(49° 117° S.W.) Mine address, P.O. Box 849, Rossland. B. C. Fillingham, manager. The company owns 18 mineral claims and two mineral leases on the west slope of Red Mountain. Main ore zones are on the Coxey Crown-granted mineral claim (Lot 1221).

Main production came from the A ore zone, which was mined in 1966 and is near the eastern boundary of the Coxey claim. Mining of the B ore zone down the slope to the west of the A zone was started late in 1967. Production was as follows:—

| | Ore (Tons) | Waste (Tons) |
|---|---|---|
| A zone | 156,415 | 3,842 |
| B zone | 4,102 | 16,862 |
| Total | 160,517 | 20,704 |
| Ore milled | 159,711 | |
| Molybdenum produced | | 678,818 lb. |

Diamond drilling amounted to 3,530 feet in 33 holes, mainly on the Coxey and Nevada (Lot 966) Crown-granted mineral claims.

Drilling and blasting are done with an air-track drill and AN/FO explosives. Loading is done with a track-mounted front-end loader, and hauling from the pit to the mill, a distance of about half a mile, is done with tandem trucks for the most part.

A major ventilation installation was placed in the crushing plant, and to prevent contamination with molybdenite mineral, which is rather greasy, the mill dry was moved away from the main mill.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 200–207; Trans., *C.I.M.M.*, Vol. 60, 1967, pp. 807–814.]

*Molybdenum*

**Giant, Novelty, Golden Queen, St. Elmo**
*Scurry-Rainbow Oil Limited*
By James T. Fyles and P. E. Olson

(49° 117° S.W.) Company office, 539 Eighth Avenue, Southwest, Calgary, Alta. This company did extensive drilling on the Giant (Lot 997) claim under agreement with Cascade Molybdenum Mines Ltd. and on the Novelty (Lot 958), Golden Queen (Lot 991), and St. Elmo (Lot 928) claims, which they optioned from Continental McKinney Gold Mines Ltd. The holes are mainly vertical and drilled more or less on a grid at about 50-foot centres to depths of 200 feet and locally to 500 feet. They test the full width of the breccia complex on the Giant and Novelty claims (*see* Fig. 29), with the exception of the narrow southern " tail " and the eastern part of the breccia on the Golden Queen and St. Elmo claims.

A total of 46,000 feet of diamond drilling was done in 174 holes, mainly on the Giant. J. Rowntree did a detailed geological survey of the entire property on a scale of 1 inch to 100 feet. A magnetometer survey at the same scale was done on the Giant. Four trenches totalling 800 feet were bulldozed. The main emphasis was on diamond drilling, in order to extend known mineralized zones. Some trenching and road-building were done on the property to facilitate geological mapping. Scurry-Rainbow was preparing a feasibility study of its properties on Red Mountain including the Golden Queen.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 208.]

Plate VIIA. Red Mountain Mines Limited. Concentrator on the north side of Red Mountain.

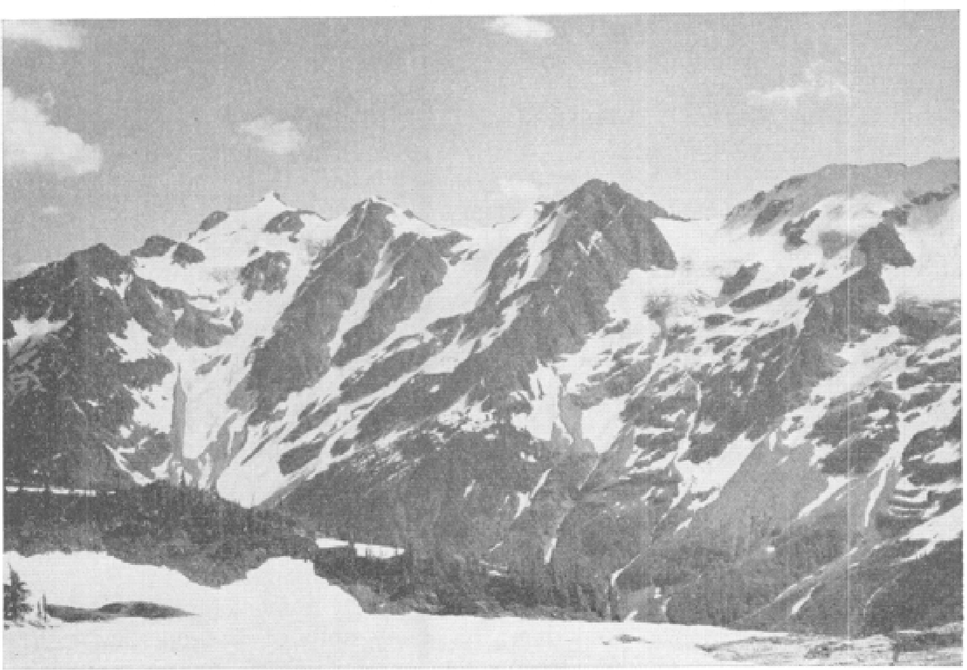

Plate VIIB. Looking southeast across Copeland Creek to Mount Copeland on the extreme left. The molybdenum showings of KRC, Inc., are below the glacier on the extreme right.

*Copper-Molybdenum*

**Kirkup**
*Royal Canadian Ventures Ltd.*
By P. E. Olson

(49° 117° S.W.) Company office, 270, 180 Seymour Street, Kamloops. Royal Canadian Ventures Ltd. held the Kirkup recorded mineral claims and some Crown-granted mineral claims, including the Argentine (Lot 1507), under option agreement from a Rossland group including James Hunter and Thomas Metcalfe. The claims, 52 in number and covering nearly 2 square miles, are 4 miles north of Rossland near the headwaters of Little Rock Creek, a tributary of Hanna Creek.

Geologic mapping and electromagnetic and soil surveys were done on the entire block of claims, and a magnetometer survey was done on the area around the Argentine Crown-granted mineral claim. One diamond-drill hole was put down 250 feet on the Argentine before work was suspended.

[References: Assessment Reports Nos. 1054, 1068, and 1117.]

*Copper*

**Grey, St. Louis**
*Cominco Ltd.*
By P. E. Olson

(49° 117° S.W.) Company office, 300, 890 West Pender Street, Vancouver 1. The Grey and St. Louis property, owned by Cominco Ltd., consists of five recorded mineral claims (Grey 3 to 7) and Mineral Lease No. 12, which comprises several Crown-granted mineral claims, including the St. Louis (Lot 935). The property is 2 miles north of Rossland on Red Mountain.

Detailed geological mapping was done in the vicinity of the east shaft on the St. Louis. Considerable stripping was also done. Chalcopyrite mineralization was found in the skarn and other metamorphic rocks.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1965, p. 174, *see* Grey.]

## NELSON MINING DIVISION

*Silver-Lead-Zinc*

### NELSON

**Molly Gibson**
*Homestake Silver Ltd.*
By N. D. McKechnie and P. E. Olson

(49° 117° N.E.) Company office, 600, 890 West Pender Street, Vancouver 1. D. A. McLeod, project manager. The company holds under option agreement from Cominco Ltd. 20 recorded and Crown-granted mineral claims, including the Molly Gibson (Lot 1579) and the Gopher, Mercury No. 1, and Bluff No. 1 Fraction, in the southern part of Kokanee Park, just north of Gibson Lake. The property is serviced by a good road to the 5880 level, where most of the work has been done. Cominco Ltd. is underwriting some of the exploration costs.

A line-drive northwestward in Nelson porphyritic granite from the 5880 level crosscut encountered quartz-filled fissures striking north 30 degrees west and dipping 85 degrees northeastward, and striking north 70 degrees east and dipping 85 degrees southeastward. Where the fissures intersect, the quartz appears to be of the same age in both. At 40 to 50 feet farther to the northwest a mineralized fissure was cut striking north 40 degrees west and dipping 85 degrees southwestward. The fissure is about 2 feet wide and is partly filled with asymmetrically banded buff carbonate; drusy, watery, crystalline quartz; and sulphides. Dark-brown to reddish sphalerite is the most prominent sulphide; pyrite and galena occur in the bands of sphalerite. Examination was in hand specimen only. Cockade structure is common. The fissure in part is cavernous and is the locus of a considerable water flow. Post-mineral movement along the fissure is indicated by local fracturings of the carbonate-quartz-sulphide material into blocks 6 inches to 2 feet in diameter.

The fissure is offset by a dark-grey fine-grained diorite dyke 10 feet wide, striking north 30 degrees east and dipping 85 degrees southeastward. Movement appears to have been normal to the dyke walls only. The diorite is massive and unmineralized.

The mineralized fissure is about on the projection of the Florence-Aspen vein system in the old workings 1,000 feet higher in elevation.

Underground geological mapping together with 1,804 feet of drifting and 100 feet of raising were done in a six-month operation in 1967; 12 men were employed. Owing to heavy winter snowfall and danger of avalanches, the camp below 5,880 feet elevation was largely removed when operations were suspended.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1896–1950 (1922, p. 206), 1965, 1966; Report of the Zinc Commission, *Mines Branch*, 1906, pp. 262–266; *Geol. Surv., Canada*, Ec. Geol. Series No. 8, Zinc and Lead Deposits of Canada, pp. 352–353.]

*Silver-Lead-Zinc*

**Kok**
By P. E. Olson

(49° 117° N.E.) The Kok 1 to 12 claims, held by M. MacDougal, of Nelson, straddle Busk Creek, a tributary of Kokanee Creek from the east, 3 miles from Highway No. 3. The main showings are on the Kok No. 11, 500 feet north of Busk Creek, at an elevation of 4,200 feet and were discovered early in 1967. There are several other showings on the property below the main showing. These were prospected many years ago. There is also a large fracture zone exposed by the Kokanee Creek road to the north of Busk Creek, which is also on the property.

The main showing (M-1 zone) was discovered by conventional prospecting methods and later fully exposed by hand by the owner. A channel sample across 8.5 feet assayed: Silver, 1.6 ounces per ton; lead, 1.6 per cent; zinc, 3.0 per cent; copper, 0.02 per cent. The mineralized zone strikes east and dips nearly vertically. Wallrocks are altered porphyry of the Nelson batholith, and the gangue is quartz heavily mineralized with pyrrhotite and pyrite. An induced polarization survey indicated an extension of the mineralized zone down slope from the main showing.

*Gold-Silver-Copper*

**Silver King**
*New Cronin Babine Mines Limited*
By P. E. Olson

(49° 117° S.E.) Company office, 610, 890 West Pender Street, Vancouver 1. New Cronin Babine Mines Limited holds 32 mineral claims on Toad Mountain, 9 miles southwest of Nelson, mainly through agreements with Cominco Ltd. and several individuals. Two main mineral claims on the property are the Silver King (Lot 141) and Kootenay Bonanza (Lot 140) Crown grants. The Silver King mine was operated from 1896 to 1913, and since that time has been leased several times. New Cronin Babine Mines Limited undertook investigation of the property in 1965, following efforts by L. Telfer, of Rossland, to amalgamate the various holdings at the Silver King mine.

During 1967 the company drilled 26 surface diamond-drill holes amounting to 2,591 feet. It is reported that exploration has thus far outlined nearly enough ore to justify a mining and milling operation of 100 tons per day.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 209–210.]

## HALL CREEK

*Gold*

**T.P.M., J** (49° 117° S.E.) Company office, 13, 5901 East Broadway, Burnaby 2. Nelway Mines Ltd. owns 26 recorded mineral claims on the Nelson–Salmo highway 1 mile north of Hall Creek. This property was previously known as the Golden Age.

*Nelway Mines Ltd.*
By P. E. Olson

The first 40 feet of the No. 2 level of the Golden Age mine was retimbered. The portal of this level is beside the highway. Three small-diameter diamond-drill holes totalling 200 feet were diamond drilled to intersect the Golden Age vein adjacent to the old workings. Some road-building was also done to service the drills.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 211; Little, H. W., 1959, *Geol. Surv., Canada,* Mem. 308, p. 166.]

*Molybdenum*

**Mammoth** (49° 117° S.E.) Company office, Suite 1002, 549 Howe Street, Vancouver 2. J. A. Tregilgis, resident engineer. The company holds Mineral Lease No. 112, which straddles the ridge between Hall and Barrett Creeks, at the head of Keno Creek. There are eight claims in the lease, including the Mammoth No. 2 Crown-granted mineral claim (Lot 14694).

*Weland Mining Ltd.*
By P. E. Olson

Late in December the company put down three short diamond-drill holes which were intended to intersect a molybdenum showing which lies on the northwest corner of the Mammoth. Molybdenum mineralization was noted in a skarn-like rock which had been left as dump rock from previous explorations.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1917, p. 171.]

## YMIR

*Molybdenum*

**Fresno, Fresnu** (49° 117° S.E.) Company office, 210, 48 Nanaimo Avenue East, Penticton. The company owns about 170 mineral claims, some recorded under the name Fresno and some under Fresnu, lying immediately west of Ymir and extending across Quartz and Stewart Creeks. The claims cover the main body of a quartz monzonite stock about 4,000 feet in diameter.

*Copper Horn Mining Ltd.*
By P. E. Olson

Three X-ray drill-holes totalling 140 feet put down late in 1966 in the vicinity of the original Fresnu showing located in 1902 on Quartz Creek 2 miles from Ymir indicated the presence of a zone of molybdenite mineralization. In 1967 geological, geochemical, and magnetometer surveys were run over 11 claims and several anomalous areas were selected for further exploration by diamond drilling. By the end of 1967 four diamond-drill holes totalling 1,026 feet had been completed in the Quartz Creek area. One hole is reported to have intersected the presumed extension of the Fresnu zone.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 212; Assessment Report No. 1083.]

*Gold-Silver-Lead-Zinc*

**Yankee Girl, Lake View** (49° 117° S.E.) Company office, 510 West Hastings Street, Vancouver 1. The company owns 24 Crown-granted mineral claims, including the Yankee Girl (Lot 7712) and the Lake View (Lot 3245), situated along a ridge between Ymir and Oscar Creeks about 2 miles east of Ymir. Workings are extensive and range in elevation from 2,800 to 5,500 feet.

*Burlington Mines Ltd.*
By P. E. Olson

The property, which has been an important producer of gold, silver, lead, and zinc during the first half of this century, has been idle for about 30 years, except for some leasing and sporadic diamond drilling. Work in recent years has been limited to keeping the portals open. This and some surface prospecting was done in 1967. The work was done under the direction of Ralph Sostad.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1963, p. 69.]

## SALMO

### Erie Creek

*Gold-Silica*

**New Arlington** By P. E. Olson (49° 117° S.E.) The New Arlington mine is held under lease by G. D. Fox and associates, of Trail. The main workings are on the Arlington Crown-granted mineral claim (Lot 3648) on Mineral Mountain between Hooch (Whisky) and Rest Creeks, which are tributaries to Erie Creek entering from the east. Seven thousand three hundred and twenty-five tons of dump rock was shipped by truck to the Trail smelter.

The lessees also stripped bedrock and put in rock cuts on the Micawber (Lot 4443) and Original (Lot 5120) Crown grants, which are down-slope from the Arlington.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 212.]

*Copper-Gold-Silver-Lead*

**Hattie** *Canzac Mines Ltd.* By Stuart S. Holland (49° 117° S.E.) Company office, 818, 510 West Hastings Street, Vancouver 2. The Hattie group of about 40 recorded claims on Erie Creek between McKay and Craigtown Creeks and 16 leased Crown grants are held by Canzac Mines Ltd. In 1967 some surface prospect trenching was done.

*Molybdenum*

**Meadows** By P. E. Olson (49° 117° S.E.) The Meadows property was located in 1967 by G. D. Fox and associates, of Trail. It is situated about 5 miles west of Salmo and 1 mile north of Meadows, a siding on the Great Northern Railway.

Molybdnum occurs in fractures in granite and is associated with quartz and aplite veinlets. Minor amounts of copper and tungsten have also been found on the property. A 60-foot adit was driven at the southeast corner of the Meadows No. 2 mineral claim, at an elevation of 2,500 feet. Below the adit a 300-foot cut was put in to expose bedrock. Some geochemical testing for molybdenum was also done over some of the claims.

*Silver-Lead*

**Silver Dollar** *Merritt Copper Co. Ltd.* By P. E. Olson (49° 117° S.E.) Head office, 248 Second Avenue, Kamloops. Eugene Meyer, manager. The Silver Dollar Crown-granted mineral claim (Lot 12599) and several adjoining claims are held by Merritt Copper Co. Ltd. under agreement with D. Norcross, of Nelson. The property is immediately west of Salmo, a few feet above the valley floor. A vein has been exposed along a hillside on the Silver Dollar. This vein conforms with the rock formation, which dips gently toward the east.

D. Norcross opened a level in 1966, continued this level during 1967, and stoped several carloads of ore from above the level. The company took over the property in October and continued the work started by D. Norcross until the level reached a point about 300 feet from the adit. In December a new level was collared about 75 feet down-dip from the Norcross level. Ore shipments to the Trail smelter amounted to 446 tons.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 212.]

*Gold-Silica*

SHEEP CREEK

**Gold Belt** (49° 117° S.E.) The Golden Belle is the main claim of the Gold
By P. E. Olson
Belt mine, which operated in the 1930's. The Golden Belle Crown-granted mineral claim (Lot 9907) is held under lease by A. Endersby, of Fruitvale. The mine is on the north side of Sheep Creek, 1 mile east of the old town of Sheep Creek, at an elevation of 2,100 feet. A. Endersby and sons mined 100 tons of ore from a vein about 600 feet from the portal of the 2100 level. This ore was shipped to the Trail smelter, where it was used as a silica flux.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 230.]

*Gold-Silica*

**Yosemite** (49° 117° S.E.) The Yosemite Crown-granted mineral claim
By P. E. Olson
(Lot 3654) is part of the property comprising the Kootenay Belle mine. This property is at 4,000 feet elevation on the south side of Sheep Creek, about one-half mile east of the old town of Sheep Creek. The property has been idle since the 1930's, except for the removal of dump rock sold to the Trail smelter. During 1967, 3,160 tons of dump rock was shipped to Trail by W. D. Tames, of Nelson.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 181; Walker, J. F., 1934, *Geol. Surv., Canada*, Mem. 172, p. 38.]

*Gold-Silica*

**Kootenay Belle Mill Site** (49° 117° S.E.) The Kootenay Belle mill site is on
By P. E. Olson
the north side of Sheep Creek, immediately upstream from the old town of Sheep Creek. W. D. Tames, of Nelson, shipped 281 tons of dump rock from the property to the Trail smelter under an arrangement with the property-owner, M. Arishenkoff.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 231.]

*Lead-Zinc*

IRON MOUNTAIN

**Jersey**
*Canadian Exploration Limited*
By P. E. Olson

(49° 117° S.E.) Head office, 700 Burrard Building, Vancouver 1; mine office, Salmo. C. E. Brown, mine manager; J. W. Robinson, mine superintendent; D. A. Knight, mill superintendent. Canadian Exploration Limited is a wholly owned subsidiary of Placer Development Limited. The property comprises 56 Crown-granted mineral claims between Sheep Creek and Lost Creek. Access is by two roads which leave the Salmo–Nelway highway at points 4 and 6½ miles south of Salmo, the most northerly (Emerald) being the main access road. The concentrator is on the highway at the junction with the south access road. Ore is transferred to the mill from the crushing plant at the mine by a system of conveyors and raises. There are seven conveyor units totalling 6,970 feet, and the vertical drop from crusher to mill is about 1,700 feet.

The mine, offices, plant buildings, 60 company residences, and a two-room school are at 4,000 feet elevation on the south side of Iron Mountain.

The lead-zinc ore of the Jersey mine occurs at the base of the Reeves limestone member, and is generally localized in the western limbs of two fold structures overturned to the west. The most westerly of these structures is the "A" zone, whose axis strikes about due north. The ore bands vary in thickness from a few inches to several feet, and the zone has an over-all thickness up to 80 feet. The eastern structure, the Dodger trough, strikes about north 15 degrees east and is more complex. There, the ore occurs in a variety of bands, lenses, and mantos which dip from flat to 30 degrees easterly. The structures have a gentle south dip.

Mining is by open-stope methods. Drilling is done by jacklegs, except for one three-boom Jumbo, which is used in large headings and on some benches. Most blasting is done with ammonium nitrate and fuel oil. Muck is scraped to ore passes and chutes or loaded with front-end loaders into Dumptors and hauled to pockets over the crushing plant. Ore-pass muck is hauled with DW-10's and semi-trailers to the crusher pockets.

During 1967 all production, amounting to 493,029 tons, came from the Jersey zone and was treated at the company concentrator. Lead concentrates were shipped to the Bunker Hill smelter at Kellogg, Idaho, and the zinc concentrates were shipped to the Anaconda smelter at Black Eagle, Mont., and the Bunker Hill zinc plant at Kellogg, Idaho. A strike at smelters in northwestern United States necessitated stockpiling of zinc concentrates from July to the year-end.

Development work in the mine amounted to 12,197 feet of drifting and 889 feet of raising. Underground diamond drilling amounted to 16,370 feet. Probable reserves at the end of 1967 were 523,453 tons, slightly down from the previous year.

The company operates 31 pieces of diesel equipment underground. Ventilation is supplied by four 48-inch fans driven by 60-horsepower electric motors.

There are 223 men employed by the company, including 122 who worked underground.

*Lead-Zinc-Tungsten*

**Tungsten King**
*Canadian Exploration Limited*
By P. E. Olson

(49° 117° S.E.) Head office, 700, 1030 West Georgia Street, Vancouver 5; district office, Salmo. The Tungsten King property, comprising eight Crown-granted mineral claims, is adjoined on the north by the Emerald and Jersey holdings of Canadian Exploration Limited and on the south by the Truman holdings of American Zinc Company Limited. Access is by way of 1 mile of road up Lost Creek from the Salmo–Creston highway. The property is under option from the L. R. Clubine estate and E. Oscarson.

Following an improvement in the tungsten market, the company during 1967 diamond drilled two deep holes totalling 1,292 feet in the vicinity of workings 1 mile southwest of the Jersey open pit.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1958, p. 39.]

*Tungsten*

**Emerald Fraction, Invincible**
*Canadian Exploration Limited*
By P. E. Olson

(49° 117° S.E.) Head office, 700, 1030 West Georgia Street, Vancouver 5; district office, Salmo. The Emerald Fraction and the Invincible are part of a large block of claims which cover the Emerald tungsten mine and the Jersey lead and zinc mine, both owned by Canadian Exploration Limited. Access to the property is by road which leaves the Salmo–Nelway highway 4 miles south of Salmo. The Emerald mine was an important producer of tungsten from 1947 to 1958, when the market for tungsten declined.

From the time the mine closed until 1967, the tungsten property was idle. During 1967 the company carried out magnetometer and electromagnetic surveys on the Invincible Crown-granted mineral claim (Lot 12084).

[Reference: *Minister of Mines, B.C.*, Ann Rept., 1958, pp. 38–39.]

## NELWAY

*Lead-Zinc*

**Reeves MacDonald Mine** (49° 117° S.E.) Company office, Remac. *Reeves MacDonald Mines Limited* L. M. Kinney, general manager; F. R. Thompson, mine manager; M. B. Wiwchar, chief engineer; J. M. McDearmid, mill superintendent. The property straddles the Pend d'Oreille River 4 miles west of Nelway. The Nelway–Waneta road passes through the property.

By P. E. Olson

Lead-zinc-pyrite mineralization occurs in dolomitized zones of the Reeves limestone, which, in the vicinity of the mine, has a northeasterly strike and a dip of 55 to 60 degrees to the south. Orebodies plunge generally to the west and are fairly continuous down-dip.

The mine to date has produced 5,757,940 tons of ore from a vertical range of about 2,000 feet. Ore zones have been developed by the 1900 level main haulage and two internal shafts, the larger of which (No. 3 shaft) is the main production shaft. Ore zones, which vary up to 100 feet in width, are developed by sublevels which are slashed by jackleg mining methods to the full width of the ore. The remainder of the ore is blasted by long-hole methods and drawn out at the bottom of the stopes via drawpoints and slusher drifts to ore-passes. Ore is then hoisted to a pocket above the 1900 level and then hauled by trolley electric trains to the crusher on the surface.

Production for 1967 was as follows:—

| | Tons |
|---|---|
| O'Donnell zone | 74,263 |
| Upper Reeves zone | 13,405 |
| Lower Reeves zone | 315,504 |
| Miscellaneous exploration | 1,610 |

The following table shows development and drill footages:—

| | Ft. |
|---|---|
| Drifting and crosscutting | 8,141 |
| Raising | 5,492 |
| Surface and diamond drilling | 1,762 |
| Underground diamond drilling | 9,741 |
| Percussion test-hole drilling | 2,238 |
| Blast-hole drilling (2¾-inch) | 38,825 |
| Blast-hole drilling (2⅛-inch) | 36,965 |

Long-hole drilling and blasting methods were altered to effect better fragmentation in primary blasting.

The company continued its underground exploration programme on the Annex property on the south shore of the Pend d'Oreille River. The main crosscut (1750 level) was advanced 1,679 feet to a known ore zone previously encountered by surface diamond drilling. Diamond drilling of this ore zone was started in November from stations near the end of 1750 level. Exploration thus far has been insufficient to determine the size and grade of the Annex zone.

The mill treated 404,782 tons of ore of a slightly lower grade than that of the past few years.

The company operates a bunkhouse and cookhouse at Remac and employs 148 men, 22 of whom are on staff.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 215.]

*Lead-Zinc*

## KITCHENER

**Kid**
*Cominco Ltd.*
By Stuart S. Holland

(49° 116° S.E.) Company office, 300, 890 West Pender Street, Vancouver 1. The Kid group of 48 claims is on Found Creek, a tributary of Kid Creek, 4 miles northeast of Kitchener. The claims are under option from Helge E. Fors, of Kimberley.

It is reported that galena, sphalerite, and pyrrhotite occur in fractures in argillaceous quartzite on the Kid Nos. 1 to 4 claims. The company continued exploration work begun in 1966.

In 1967 the geology of about 36 claims was mapped, an electromagnetic survey made of an area 2,000 by 2,500 feet, and a geochemical survey made of six claims, Three trenches totalling 900 lineal feet were bulldozed. H. H. Freund, geologist, was in charge of the work.

[Reference: Assessment Report No. 1069.]

*Molybdenum*

## CRAWFORD BAY

**UNF, Ben Derby**
*Kamalta Exploration Ltd. and United New Fortune Mines Ltd.*
By P. E. Olson

(49° 116° N.W.) Company office, 709 Lancaster Building, Calgary, Alta. The UNF and Ben Derby groups of 30 recorded mineral claims are near Gray Creek, which enters the east side of Kootenay Lake 10 miles southwest of Crawford Bay post office.

Bulldozer stripping and diamond drilling were done during 1967. Molybdenum values were disclosed by the diamond drilling, but extent and nature of the deposit have not been determined.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 217; Assessment Report No. 1176.]

# SLOCAN MINING DIVISION

*Zinc*

## PINGSTON CREEK

**Odin, Van**
*Northwest Zinc Company Ltd.*
By P. E. Olson

(50° 118° N.E.) Company office, 675 West Hastings Street, Vancouver 2. Northwest Zinc Company Ltd. holds by option the Van and Odin groups, totalling 120 recorded mineral claims. The property is on Pingston Creek, on the west side of Upper Arrow Lake, and ranges in elevation from lake-level to 7,500 feet.

Twelve men spent six months geological mapping, geochemical prospecting, and diamond drilling six holes totalling 3,271 feet, and constructing 6 miles of roads on the property to service the exploration programme. The work was supervised by D. C. Malcolm.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 218.]

*Copper*

## NAKUSP

**Copper Horn**
*Copper Horn Mining Ltd.*
By P. E. Olson

(50° 117° S.W.) Company office, 212 Nanaimo Avenue East, Penticton. Copper Horn Mining Ltd. owns 60 recorded mineral claims at Cape Horn on the east side of Upper Arrow Lake, 10 miles north of Nakusp.

Geological mapping and a geochemical survey were carried out mainly in the immediate vicinity of Cape Horn, where chalcopyrite mineralization in schistose rock had been found on Cape Horn Creek.

*Silver*

**NePe** (50° 117° S.W.) Company office, 1170, 505 Burrard Street, Vancouver 1. The NePe group consists of eight recorded mineral claims owned by F. Jordan and associates, who have optioned the property to Jason Explorers Ltd. The property is on the south side of Slewiskin Creek at an elevation of 2,400 feet. It is reached by 2 miles of mining-road which leaves the Nakusp–Needles highway 7 miles south of Nakusp.

*Jason Explorers Ltd.*
By P. E. Olson

The workings consist of two levels which explore quartz veins ranging in width from several inches to about 8 feet. The veins strike northwesterly, have steep dips, and show some mineralization, but there appears to be no continuity of values. Pyrite and silver-bearing tetrahedrite are the main sulphides present.

Work was started by the company late in the year. The lower level was extended southerly about 20 feet.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1964, p. 129.]

## BURTON

*Gold-Silver-Lead-Zinc*

**Millie Mack** (50° 117° S.W.) Company address, P.O. Box 230, Osoyoos. The Millie Mack Crown-granted mineral claim (Lot 1831) and 43 other Crown-granted and recorded mineral claims are on the north side of Caribou Creek, 15 miles by road from Burton. The principal workings are on the Millie Mack at an elevation of 6,300 feet. The mine produced almost continuously from 1904 to 1924.

*Richwood Silver Mines Ltd.*
By P. E. Olson

Richwood Silver Mines Ltd. repaired the mine road and relocated about 1 mile of it. Several hand and bulldozer cuts were made on the property in an attempt to find an extension of the Millie Mack vein.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1917, p. 175.]

## SPRINGER CREEK

*Silver-Lead-Zinc*

**Joyce** (49° 117° N.E.) The Joyce recorded mineral claim is at 4,000 feet elevation on the north side of Memphis Creek, about 1 mile east of the Slocan–Silverton highway. The property was leased by John Nesbitt, of Silverton, from the owner, Stanley Reid. There is one 30-foot adit on the property, which was driven by early prospectors. Ten tons of sorted ore was shipped to the Trail smelter.

By P. E. Olson

*Silver*

**Meteor** (49° 117° N.E.) Company office, 570, One Thornton Court, Edmonton, Alta. The Meteor Crown-granted mineral claim (Lot 2893), on which the Meteor mine is situated, is at 6,600 feet on Tobin Creek, a tributary of Springer Creek. It is owned by Cultus Exploration Ltd. A small mill was put on the property in 1963 but was operated for only a short time.

By P. E. Olson

In 1967 two separate leases were let on the mine. J. McWhirter and partner shipped 92 tons of ore to the Trail smelter, and later C. Thickett and son shipped an additional 24 tons. Both hand-sorted the ore from stopes above the No. 6 level.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1964, p. 129; Cairnes, C. E., 1935, *Geol. Surv., Canada*, Mem. 184, p. 179.]

*Silver-Lead-Zinc*

**Hughes** (49° 117° N.E.) Company office, 24 North Rosser Avenue, Burnaby 2. The property consists of 37 mineral claims

*New Eagle Mining Corporation Ltd.*
By P. E. Olson

comprising the Hughes, Ann, Tom, and other recorded claims on the south side of Springer Creek, and ranges in elevation from 4,000 to 5,500 feet. Old workings are scattered over the property. The property is reached by 2 miles of road that extends southward from the Slocan–Ottawa road.

Two portals were reopened on the Loder and Argo mineral claims, which are on the Ottawa road. Some bulldozer trenching, stripping, and road-building were done on the Hughes No. 3 mineral claim.

*Silver-Lead-Zinc*

**Colorado**
*Western Standard Silver Mines (1966) Ltd.*
By P. E. Olson

(49° 117° N.E.) Company office, 850 West Hastings Street, Vancouver 1; mine office, Slocan. Western Standard Silver Mines (1966) Ltd. holds about 22 recorded mineral claims of the Colorado group, located at an elevation of about 5,000 feet on the north side of Memphis Creek 4 miles north of Slocan. This group of claims covers a property previously known as the Colorado mine.

A raise, expected to penetrate 150 feet of unexplored ground, was driven from the new level started in 1965. After the raise was advanced 20 feet, it broke into old workings and work was suspended.

In October 23 tons of vein material was shipped to the Trail smelter.

[References: *Minister of Mines, B.C.*, Ann Rept., 1966, p. 218; Cairnes, C. E., 1935, *Geol. Surv., Canada,* Mem. 184, p. 170.]

*Silver*

**Ottawa**
*Brimont Mining Limited*
By P. E. Olson

(49° 117° N.E.) Company address, P.O. Box 56, Slocan; A. Ditto, manager. Brimont Mining Limited has the Ottawa mine under lease agreement from Slocan Ottawa Mines Ltd. The mine is 5 miles from Slocan on the north side of Springer Creek. Nearly all the mine workings are on the Ottawa Crown-granted mineral claim (Lot 4968).

The mine was closed from November, 1966, to October, 1967, when it was reopened by Brimont Mining Ltd. This company limited work to stoping on the easterly shear between No. 8 level and No. 6 level, where much stoping had been done in previous years; 1,612 tons of ore was shipped to the Trail smelter via Canadian Pacific Railway cars loaded at Slocan. The company did no development work or diamond drilling.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 218.]

*Silver-Lead-Zinc*

**Arlington**
*Arlington Silver Mines Ltd.*
By P. E. Olson

(49° 117° N.E.) Company office, 809, 525 Seymour Street, Vancouver 2; mine office, Slocan. The Arlington property consists of 16 mineral claims, including the Arlington Crown-granted mineral claim (Lot 2416), on the north side of Springer Creek 6.7 miles from Slocan. Principal workings at the Arlington mine are the "A" level, at an elevation of about 5,700 feet, and "B" level, 110 feet above the "A" level. Other adits above the "B" level have not been explored for many years. The mine has produced approximately 750,000 ounces of silver from a vertical range of 650 feet in a mineralized crush zone in granite.

Exploration work in 1967 was confined to the "A" level, which was advanced 760 feet, and is parallel to the old "A" level, which was driven around 1900. A raise was driven to the "B" level to provide natural ventilation and to explore an intersection of ore located by diamond drilling in 1966. A second raise was driven on a rich narrow vein encountered while drifting. These raises are about 1,000 feet from the "A" level adit.

Work was done under the direction of S. Walsh, the mine manager, by a crew of eight men.

[References: *Minister of Mines, B.C.,* Ann Repts., 1904, p. 165; 1966, p. 219; Cairnes, C. E., 1935, *Geol. Surv., Canada,* Mem. 184, p. 168.]

*Silver-Lead-Zinc*

## ENTERPRISE CREEK

**Neepawa Mine**
*Silver Pegg Mines Ltd.*
By P. E. Olson

(49° 117° N.E.) Company office, 700 St. Andrew's Road, West Vancouver. The Neepawa Crown-granted mineral claim (Lot 1260) and several adjoining recorded claims are held by Silver Pegg Mines Ltd. by agreement. The Neepawa mine is at 4,600 feet elevation on the south side of Enterprise Creek, 5 miles from the Slocan–New Denver highway.

Work started on No. 3 level in 1966 was continued in 1967. A raise from No. 3 level to No. 2 level was cleared of broken rock, and the old stopes were examined. The mill was inactive during the year.

[Reference: *Minister of Mines, B.C.,* Ann Rept., 1966, p. 220.]

*Silver-Lead-Zinc*

**Enterprise Mine**
By P. E. Olson

(49° 117° N.E.) The Enterprise mine, which was one of the biggest producers in the Slocan, is at an elevation of 4,000 feet on the south side of Enterprise Creek about 4 miles from the Slocan–New Denver highway. The Enterprise Crown-granted mineral claim (Lot 1014) and several adjoining Crown grants cover the main workings.

J. Gates and R. J. Forgie are reported to have purchased the Enterprise mine from Western Exploration Company Limited. Following the purchase, some drifting was done on a sublevel on No. 2 vein near Enterprise No. 5 level.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 220; Cairnes, C. E., 1935, *Geol. Surv., Canada,* Mem. 184, p. 172.]

*Silver-Lead-Zinc*

## SILVERTON

**Standard**
*Panoil Canadian Minerals Associates*
By P. E. Olson

(49° 117° N.E.) The Standard Crown-granted mineral claim (Lot 564) and others comprise the Standard-Mammoth mine, which is located on the north side of Silverton Creek about 2 miles east of Silverton. Panoil Canadian Minerals Associates holds the property by agreement with Western Exploration Company Limited and maintains an office at Silverton. The property was idle from late 1966 until November, 1967.

The mine workings in the Hecla tunnel area were repaired and ventilated, and a raise was started to the Mammoth No. 7 level. It is planned to sink an inclined shaft about 200 feet below the Hecla level to develop known ore reserves.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 220.]

*Silver-Lead-Zinc*

**Hewitt, Lorna Doone**
By P. E. Olson

(49° 117° N.E.) The Hewitt mine is on the south side of Silverton Creek about 3 miles east of Silverton and is under lease to A. K. Lotze. The mine comprises two Crown-granted mineral claims, Lorna Doone (Lot 1401) and Hewitt (Lot 4440). Five tons of hand-sorted ore from the No. 10 level was shipped to the Trail smelter.

[Reference: *Geol. Surv., Canada,* Mem. 184, pp. 51–58.]

*Silver-Lead-Zinc*

**Freddy** (49° 117° N.E.) The Freddy Crown-granted mineral claim (Lot 4025) is owned by V. Hansen, of New Denver. The claim is 1 mile south of Silverton at an elevation of about 2,300 feet. V. Hansen and partner did a small amount of drifting and sorted 30 tons of ore, which was shipped to the Trail smelter.

By P. E. Olson

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1964, p. 126.]

## SANDON

*Silver-Lead-Zinc*

**Mercury** (49° 117° N.E.) Mineral Lease No. 21, comprising the Mercury Crown-granted mineral claim (Lot 3531) and Redress Fractional mineral claim (Lot 3209), is on the southwest slope of Mount Payne, about 2 miles by road from Sandon, and is held by Pat McCrory, of New Denver. The Mercury adit was cleaned out and retimbered.

By P. E. Olson

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1929, p. 307.]

*Silver-Lead-Zinc*

**Payne**
*Toby Creek Mines Limited*
By P. E. Olson

(50° 117° S.E.) Company office, 204, 569 Howe Street, Vancouver 1; mine office, New Denver. Ian McMillan, field manager. Toby Creek Mines Limited has acquired the Payne mine by agreement with R. A. Grimes, of Nelson. The property is reached by 2½ miles of road from Sandon. The mine is on the southwest slope of Mount Payne.

Work was confined to opening the Payne No. 5 level (elevation 5,041 feet), which had caved in several places. Only limited access had been accomplished when the operation closed due to heavy snows.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1896, pp. 60–61.]

*Silver-Lead-Zinc*

**Victor**
*Kam-Kotia Mines Limited*
By P. E. Olson

(49° 117° N.E.) The Victor mine is immediately south of Three Forks and is reached by road from Sandon. It is now owned by Kam-Kotia Mines Limited but was previously operated by Violamac Mines Limited until known ore reserves were exhausted around the end of 1961. Since that time the mine has been leased to various operators from the New Denver area. Most of the workings are on the Victor Crown-granted mineral claim (Lot 4565).

E. H. Petersen and E. Perepolkin, of Sandon, continued their lease in the vicinity of No. 5 level portal (elevation 4,150 feet). Besides stoping, the lessees did about 125 feet of winzing and drifting. Some bulldozer stripping was done by both the lessees and Kam-Kotia Mines Limited, under the direction of J. C. Black, of New Denver. Fifty-two tons of sorted ore was shipped to the Trail smelter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 222.]

*Silver-Lead-Zinc*

**Silmonac**
*Silmonac Mines Limited*
By P. E. Olson

(49° 117° N.E.) Company office, 808, 602 West Hastings Street, Vancouver 2; mine office, New Denver. Silmonac Mines Limited is financed by a group of companies including Kam-Kotia Mines Limited, which manages the operation. The property consists of 62 claims lying west of Sandon.

Underground work was done mainly on the Ireland (Lot 3986) and Minnie-haha (Lot 3171) Crown-granted mineral claims, via the Ruth-Hope No. 5 level. The portal of this level is around 4,100 feet in elevation, and new workings are about 7,500 feet from the portal. Drifting, crosscutting, and cut-outs for diamond-drill stations amounted to approximately 500 feet. Underground diamond drilling amounted to 5,353 feet. Several up-holes encountered silver-lead-zinc mineralization along what appears to be a flat-lying zone about 300 feet above the underground workings. Surface diamond drilling of 3,697 feet in five holes further explored the intersections made from underground. Road-building and stripping were done prior to the surface diamond drilling.

The operation, which employed about 10 men, closed in November. All phases of the programme were under the direction of J. C. Black.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 222.]

*Silver-Lead-Zinc*

## RETALLACK-THREE FORKS

**Antoine, Ogema, Soho**
*Antoine Silver Mines Ltd.*
By P. E. Olson

(50° 117° S.E.) Company office, 506, 905 West Pender Street, Vancouver 1; mine office, New Denver. W. Wingert, mine manager; John Lamb, consultant. The Antoine property consists of the Antoine group of five Crown-granted and three recorded mineral claims and the Soho group of eight Crown-granted mineral claims. The property is at the head of McGuigan Creek and is reached by 9 miles of good mining-road which leaves the Kaslo–New Denver highway 3 miles east of Three Forks.

Most of the work was done on the Antoine Crown-granted mineral claim (Lot 516), at an elevation of 7,000 feet. Drifting was continued on the Tom Moore No. 5 level for several hundred feet and a raise was driven to the old Antoine workings, a vertical distance of about 450 feet. This raise followed a lamprophyre dyke which proved to be the same dyke found in the upper levels. Ore was encountered in a downward extension of the Antoine vein about 100 feet below the Antoine No. 5 level, and a sublevel was driven to explore this horizon. Twenty-five tons of ore was shipped to the Trail smelter, and some mill feed was stockpiled at the Red Deer Valley Coal Company Limited mill, near Silverton.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1963, p. 74; 1966, p. 222.]

*Silver-Lead-Zinc*

**Washington**
By P. E. Olson

(50° 117° S.E.) Company office, 634 Eighth Avenue Southwest, Calgary, Alta. The Washington Crown-granted mineral claim (Lot 4894), owned by Red Deer Valley Coal Company Limited and under lease to W. McLeod of Silverton, is on the south side of McGuigan Creek at an elevation of 5,800 to 6,400 feet. Access to the property is via the Antoine road.

Several tons of hand-sorted ore from the Washington dumps was stockpiled near No. 4 level.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 190; *Geol. Surv., Canada,* Mem. 184, p. 154.]

*Silver-Lead-Zinc*

**Wellington**
*Blue Star Mines Limited*
By P. E. Olson

(50° 117° S.E.) Company office, 400, 837 West Hastings Street, Vancouver 2; mine office, Kaslo. C. Lind, manager. The Wellington Crown-granted mineral claim (Lot 553) is 1 mile due north of Retallack on the Kaslo–New Denver highway. Since 1895 the property has been explored by many workings, including the Matheson adit at an elevation of 4,300 feet.

The company did 325 feet of surface diamond drilling after repairing the road to the property.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1963, p. 74.]

*Silver-Lead-Zinc*

**Winona, Boon** (50° 117° S.E.) Company office, 401, 470 Granville Street, Vancouver 2. Hilroy Mines Ltd. has optioned the Winona Crown-granted mineral claim (Lot 10061), Boon (Lot 10062), and other adjoining claims from L. N. Garland, of Kaslo. The property is at an elevation of 7,000 feet on the northeast slope of Reco Mountain, near the head of Stenson Creek. It is reached by 5 miles of road from Retallack. Recently two sections of this road have been constructed.

*Hilroy Mines Ltd.*

By P. E. Olson

The company continued work started the previous year, when several adits were opened on the Winona and Boon Crown grants. In the autumn 100 feet of stripping was done using a bulldozer, and two diamond-drill holes totalling 150 feet were drilled on the Winona claim. Two new bridges were built on the access road from Retallack.

In August, 2 tons of sorted ore from old dumps on the Boon claim was shipped to the Trail smelter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 223.]

*Silver-Lead-Zinc*

**Sunset** (50° 117° S.E.) Company office, 401, 470 Granville Street, Vancouver 2. Several Crown-granted mineral claims, including the Sunset (Lot 1164), Trade Dollar, Bell, Cashir, and others are under option to Hilroy Mines Ltd. from the Royal Trust Company. The property is at the head of Stenson Creek at an elevation of 7,000 feet.

*Hilroy Mines Ltd.*

By P. E. Olson

The property is reached by 5 miles of road, which was repaired and extended by the company. A new bridge was put across a small creek on the Bell (Lot 1165).

There are a large number of old workings on the Bell and adjoining claims, and considerable hand-sorted ore has been shipped from this area.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1896, p. 64.]

*Silver-Lead-Zinc*

**Dublin Queen** (50° 117° S.E.) The Dublin Queen Crown-granted mineral claim (Lot 1176) is part of the Jackson Basin mine holdings and is on the west side of Stenson Creek at an elevation of 5,500 feet.

By P. E. Olson

Philip Kabatoff, of Winlaw, leased the property during 1967 and mined from the surface on a narrow vein near the northern edge of the claim. A shipment of about 32 tons of sorted ore was sent to the Trail smelter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1929, p. 319, *see* Jackson.]

*Silver-Lead-Zinc*

**Caledonia** (50° 117° S.E.) Company office, 400, 837 West Hastings Street, Vancouver 2. C. Lind, manager. The Caledonia mine is on the Caladonia Crown-granted mineral claim (Lot 15415) on the north side of Kaslo Creek at the mouth of Bear Creek. The Kaslo–New Denver highway passes within a few feet of the mine workings.

*Blue Star Mines Limited*

By P. E. Olson

Exploration and stoping started by the company in 1966 was continued through to March, 1967, when the mine was closed. The company did 222 feet of raising, 63 feet of drifting, 460 feet of underground diamond drilling, and stoped out 3,800 tons of ore between the No. 4 and No. 2 levels, which appears to have cleaned out that portion of the ore zone. Ore is exposed below the No. 4 level, but no attempt was made to extract this ore for economic reasons. The company mill at Ainsworth operated for 3½ months.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 224.]

*Silver-Lead-Zinc*

**Doherty**
*Blue Star Mines Limited*
By P. E. Olson

(50° 117° S.E.) Company office, 400, 837 West Hastings Street, Vancouver 2. C. Lind, manager. Blue Star Mines Limited optioned the Doherty Crown-granted mineral claim (Lot 12402), which straddles the Kaslo–New Denver highway near the mouth of Lyle Creek.

Old workings were cleared out, and 960 feet of exploratory cuts and 110 feet of raising were done. Upon completion of this work the option was relinquished.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1965, p. 189.]

## KEEN CREEK

*Silver-Lead-Zinc*

**H, Whitey**
*Andex Mines Ltd.*
By P. E. Olson

(49° 117° N.E.) Company office, 305, 543 Granville Street, Vancouver 1. Andex Mines Ltd. holds 40 recorded mineral claims on the southeast side of Keen Creek. The claims extend along the Keen Creek road at an elevation of 4,000 feet from Desmond Creek to Briggs Creek.

Work on the claims was limited to minor road-building, some stripping, and a magnetometer survey of the H 1 to 23 claims.

[Reference: Assessment Report No. 858.]

*Silver-Lead-Zinc*

**Montezuma**
*Hilroy Mines Ltd.*
By P. E. Olson

(49° 117° N.E.) Company office, 410, 470 Granville Street, Vancouver 2. The Montezuma Crown-granted mineral claim (Lot 2041) is on the east side of Montezuma Creek, a tributary from the north of Keen Creek. Old workings on the claim range in elevation from 5,500 to 5,900 feet. The property, comprising the Montezuma (Lot 2041), Mexico (Lot 2042), and Orogon (Lot 11279) Crown grants, is held under option from Henry Giegerich, formerly of Kaslo.

The Montezuma was an important producer around the turn of the century but has not been worked to any extent since that time. Hilroy Mines Ltd. built a jeep-road from the main Keen Creek road up to the bottom (third) level of the old workings. This road crosses Keen Creek at the mouth of Deer Creek, and then crosses Montezuma Creek about 500 feet from Keen Creek. From this point it follows the old access trail on the east side of Montezuma Creek. Geological mapping and some geochemical soil-sampling were done on the Montezuma and adjoining claims.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1899, pp. 701–702.]

*Silver-Lead-Zinc*

**Oxide, Ida**
*Daybreak Mining Corporation (1957) Ltd.*
By P. E. Olson

(49° 117° N.E). Company office, 515, 475 Howe Street, Vancouver 1. Daybreak Mining Corporation (1957) Ltd. owns several Crown-granted mineral claims, including the Oxide (Lot 14367) and Ida (Lot 14368), on the east side of Klawala Creek, a southeast tributary of Keen Creek. The property was previously known as the Daybreak or Gibson.

The company built a road along Klawala Creek in order to service the area, which was previously serviced by an aerial tramway. No additional work was possible because of a forest closure.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1923, p. 211, *see* Gibson.]

## AINSWORTH

*Silver-Lead-Zinc*

**Greenacres**
*Multiple Mining Ltd.*
By P. E. Olson

(49° 116° N.W.) Company office, 569 Howe Street, Vancouver 1. The Jewel Crown-granted mineral claim (Lot 10785) and Greenacres recorded claim are located 1 mile north of Ainsworth. Multiple Mining Ltd. has optioned the property from T. Lane, of Ainsworth.

Several flat diamond-drill holes were drilled across a northerly striking and steeply dipping limestone bed which was explored previously by T. Lane and partner. Some bulldozer stripping was also done on the claims. R. E. Renshaw directed the exploration programme. Some lead and zinc mineralization, intersected by the drill-holes, is associated with easterly striking fractures in the limestone.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 224.]

*Silver-Lead-Zinc*

**Silver Hoard**
By P. E. Olson

(49° 116° N.W.) The Silver Hoard Crown-granted mineral claim (Lot 10712) is held under lease and option by S. L. McLellan, of Ainsworth. The claim is on the south side of Cedar Creek at an elevation of 4,300 feet.

Working on week-ends during the summer, McLellan and sons restored the Silver Hoard shaft and some short levels, hand-sorted ore from muck piles on these levels, and shipped 14 tons of high-grade material to the Trail smelter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1927, p. 282.]

*Silver-Lead-Zinc*

**Mountain Cougar**
By P. E. Olson

(49° 116° N.W.) The Mountain Cougar Crown-granted mineral claim (Lot 9664) is on the west shore of Kootenay Lake 1 mile south of Woodbury Creek.

The property is held by Wayne Turley under option agreement. Two short adits were driven on narrow mineralized fractures which carry silver, lead, and zinc values. This work was done at an elevation of 1,850 feet.

[Reference: *Geol. Surv., Canada*, Mem. 117, p. 40.]

*Silver-Lead-Zinc*

**R.F.G.**
By P. E. Olson

(49° 116° N.W.) The R.F.G. Crown-granted mineral claim (Lot 12719) lies 1 mile west of the mouth of Woodbury Creek and immediately south of Lendrum Creek at an elevation of about 3,000 feet. The claim is owned by E. Savage and Dick Rennenburg, of Nakusp.

The property was prospected and some mining was done along an exposure of vein material left by old-timers. Nineteen tons of ore was shipped to the Trail smelter.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1928, p. 301; 1930, p. 254.]

*Gold-Silver-Lead-Zinc*

**Scranton**
*Blue Star Mines Limited*
By P. E. Olson

(49° 117° N.E.) Company office, 400, 837 West Hastings Street, Vancouver 2; mine office, Kaslo. C. Lind, manager. Blue Star Mines Limited owns several Crown-granted and recorded mineral claims near the headwaters of Pontiac Creek, a tributary of Woodbury Creek from the south. There are workings on the Scranton Crown-granted mineral claim (Lot 7452) and on the Grandview Crown-granted mineral claim (Lot 6279).

The old Scranton camp was renovated, and roads to the mine workings were improved. A road was also built from the camp on Pontiac Creek to the northeastern edge of the Grandview. A portal was established at an elevation of 5,900 feet, about 200 feet higher than the Sunset drift, which is on the west side of Pontiac Creek near the main camp. From the portal a 100-foot crosscut was driven westerly which intersected a strong vein striking northeasterly and dipping steeply to the southeast. The vein showed small bunches of coarse-grained galena in quartz gangue. Work was suspended early in December following a fatal blasting accident on the new level.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1965, p. 187.]

*Silver-Lead-Zinc*

**Silver Boy**
*Multiple Mining Ltd.*
By P. E. Olson

(49° 116° N.W.) Company office, 569 Howe Street, Vancouver 1. The Silver Boy recorded mineral claim is on Krao Creek and adjoins the Crow Fledgling Crown-granted mineral claim (Lot 147) to the east. The property was formerly known as the Firebrand recorded mineral claim when Yale Lead & Zinc Mines Limited was operating at Ainsworth from 1949 to 1960.

The present owners, Multiple Mining Ltd., did stripping on an extension of the old Firebrand workings. They exposed about 100 feet of vein showing scattered mineralization of galena, pyrite, and sphalerite. A diamond-drill hole was driven to a depth of 150 feet which should have intersected the showing. Caving ground caused much loss of core and eventually resulted in the loss of some drilling rods, a core barrel, and a diamond-drill bit. Work on the claim was under the direction of R. E. Renshaw.

*Silver-Lead-Zinc*

**Krao and Lead Coin**
*Coin Explorations Ltd.*
By P. E. Olson

(49° 116° N.W.) Company address, P.O. Box 230, Osoyoos. The Krao Crown-granted mineral claim (Lot 93) is on Krao Creek about 3 miles by road from Ainsworth. Coin Explorations Ltd. holds the Krao by agreement and owns a large number of Lead Coin recorded claims adjoining.

Hand trenching was done along Krao Creek where the Krao vein is known to outcrop. The McCune adit, which is collared near Loon Lake and extends below the Krao, was mapped by B. T. Furneaux, company geologist.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 225.]

## GERRARD

*Silver-Lead-Zinc*

**Ann**
*Silver Summit Mining Co. Ltd.*
By P. E. Olson

(50° 117° S.E.) Company address, P.O. Box 269, Kamloops. Silver Summit Mining Co. Ltd. has 20 recorded mineral claims, known as the Ann 1 to 20, near the head of the south fork of Mobbs Creek. Most of the workings are on a property known previously as Linson's View, which was worked from 1901 to 1914. Other claims in the vicinity were known as Pedro and Grand Solo. Nearly all the important workings are at an elevation of 6,000 feet.

In the vicinity of the Linson's View, two adits were rehabilitated; 166 feet of trenching and seven diamond-drill holes totalling 573 feet were put in.

The ownership of the claims is in doubt due to overstaking.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1914, p. 318.]

*Silver-Lead-Zinc*

**Joe**
*Silver Summit Mining Co. Ltd.*
By P. E. Olson

(50° 117° S.E.) Company address, P.O. Box 269, Kamloops. The Silver Summit Mining Co. Ltd. owns the Joe 1 to 40 recorded mineral claims near the head of Tenderfoot Creek at an elevation of 5,000 to 7,000 feet. This area is accessible only by helicopter.

Open-cut work on the Joe Nos. 8, 27, and 29 claims was contracted by Rayrich Mine Services Ltd. No mineralization was uncovered.

## HEALY CREEK

*Silver-Lead-Zinc*

**Wales, Ukiale**
By P. E. Olson

(50° 117° N.E.) The Wales (Lot 3481) and Ukiale (Lot 7269) Crown-granted claims are included in Mineral Leases No. 160 and No. 156 respectively. These claims straddle a ridge, at an elevation of 7,200 feet, between Healy and Lake Creeks about 1 mile south of Abbott Peak. The Wales and Ukiale claims were Crown granted in 1902 and 1907 respectively.

The mineral leases are held by S. Baschzok, of Kaslo, who built a tractor-road to the properties from the Healy Creek mining-road. There are two short adits, driven many years ago, on the Wales claim. These adits were driven northeasterly into carbonaceous argillite, in which there are narrow veinlets of quartz carrying some tetrahedrite. The lower adit, at an elevation of 7,000 feet, was exposed by bulldozing. This adit is about 50 feet long, has a short shaft at its end, and has crosscuts going both ways at the top of the shaft. A sample was taken, from the adit, across 10 inches of apparently barren quartz which assayed *nil.* A second sample was taken across 6 inches of quartz carrying minor tetrahedrite and assayed 5.2 ounces of silver per ton. About 1 ton of quartz, carrying appreciable tetrahedrite, was piled near the adit. The upper adit was not examined.

On the Ukiale claim a mineralized zone has been traced for more than 500 feet in natural exposures, surface cuts, and short adits. The zone, which strikes north 20 degrees west and dips 60 degrees to the west, is in a narrow bed of limestone which has been sheared parallel to the bedding. Siderite, sphalerite, and galena mineralization is fairly continuous, and in a number of places consists of several inches of massive mineralization. Most of the exposures are on the Lake Creek side of the ridge at an elevation of 7,000 to 7,200 feet. Two samples were taken for assay from exposures several hundred feet apart. The results of these assays are as follows:—

| | Width | Silver | Lead | Zinc |
|---|---|---|---|---|
| | In. | Oz. per Ton | Per Cent | Per Cent |
| Upper sample | 38 | 2.0 | 16.81 | 1.9 |
| Lower sample | 15 | 6.3 | 11.62 | 19.1 |

## HAMILL CREEK

*Lead-Zinc*

**Fog (Argenta, Mag)**
*KRC, Inc.*
By James T. Fyles

(50° 116° S.W.) Company office, 1300 Elveden House, Calgary, Alta. This company, under agreement with W. R. Smith, of Calgary, holds 19 claims which cover ground east of the head of Kootenay Lake on the north side of Hamill Creek west of Mount Lavina. The claims include the Mag property and adjoin the Argenta Crown-granted claim (Lot 1038), which is on the south. Soil-sampling and geological mapping were carried out under the direction of G. A. Wilson, consulting geologist, Calgary.

[References: *B.C. Dept. of Mines,* Bull. No. 49, 1964, pp. 70, 76; Assessment Report No. 1015.]

*Lead-Zinc*

## JOHNSONS LANDING

**Duncan** By P. E. Olson (50° 116° S.W.) The Duncan recorded mineral claim, held by S. G. Lake, whose home and farm are adjacent to the claim, is immediately north of Johnsons Landing, on the east shore of Kootenay Lake. A chip sample of partly leached mineralization taken across 12 feet near the end of the drift assayed 1.8 per cent lead and 0.8 per cent zinc.

*Silver-Lead-Zinc*

## RIONDEL

**Bluebell Mine** *Cominco Ltd.* By P. E. Olson (49° 116° N.W.) Company office, Trail; mine office, Riondel. J. B. Donald, property superintendent; A. J. Richardson, mine superintendent; T. F. Walton, mill superintendent. The Bluebell mine is on a peninsula in Kootenay Lake 6 miles by road north of Kootenay Bay. The mine workings are below lake-level and are serviced mainly by the No. 1 shaft, inclined westward at 35 degrees near the footwall of a layer of limestone in which replacement orebodies occur. The ore zones extend laterally from a series of steeply dipping fractures that cross the formation almost at right angles. Mineralization favours the hangingwall of the limestone bed.

Mining is done mainly by cut-and-fill stoping methods using tailings for backfill; some open stoping is also done.

A raise-boring machine, capable of reaming pilot holes from 9⅞ inches in diameter to 48 inches, was utilized during 1967 to put in five holes totalling 2,180 feet. Using conventional methods, this raising would have required several years and would have involved considerable hazard to miners. Thus far the raising-machine has been used for ventilation airways, but in the future will be used for other types of raises.

Thermal-water and high-pressure concentrations of carbon dioxide gas are being encountered continually, and are increasing the ventilation and pumping requirements of the mine. Since there is this problem, the company is endeavouring to lower the water level in the rock and drain off carbon dioxide by using deep boreholes and deep-well pumps. The raise-boring machine is used to drill deep pilot holes into suspected thermal zones. Although experimental, this programme is showing favourable results.

The No. 8 level was advanced northward about 1,500 feet under adverse conditions. This work is important since it develops considerable ore which could not be mined without No. 8 level.

Ore production was as follows:—

| | Tons |
|---|---|
| Comfort zone | 37,794 |
| Bluebell zone | 44,162 |
| Kootenay Chief zone | 126,236 |
| Development (all zones) | 47,344 |

Development and diamond drilling are shown below:—

| | Ft. |
|---|---|
| Drifting and crosscutting | 2,682 |
| Subleveling | 6,265 |
| Raising | 8,460 |
| Diamond drilling | 17,340 |

Approximately 54,000 yards of deslimed tailings and 6,370 yards of waste rock were used as backfill.

The mill treated 255,536 tons of ore and shipped all concentrates to the Trail smelter.

The company employs 233 people, 37 of whom are on staff.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 226.]

## CRAWFORD CREEK

*Silver-Lead-Zinc*

**Humbolt**
*Rose Pass Mines Ltd.*
By P. E. Olson

(49° 116° N.W.) Company office, 630A—17th Avenue Southwest, Calgary, Alta. Rose Pass Mines Ltd. has a large number of recorded claims adjoining the Humbolt Crown-granted mineral claim (Lot 2015). The property, which is under option from E. T. Coleman, of Nelson, is 1 mile west of Rose Pass and is reached by 15 miles of public and logging roads from Crawford Bay.

The company drilled 1,030 feet of diamond-drill holes in 11 holes where anomalies had been previously established by an induced polarization survey. Work, all of which was done on the Humbolt at an elevation of 5,400 feet, was under the direction of Glen Champion, a director of the company.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 227.]

*Silver-Lead-Zinc*

**Les-Ann, Norm**
*Nelway Mines Ltd.*
By P. E. Olson

(49° 116° N.W.) Company office, 13, 5901 East Broadway, Burnaby 2. The Les-Ann and Norm recorded mineral claims are at 3,200 feet elevation, about 2 miles north of the Crawford Bay post office, on the northwest side of Crawford Creek. The company holds the Les-Ann claim by option agreement with Elda McGregor of Crawford Bay.

Galena, sphalerite, and pyrite mineralization has been exposed in dolomitized limestone similar to that noted at Riondel and at the dolomite quarry on Crawford Creek. Some replacement occurred near the hangingwall of the dolomite adjacent to a fracture. An old cut on the mineralized exposure was enlarged by drilling and blasting.

*Silver-Lead-Zinc*

**Silver Hill, Simcoe, Indication**
*Ryslo Silver Mines Ltd.*
By P. E. Olson

(49° 116° N.W.) Company office, 102, 402 West Pender Street, Vancouver 2. The Silver Hill property consists of 30 recorded and Crown-granted mineral claims located on the south side of Crawford Creek and west of Canyon Creek, a tributary of Crawford Creek. Key claims on the property are the Silver Hill (Lot 2852) and Simcoe (Lot 2853) Crown grants.

The company rebuilt several miles of road from the Crawford Creek logging-road to the main workings of the old Silver Hill mine (elevation 6,250 feet). Diamond drilling in 12 holes totalling 3,280 feet was done in an effort to find extensions of the Silver Hill vein. The work was supervised by David A. Sloan.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1900, p. 849.]

# REVELSTOKE MINING DIVISION

*Molybdenum*

## REVELSTOKE

**Knox** *KRC, Inc.* By James T. Fyles (51° 118° S.E.) Company office, 1300 Elveden House, Calgary, Alta. This company, formerly King Resources Ltd., abandoned the Joan group and adjoining claims and relocated them as the Knox group. The claims cover the ridge between Hiren and Copeland Creeks about 15 miles northwest of Revelstoke. The principal showings are between elevations of 7,000 and 7,200 feet on the north slope of the ridge about 2 miles west of Mount Copeland (*see* Plate VIIB). Exploration carried out in 1965 and 1966 was continued in 1967 beginning in August with sampling and surface drilling and in September with underground work.

The geology of the area around the showings is sketched on Figure 30. The area is within the Shuswap metamorphic complex and contains schists and gneisses in a high grade of regional metamorphism which dip at moderate angles to the south. Near the showings these rocks include a complex thin-bedded sequence of calc-silicate gneiss and marble, a medium-grained syenite gneiss, and, at a distance from the showings, a white quartzite and a sequence of greenish-grey hornblende and biotite feldspar gneiss. The lime silicate sequence includes thin-bedded green and brown calcareous biotite-diopside gneisses, layers of buff-weathering dolomitic marble commonly 5 to 20 feet thick, and lenses of dark-green calcareous hornblende biotite gneiss. The syenite gneiss is a grey to pinkish-grey biotite feldspar rock forming a marginal facies of a large mass of nepheline syenite gneiss.

The rocks are strongly foliated and complexly contorted. The layers in general strike north 70 degrees west and dip 30 to 50 degrees to the south. They contain many minor folds and lineations parallel to the fold axes. From regional studies the folds and lineations can be separated into early structures and late structures. The early ones on the average plunge 25 to 45 degrees in a direction of south 55 degrees west and the late ones plunge 15 to 50 degrees in directions ranging from south to southeast. The early folds are isoclinal with axial planes essentially parallel to the foliation. The late folds are more open than the early ones, but they, too, may be isoclinal. The axial planes of the late folds on the average strike north 55 degrees west and dip 40 degrees to the south.

Cross-faults later than the folding and metamorphism with displacements up to a few tens of feet are found at intervals in the mineralized area. They belong to a set of steeply dipping fractures which trend between north and northeast. These fault zones throughout the region commonly contain basaltic dykes, iron carbonates, and locally fluorite and sulphides, but only carbonates and pyrite have been found along them near the molybdenite showings.

Molybdenite, together with pyrrhotite and pyrite, is found in the calc-silicate gneiss and the nearby syenite gneiss (*see* Fig. 30). Molybdenite seen on surface occurs as scattered and disseminated grains along the foliation, and as clusters and lenticular high-grade lenses a few inches to almost a foot thick. A series of lenses may be several feet long. Scattered molybdenite is visible over width up to 5 feet perpendicular to the foliation. Consecutive samples over widths up to 40 feet are reported by the company to assay 0.1 per cent or more $MoS_2$ while maximum values of about 4 per cent $MoS_2$ are reported across widths of 5 feet.

Four general zones of molybdenite mineralization are shown on Figure 30. The lowest and most easterly showing, known as the Glacier zone, is within the syenite, whereas the others are mainly in calc-silicate gneiss. Exploration in 1967

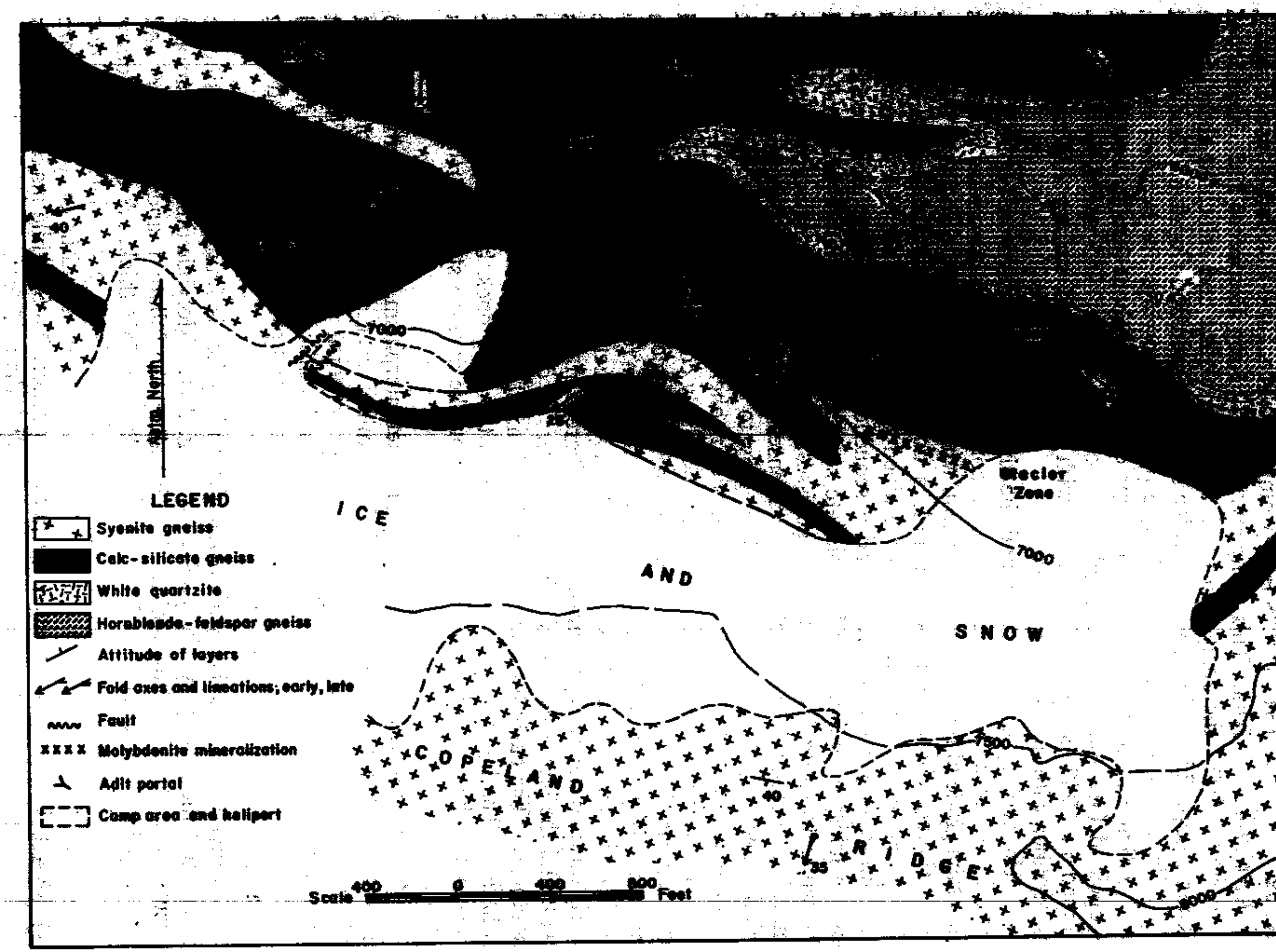


Figure 30. KRC, Inc. Geology of Copeland Ridge.

was concentrated on the Glacier zone, and previous work has been done mainly on the other zones. In the Glacier zone the molybdenite is found in pegmatitic lenses in the syenite gneiss. They consist of coarse potash feldspar and minor biotite, pyroxene, and magnetite with scattered fine- to medium-grained crystals of molybdenite between the feldspars. Locally the syenites are calcareous, and in them the molybdenite occurs in fractures in the calcite grains and along the grain boundaries. The Glacier zone is exposed on surface for about 400 feet and passes eastward beneath ice an snow. It is a few tens of feet above the main contact between the syenite gneiss and the calc-silicate gneiss. This contact outlines isoclinal folds which plunge 30 to 40 degrees to the south, and the pegmatite containing the molybdenite is near the hinge zone of one of these folds lying parallel to the axial plane (*see* Fig. 24). The pegmatite and molybdenite lens out to the west before reaching the contact of the syenite and calc-silicate gneiss.

On the basis of surface drilling, which encountered grades and widths higher than those found in the other zones, a crosscut was driven southward at an elevation of 6,700 feet about 120 feet below the outcrop of the mineralization, and it intersected 20 feet of high-grade molybdenite. From the crosscut, four holes totalling 600 feet were drilled downward. Plans were made to drive a 5,000-foot crosscut at an elevation of 6,150 feet from the south side of Copeland Ridge. A cat-road was made along Hiren Creek, the main creek south of Copeland Ridge, which by the end of the year had passed Hiren Lake and was within 2 miles of the portal-site. The work was under the general direction of M. C. Robinson, consulting geologist, and B. T. Gallant, of KRC, Inc.

A new type of survey using an electronically controlled helicopter established the positions of 137 of the claims and provided survey control for the long drive (*see* Northern Miner, March 7, 1968, p. 28). This work was done under contract to Interior Engineering Services Ltd., of Kelowna.

Regionally, this type of mineralization is associated with bodies of nepheline syenite gneiss. Lenses of coarse syenite containing magnetite are common in the syenite gneiss, particularly near contacts with the calc-silicate gneisses. Pyrrhotite, pyrite, and locally molybdenite occur in the lime silicate gneisses near the nepheline syenite gneiss. The nepheline syenite gneiss has an irregular outcrop extending 8 to 10 miles northwestward across the upper part of Hiren Creek to the pass between Copeland and Bews Creeks (*see Geol. Surv., Canada,* Map 12-1964) and in this area is in contact almost entirely with calc-silicate gneiss. The nepheline syenite forms a folded concordant sheet within the lime silicate gneiss. Small masses of nepheline syenite gneiss are found in Copeland Creek and on the ridge to the north, northeast of the showings just described, in a different sequence of gneisses, but these masses are not known to be mineralized. Nepheline syenite gneiss also occurs in a concordant layer 10 to 15 miles to the west, west of Perry River (*see Geol. Surv., Canada,* Paper 67-1, p. 75), but it, too, is not known to be mineralized.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 205; 1966, p. 228; Assessment Reports Nos. 679 and 776.]

*Silver-Lead-Zinc-Tin-Tungsten*

**Stannite**
*Stannex Minerals Ltd.*
By T. M. Waterland

(51° 117° S.W.) Company address, 309, 850 West Hastings Street, Vancouver 1. This 34-claim property, comprising the May, Helena, Alice, and other claims, owned by the company, is on Clabon Creek, a tributary to Woolsey Creek. The property is reached via the Trans-Canada Highway for a distance of 17 miles east of Revelstoke and thence about 7 miles via road up Woolsey and Clabon Creeks.

The property was formerly known as the Woolsey, Regal Silver, and Snowflake. Seven men were employed for a period of seven months, and work was continuing at year-end with the crew living in a trailer camp set up beneath a snowshed roof at the mine. Preliminary magnetometer surveying, soil-sampling, and geological mapping were done, 7½ miles of road was repaired or rebuilt, Nos. 6, 7, 9, and 10 adits were reopened, and 36 tons of ore was mined and shipped to Trail for testing.

Work during 1967 was directed by W. S. Read, consultant, and supervised by H. Hewat.

*Silver-Lead-Zinc*

## NORTH LARDEAU

**True Fissure, Blue Bell, Broadview, Etc.**
*Columbia Metals Corporation Limited*
By P. E. Olson

(50° 117° N.E. and N.W.) Company office, 1002, 80 Richmond Street West, Toronto, Ont.; mine office, Trout Lake. Columbia Metals Corporation Limited owns a block of claims, the Blue Bell, True Fissure, Broadview, Great Northern, and St. Elmo, on Great Northern Mountain, about 2 miles north of Ferguson. There are four adits and other workings, mainly on the True Fissure Crown-granted mineral claim (Lot 1097), at an elevation of about 5,500 feet.

The company repaired and widened the mine road from Ferguson to the property and established a permanent camp near the portal of No. 3 level. At year-end the company was ready to advance No. 2 level southward a planned distance of 1,000 feet. Work at the mine was under the direction of J. Branca.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 229; Gunning, H. C., 1929, *Geol. Surv., Canada*, Mem. 161, pp. 70–75.]

*Silver-Lead-Zinc*

**L.B. (Lucky Boy)**
*R. J. Forgie and Associates Engineering Ltd.*
By P. E. Olson

(50° 117° N.W.) Company office, 317 Lancaster Building, Calgary, Alta. The Lucky Boy property consists of six Crown-granted mineral claims, two recorded mineral claims, and one mineral lease (No. 24), lying immediately south of Wilkie (Trout) Creek at an elevation of about 4,600 feet. The L.B. Crown grant (Lot 5423) is central in the group and is referred to generally as the Lucky Boy claim. The company holds the property under agreement with Alan Marlow, of Beaton.

The road to the property was repaired and about 200 tons of dump rock was hauled to the Blue Star mill at Ainsworth, but no milling was done.

[Reference: *B.C. Dept. of Mines*, Bull. 45, 1962, pp. 59–64.]

# GOLDEN MINING DIVISION

*Lead-Zinc*

## CUMMINS RIVER

**Bend**
*Cominco Ltd.*
By James T. Fyles

(52° 118° S.E.) Cominco Ltd. owns a group of 45 recorded claims covering ground east of the Columbia River south of Boat Encampment. The group, which is three claims wide, is a mile or so east of the Columbia and extends from about 2 miles south to 3 miles north of the Cummins River. The main showings are in the canyon of the Cummins and near logging-roads 1½ to 2 miles north of the canyon. They were discovered by A. B. Mawer late in the summer of 1966, and he was in charge of a programme of drilling, sampling, and geological mapping in June and July of 1967. A base camp was made near the Big Bend highway just north of the Cummins River, and a helicopter was used to take equipment into the canyon.

Showings in the canyon of the Cummins River on the Bend 3, Bend 4, Bend 5, and Bend 6 claims are of banded massive to disseminated sulphides in rusty-weathering dolomite. Fine-grained granular pyrite with interstitial very fine-grained sphalerite and galena occur in banded and folded rocks in a zone more or less parallel to the formations. The dolomite and sulphides lie between greyish garnet mica schist on the southeast or footwall side and platy greyish-brown micaceous quartzite on the hangingwall. The quartzite-dolomite-mica schist sequence strikes northwest and dips at more than 50 degrees to the southwest. It contains a series of step-like folds rising to the northeast which have a low plunge. The mineralized zone, which is mainly in dolomite but extends into the hangingwall quartzite, is as much as 30 feet thick. It is exposed for several hundred feet up the walls of the canyon, beyond which it is not exposed, but the slopes contain only scattered outcrops. Eight short holes were drilled—six on the south and two on the north side of the river.

Showings on and near the logging-roads 1½ to 2 miles north of the Cummins are between elevations of 3,500 and 4,000 feet on the Bend 19 and Bend 24 claims. The showings are in what appears to be the same sequence of rocks as is found at the canyon showings, but they are in the reverse order. Quartzite lies beneath chocolate-weathering dolomite, which in turn is beneath garnet mica schist. The beds appear to dip at moderate angles to the southwest, more steeply than the slope of the hill. They are folded and on the average probably lie almost parallel to the slope. The showings are scattered along a zone trending west-northwest almost 1,000 feet long and several hundred feet wide. Probably it marks the average trace of the beds on the hillside. The showings consist of fine- and very fine-grained galena, sphalerite, and pyrite in the dolomite and quartzite.

About 1,000 feet of bulldozed trenches and five short diamond-drill holes were made to expose the mineralization and test the grade.

*Silver-Lead-Zinc*

## PARSON

**Ruth Vermont**
*Columbia River Mines Ltd.*
By P. E. Olson

(50° 116° N.W.) Company office, 410, 470 Granville Street, Vancouver 2. The Ruth Vermont mine is on the south side of Vermont Creek 25 miles southwest of Golden and is reached from Parson via the Vowell Creek logging-road.

The property dates back to 1893 and originally consisted of 11 Crown-granted mineral claims which reverted to the Crown. The property was taken up in 1964 as a mineral lease. There are about 40 recorded mineral claims surrounding the mineral lease.

The present owners began work on the property in 1965 and worked continuously until the property was shut down on August 24, 1967.

During 1967 the 6000 level was advanced on several headings, and diamond drilling was carried out to further test the mineralized zone on that horizon. The 5750 level was also extended with a view to this becoming the main haulage level. This level was collared in heavy wet overburden. A mill-site was prepared near the 5750 level adit, and an assay office was installed nearby. Excavation of the mill-site had been completed prior to the stopping of operations.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1936, pp. E 37–E 42; 1966, pp. 230–235.]

*Gold-Silver-Lead-Zinc*

**FE, HIL, Etc.** (50° 116° N.W., 50° 117° N.E., 51° 117° S.E.)
*Far East Minerals Ltd.* Company office, 543 Granville Street, Vancouver 2.
By P. E. Olson and James T. Fyles Far East Minerals Ltd. and associated companies hold mineral claims covering a large tract of land in the Purcell Mountains between the headwaters of Vowell and McMurdo Creeks. The claims include a number of old showings and old Crown-granted claims held by agreement.

In September and October, 1966, the company built some 14 miles of cat-road up Bobbie Burns Creek from the logging-road near the mouth of Vowell Creek to the mouth of Carbonate Creek. A tent camp and later two frame buildings were constructed. Cat-roads were continued southward into the eastern part of the basin of Carbonate Creek and to the ridge north of Carbonate Mountain at an elevation of 8,500 feet. Old showings of white quartz in grey slate and buff grit were stripped along the road between elevations of 7,500 to 8,000 feet. In 1967 at elevations of 6,800 to 7,000 feet just north of the east fork of Carbonate Creek, a deep trench more than 1,500 feet long was made in greyish slates and grits. The trench is about a mile northwest on strike from a lenticular quartz vein that was drilled in 1966, but quartz is scarce in the trench, and at the time of the writer's visit in late September, 1967, no significant showings had been encountered.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 236.]

## BUGABOO CREEK

*Copper*

**Young** (50° 116° N.W.) Company office, 1120, 505 Burrard
*Pharaoh Mines Ltd.* Street, Vancouver 1. S. J. Hunter, consultant. The Young
By Stuart S. Holland group of 37 claims is 3 miles up Rocky Point Creek, a tributary of Bugaboo Creek, about 20 miles by road west of Spillimacheen. The claims cover old showings at elevations between 7,000 and 8,000 feet that formerly were known as the Copper King and Copper Queen and on which surface work and an adit had been driven.

In 1967 some open cuts and trenches were blasted in rock.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1923, p. 198.]

## HORSETHIEF CREEK

*Lead-Zinc*

**Mag, Nimrod, Puzzler, Etc.** (50° 116° N.E.) Company office, 300, 890 West
*Cominco Ltd.* Pender Street, Vancouver 1. The Mag, Nimrod,
By Stuart S. Holland Puzzler, Brown Bear, Discovery, and other groups, totalling 35 claims, are on Starbird Ridge on the north side of Horsethief Creek 13 miles west of Wilmer. The claims are under option from Gordon Larrabee, of Invermere.

It is reported that galena and sphalerite occur in gash veins in magnesian limestone and dolomite.

In 1967 the topography, surface workings, and geology were mapped, a 200-foot trench was bulldozed, and 2½ miles of access road was built. G. L. Webber was in charge of the work.

## INVERMERE

*Silver-Lead-Zinc-Barite*

**Yornoc** (50° 116° S.E.) Company address, P.O. Box 606,
*Yornoc Mining Co. Ltd.* Invermere. The property consists of the Yornoc
By P. E. Olson group of 31 recorded mineral claims near the head of Ben Abel Creek, 16 miles southwest of Invermere. Access to the claims is by

helicopter from Invermere. The property was discovered and located in 1966 by J. H. Conroy, of Invermere.

Main showings are on the Yornoc No. 23 mineral claim, at an elevation of 7,500 feet. Galena, sphalerite, and chalcopyrite in a gangue of quartz and barite are found in fractures and replacements in dolomitic limestone. Electromagnetic and geochemical soil surveys were done on five claims on the main showings. Some rock cuts and trenches were excavated on the Yornoc No. 23 claim. Work was under the direction of J. H. Conroy.

## WINDERMERE

*Silver-Lead-Zinc*

**Lisa, A**
*Colby Mines Ltd.*
By P. E. Olson

(50° 116° S.E.) Company office, 645 Hornby Street, Vancouver 1. Colby Mines Ltd. holds the Lisa 1 to 10 and the A 1 to 20 recorded mineral claims under agreement with L. M. Hemmelgarn, of Wilmer. The claims are on the north side of Jumbo Creek, 3 miles from Toby Creek, and at an elevation of 5,000 to 7,500 feet. Access to the claims is via road from Wilmer, a distance of 27 miles.

The workings at an elevation of 7,000 feet are reached via a precipitous trail from Jumbo Creek. Two diamond-drill holes totalling 150 feet were put down with an X-ray drill.

*Silver-Lead-Zinc*

**Jumbo**
*Aetna Investment Corporation Limited*
By P. E. Olson

(50° 116° S.E.) Company office, 170 Donway West, Don Mills, Ont.; mine office, Toby Creek. Aetna Investment Corporation Limited operates the Mineral King mine at Toby Creek. The Jumbo recorded mineral claims are on the north side of Jumbo Creek, 2 miles north of the Mineral King mine, and are owned by the company.

A jeep-road was constructed from Jumbo Creek to an elevation of 5,800 feet, and a tractor-road from there to the main showings at an elevation of 6,250 feet. The entire property, some 25 mineral claims, was systematically soil-sampled and tested for silver, lead, and zinc. Bulldozer stripping and some rock work were done on the main showings, which are on the west corner of the Jumbo No. 17 claim.

The geology of the area is somewhat similar to the Mineral King mine. Galena, sphalerite, pyrite, and minor bournonite are found with barite, quartz, and dolomite as a replacement in limestone of the Mount Nelson Formation.

*Silver-Lead-Zinc*

**Mineral King Mine**
*Aetna Investment Corporation Limited*
By P. E. Olson and James T. Fyles

(50° 116° S.E.) Head office, 170 Donway West, Don Mills, Ont.; mine office, Toby Creek. W. W. Cummings, resident manager. The Mineral King mine is on Toby Creek 26 miles by road from Wilmer. The workings are on a steep ridge between the junction of Toby and Jumbo Creeks. There are two main adits—the No. 7 level (elevation 4,775 feet), on the Toby Creek slope, and the No. 9 level (elevation 4,450 feet), collared near Jumbo Creek, which is the lowest entrance to the mine. Levels above No. 7 level are serviced by No. 1 shaft, and levels below No. 9 level are serviced by No. 2 shaft, which terminates at No. 12 level (elevation 4,000 feet).

The mine produced 111,332 tons of ore grading about 6 per cent combined lead and zinc and about one-half ounce of silver per ton. Increasing amounts of pillar ore were removed in 1967, especially in the vicinity of No. 3 level.

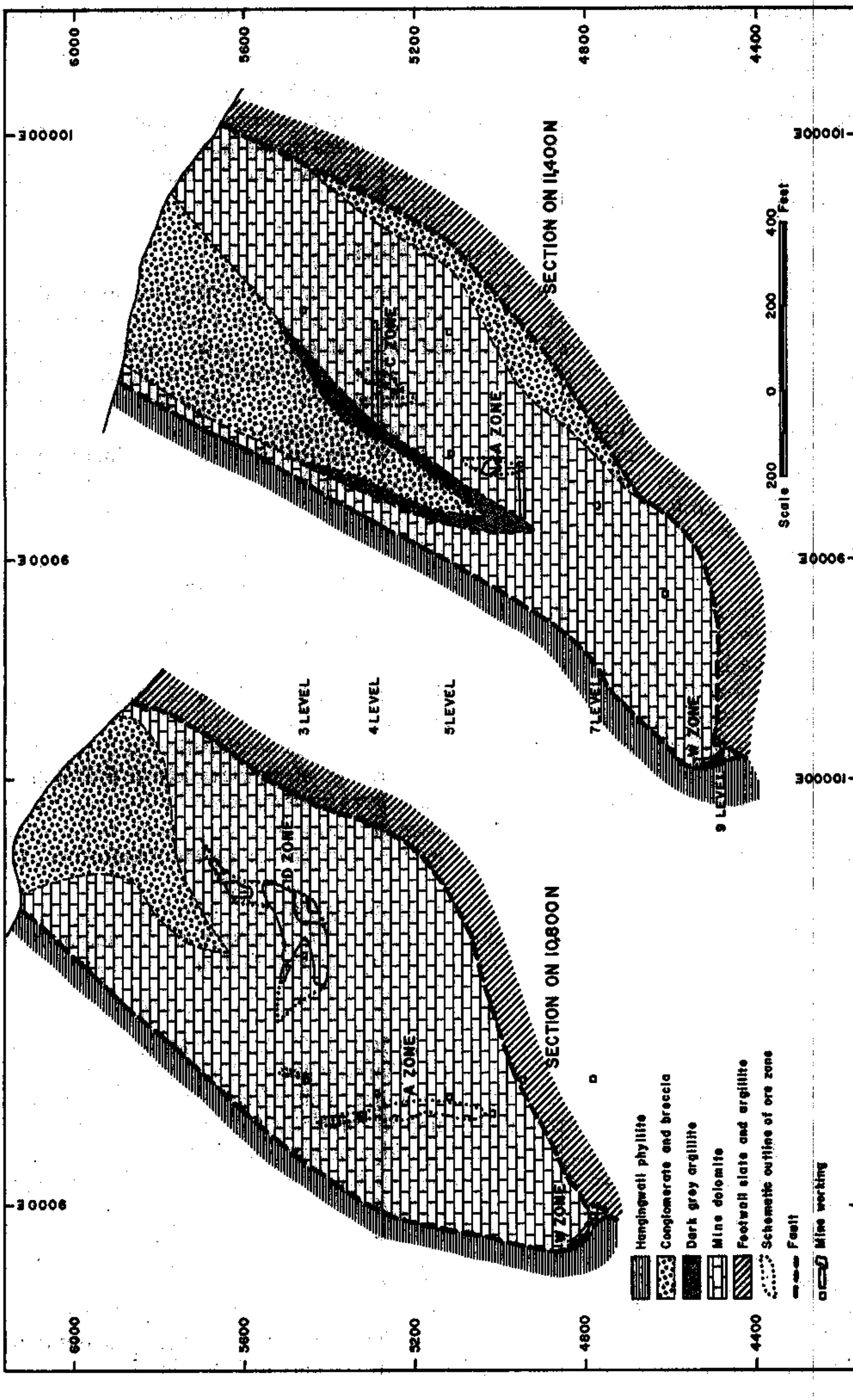


Figure 31. Aetna Investment Corporation Ltd. Geological sections through the Mineral King mine showing the orebodies in relation to the structure of the mine dolomite.

Drifting and crosscutting amounted to 1,639 feet, raising totalled 977 feet, and diamond drilling 22,789 feet. The mill produced 2,831 tons of lead concentrates grading 63.6 per cent lead and 6,894 tons of zinc concentrates grading 55.5 per cent zinc. Sales of zinc concentrates were cut off following a strike at smelters in Montana, necessitating the stockpiling of these concentrates at Invermere from July on.

Ore reserves dropped during the year, and the company was having financial difficulties, so a decision was made to shut down the mine. The mill was shut down on December 13th, and the plant was liquidated shortly thereafter.

The closing of the Mineral King brings to an end 14 years of operation, during which time 2,313,067 tons of ore has been mined; gross content of concentrates was 1,832,416 ounces of silver, 1,439,884 pounds of copper, 81,672,177 pounds of lead, 190,827,473 pounds of zinc, and 660,064 pounds of cadmium. Since 1959, 25,114 tons of barite have been produced.

The orebodies were replacements of dolomite, called the mine dolomite, by sphalerite, galena, pyrite, barite, and quartz. Bournonite ($PbCuSbS_3$), commonly associated with barite, was the source of most, if not all, the copper. Meneghinite ($4PbS \cdot Sb_2S_3$) occurs rarely with siliceous ore. The geology of the area of the mine up to 1959 has been described (*see* Ann. Rept., 1959, pp. 74–89). Mining and diamond drilling since that time have extended the outlines of the mine dolomite and have shown a changing pattern of mineralization with depth. Figure 31 shows two vertical cross-sections looking north which illustrate the shape of the mine dolomite and the position of several orebodies within it.

The mine dolomite in general is synclinal with axis plunging north 35 degrees west at 30 to 35 degrees and axial plane dipping steeply to the west. The syncline is almost isoclinal. Conglomerate and dark-grey argillite form the trough lying above the dolomite; rocks of various kinds occur beneath the dolomite on the limbs of the syncline. Slate and argillite of the Dutch Creek Formation occur on the east on what is known as the footwall side of the syncline and are in fault contact with the dolomite. Rocks to the west, known as the hangingwall sequence, are calcareous phyllites, greenish sericitic and chloritic phyllites, and argillites. At the hangingwall contact of the mine dolomite or at some place within the hangingwall sequence is another fault parallel to the formations. Thus the mine dolomite and conglomerate form a synclinal wedge between two faults.

The ore above 3 level (elevation 5,450 feet) occurred in four trough-like structures varying from a tight V-shape on the west to an open syncline on the east. These were called A, B, C, and D zones, and ore was mined between the zones in some areas. Only the A zone was exposed at surface, and the others were found as mining proceeded down the plunge. Banding in the ore indicates replacement of folded banded rocks, either a stratigraphic horizon or a folded shear zone.

Below 3 level the form of the orebodies changed. The A zone lost the V-shape and became a northerly trending tabular body with a steep dip, apparently controlled by replacement along a fault or fracture zone. Other orebodies were found down the projected plunge of the upper zones, which were called B, C, and D, although they were more or less isolated orebodies with no connection with the upper zones. Fractures, vertical fault zones, and incipient shattering of the dolomite controlled replacement. Orebodies below 3 level in general were higher in grade than those above, but some zones in the lowest levels were too low grade to mine.

Ore was mined for almost 4,000 feet down the plunge of the structure and through a vertical interval of about 1,500 feet.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1959, p. 74; 1962, p. 88.]

## FORT STEELE MINING DIVISION

### KIMBERLEY

*Silver-Lead-Zinc*

**Sullivan Mine** *Cominco Ltd.* By P. E. Olson (49° 115° N.W.) Company address, P.O. Box 1510, Station B, Montreal 2, Que. W. S. Kirkpatrick, chairman; R. Hendricks, president; D. D. Morris, vice-president, operations. Western headquarters, Trail. J. H. Salter, vice-president, western region; S. M. Rothman, manager, western operations. Sullivan mine office, Kimberley. R. M. Porter, manager, Kimberley operations; O. E. Weightman, superintendent, Sullivan mine; R. M. Lauer, superintendent, Sullivan concentrator. The Sullivan mine is on Mark Creek, 2 miles north of Kimberley, and the concentrator is at Chapman Camp, 2 miles south of Kimberley. The holdings include 678 Crown-granted mineral claims and fractions and 163 recorded mineral claims. The following is a synopsis of the Kimberley operations which was prepared by the management:—

"During 1967, about 2,100,000 tons of Sullivan ore was treated at the concentrator. In addition, the concentrator treated ore from Pine Point Mines Limited, as capacity was available. The concentrator operated 252 days during 1967.

"Development driven totalled approximately 25,200 feet and core-hole diamond drilling about 11,400 feet. Backfill totalled 608,000 cubic yards of float rock, cave and development waste.

"The ventilation system handled approximately 850,000 cubic feet per minute of air. A large 125,000 cubic feet per minute booster fan was installed on the 3900 level for primary relief on production ventilation.

"The 16 million B.T.U. per hour indirect mine air heating plant started in January on 310,000 cubic feet per minute intake at No. 41 shaft.

"A number of pillar stress measurements were made during the year by the Rock Mechanics Section. The information obtained has been useful in the planning of pillar extraction methods. Continued progress was made on the instrument development project, the aim of which is to produce systems to monitor changes in rock stresses. Surface subsidence features were periodically inspected during the year.

"Technical development has been directed towards improved mining methods, with extensive trials of pneumatic stowing equipment for the back-filling of stopes, further testing of reaming relief holes up to 8 inches in diameter for improved blasting of longhole winzes, mechanization of underground ditch cleaning, and the use of explosives.

"In 1967, the Sullivan mine had eight lost-time accidents; there was one at the concentrator. No fatalities occurred at either place. Accident frequency per 1,000,000 man hours worked was 7.21 at the mine and 2.09 at the concentrator. The severity rate per 1,000,000 man hours worked was 687.4 calendar days at the mine and 1,100 at the concentrator.

"Ten Sullivan mine and concentrator employees obtained or renewed their Industrial First-aid certificates, and 30 employees passed their St. John Ambulance First-aid examinations. Eleven Sullivan mine employees obtained their mine rescue certificates, making a total of 350 since training first started in 1929."

*Copper*

**Joe, Goat, Don** *Pharaoh Mines Ltd.* By Stuart S. Holland (49° 116° N.E. and N.W.) Company office, 1120, 505 Burrard Street, Vancouver 1. S. J. Hunter, consultant. The Goat, Joe, and Don groups, comprising 12 recorded claims, and the Surprise mineral lease, known as the Bracebridge property, are on the north side of St. Mary River 25 miles west of Kimberley. The claims cover old showings that were partly explored in the early 1900's.

In 1967 a camp was established, 5,000 feet of access road was built, and six trenches totalling 2,400 lineal feet of bulldozer stripping was done. Some drilling and blasting of the exposures were done to enable fresh samples to be taken, and four 40-foot percussion holes were drilled.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 239.]

*Gold-Silver-Lead*

## PERRY CREEK

**Jac, Jill**
*Fort Steele Mines Ltd.*
By P. E. Olson

(49° 116° N.E.) Company office, 1116 West 45th Avenue, Vancouver 13. The company owns the Jac and Jill groups of 20 recorded mineral claims on Rome Creek, a tributary of Perry Creek from the south. The claims are 25 miles by road from Cranbrook. The geology of the claims was mapped, and electromagnetic and self-potential surveys covering five claims were run. Mineralization consists mainly of galena in quartz-filled fissure veins.

*Copper*

## CRANBROOK

**Tom, Happy Day**
*Cindy Mines Ltd.*
By P. E. Olson

(49° 115° N.W.) Company office, 1318, 510 West Hastings Street, Vancouver 2. Cindy Mines Ltd. owns 90 recorded mineral claims and Mineral Lease No. 34 near Eager Hill, 4½ miles northeast of Cranbrook. Copper mineralization occurs in narrow stringers in diorite dykes and sills of the Purcell series.

An induced polarization survey was done on the Happy Day 1 to 7 and Tom No. 2 mineral claims by Seigel Associates, Limited. A total heavy metal geochemical survey was done over about 30 claims, including the Tom 23 to 29 claims.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 240; Assessment Reports Nos. 945, 946, and 964.]

*Lead-Zinc*

**Helg**
*Cominco Ltd.*
By Stuart S. Holland

(49° 115° S.W.) Company office, 300, 890 West Pender Street, Vancouver 1. The Helg property comprises 236 claims. The key claims are the Daisy, Violet, Bonnet, and Trillium, which are under option from Helge E. Fors, of Kimberley. The claims are west of Monroe Lake and are reached by 7 miles of road leading from No. 3 highway at Green Bay, north of Moyie.

In 1967 the geology of about 150 claims was mapped and some soil geochemistry done in an area 1,500 by 4,200 feet. Five holes totalling 1,800 feet were diamond drilled. The work was supervised by B. Stutsky.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 240; Assessment Report No. 834.]

*Gold*

**St. Joseph, E.L.**
*Vanco Explorations Limited*
By P. E. Olson

(49° 115° S.W.) Company office, 900, 1111 West Hastings Street, Vancouver 1. Vanco Explorations Limited has the E.L., St. Joseph, Boots, Dog, and other groups, totalling 130 claims, under option from Rimrock Mining Corporation, Limited. The property is between Jim Smith and Kiakho Lakes, 5 miles southwest of Cranbrook.

Geological mapping was done by T. E. Lisle, who supervised work on the property. Magnetometer, electromagnetic, and induced polarization surveys were done over most of the property, and a total heavy metal geochemical survey was done over 80 claims. Nine diamond-drill holes totalling 5,300 feet were put down in anomalous areas.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1956, p. 158, "Rimrock"; *Geol. Surv., Canada,* Mem. 207, p. 51; Assessment Report No. 895.]

**Jim, Cat, Nord, Etc.**
*Placid Oil Company*
By Stuart S. Holland

(49° 115° S.W. and N.W.) Company office, 860 Guiness House, Calgary, Alta. The Jim, Cat, Nord, Carol, and Neil groups of claims, totalling 200 in number, are 5 miles southwest of Cranbrook.

The company undertook an extensive programme of exploration in the vicinity of Cranbrook in the hope of finding Sullivan-type mineralization in the Aldridge Formation. In 1966 geological mapping and magnetometer work were done on the Cat group and are recorded in Assessment Report No. 863. The same year similar work was also done on the Jim group and recorded in Assessment Report No. 1043.

Additional work in 1967 was further detailed geological mapping and an induced polarization survey of the Cat, Jim, and Carol claims.

[References: Assessment Reports Nos. 863, 1043, 1174, and 1178.]

*Copper*

## FERNIE

**Commerce**
*Kennco Explorations, (Western) Limited*
By P. E. Olson

(49° 114° S.E.) Company office, 730, 505 Burrard Street, Vancouver 1. The company owns the Commerce group of 43 recorded mineral claims along the Flathead River, 45 miles from Fernie and 10 miles north of the International Boundary. The company carried out stream sediment analyses over an area of 20 square miles in an area where bornite and chalcocite mineralization is present in sedimentary rocks.

*Mercury*

## BLOOM CREEK

**Frankie**
*Cominco Ltd.*
By Stuart S. Holland

(49° 115° S.E.) Company office, 300, 890 West Pender Street, Vancouver 1. The Frankie group of six claims is on Gold Creek 1 mile east of the mouth of Bloom Creek. The claims are under option from John Wolfe of Erickson. Cinnabar is reported to occur along joint planes in magnesian limestone. In 1967 the geology of the claims was mapped, a geochemical soil survey was run, and three trenches totalling 400 lineal feet were bulldozed. The work was supervised by G. L. Webber.

*Silver-Lead-Zinc*

## WASA

**Estella Mine**
*Giant Soo Mines Limited*
By P. E. Olson

(49° 115° N.W.) Company office, 1825, 355 Burrard Street, Vancouver 1; mine address, P.O. Box 249, Cranbrook. A. G. Ditto, resident manager; J. Coffey, mill superintendent. Copper Soo Mines Limited is a private company owned by Copper Soo Mining Company Limited (40 per cent) and Giant Mascot Mines Limited (60 per cent). The Estella mine is in a basin at the head of Tracy Creek, 5 miles east of Wasa. Principal workings are on the Skylark Crown-granted mineral claim (Lot 6579). Main access to the underground workings is via the Estella portal at an elevation of 6,100 feet. After a shut-down of several years, the mine was reopened in 1966, and milling started in September of that year.

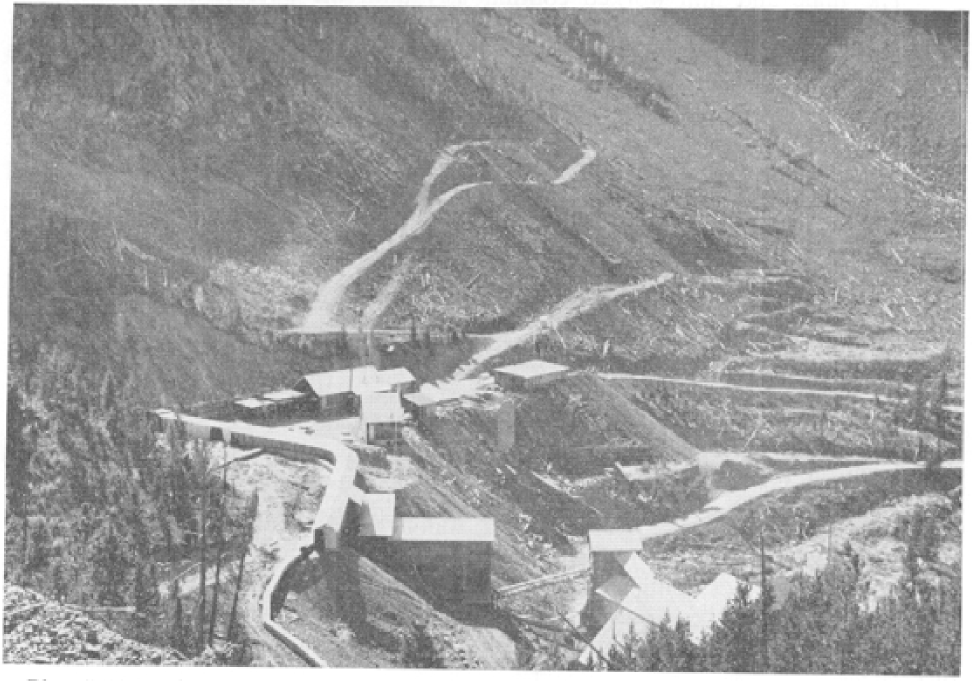

Plate VIIIA. Giant Soo Mines Limited. Concentrator and mine buildings clustered at the portal of the main adit of Estella mine at the head of Tracy Creek.

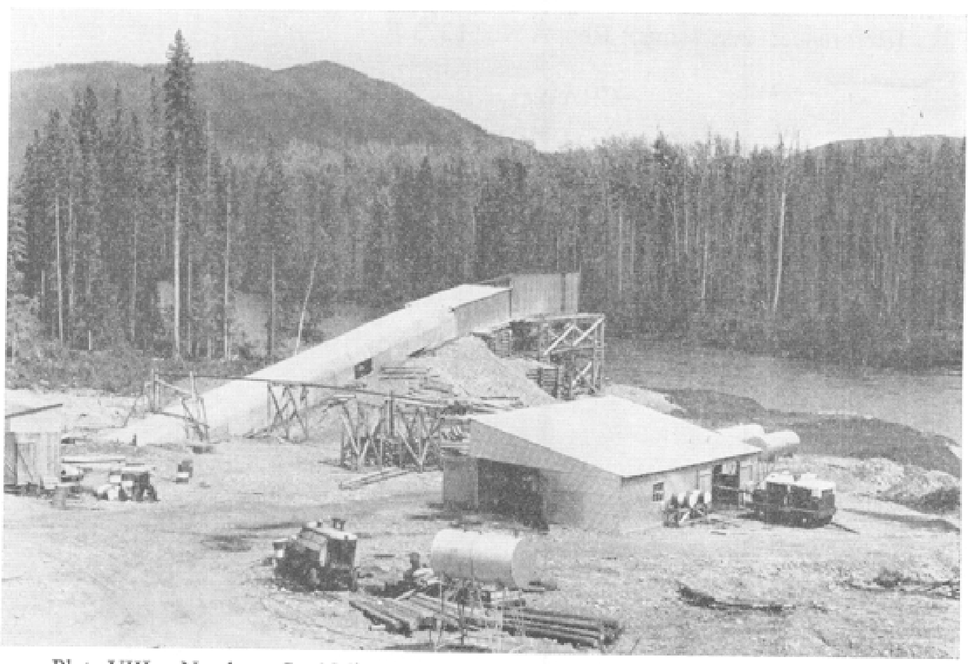

Plate VIIIB. Northern Coal Mines Limited. Looking northeastward to the incline and tipple on the west side of the Bowron River.

The mine and mill worked continuously until the operation was closed on October 5th. During 1967 the mine produced 40,250 tons of ore grading 2.5 ounces per ton silver, 5.4 per cent lead, and 9.2 per cent zinc. Stoping was done on most levels, and many pillars were removed near the end of the mining programme.

The mill treated all ore produced and turned out 2,489 tons of lead concentrates and 5,316 tons of zinc concentrates. The latter were shipped to Trail and Bunker Hill smelters, while all the lead production was treated at the Trail smelter. Toward the end of production, the company was experiencing some difficulty in disposing of its zinc concentrates.

Until the mine closed, the company employed 40 men, 24 of whom worked underground.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1963, p. 82.]

## ROOSVILLE

*Copper*

**Alice, Wilda, Betty, Green**
*Cominco Ltd.*
By Stuart S. Holland

(49° 114° S.W. and 49° 115° S.E.) Company office, 300, 890 West Pender Street, Vancouver 1. The Alice, Wilda, Betty, Green, and other claims, totalling 54 in number, are grouped as the Phil No. 1 and No. 2 groups. They are located at the head of Phillips Creek at altitudes of 4,500 to 6,500 feet on the north side of the valley in the vicinity of the north and east forks and extending eastward to Tatro Creek. The claims are under option from C. R. Sinclair and H. L. Totten, of Grasmere.

It is reported that chalcopyrite and malachite occur disseminated in the sedimentary rocks and as blebs in quartz-barite veins cutting sedimentary and volcanic rocks of the Purcell and Sheppard Formations.

In 1967 the geology of about 12 claims was mapped in detail and a geochemical soil survey run of the same area.

[Reference: Assessment Report No. 1023.]

## CRAWFORD CREEK

**Humbolt**
*Rose Pass Mines Ltd.*

(49° 116° N.W.) *See under* Slocan Mining Division, page 260.

# GEOLOGICAL, GEOPHYSICAL, AND GEOCHEMICAL REPORTS

The Annual Report for 1958 lists all geological, geophysical, and geochemical reports which to that time had been credited for assessment work on mineral claims or placer leases. Since then each annual report lists the reports accepted during the current calendar year.

A copy of each report is filed in the office of the Mining Recorder for the mining division in which the property is located and a second copy is in the office of the Chief of the Mineralogical Branch, Department of Mines and Petroleum Resources, Victoria. These reports are available for examination one year after their date of submission. Because of space limitations in the Victoria office, it is requested that appointments for examination be made in advance.

The property name is that which appears to be in most common use. It is not feasible to list all the claim names in each property. The author of each report is given and the principal for whom the report was written.

The co-ordinate given for each report is the southeast corner of the 1-degree quadrilateral within which the property lies.

REPORTS CREDITED FOR ASSESSMENT, 1967

| Geographic Position | | Property<br>Owner or Principal<br>Author of Report<br>Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 48° 123° | N.W. | Lenora, Tyee, Richard III<br>Mount Sicker Mines Ltd.<br>E. P. Sheppard and D. M. Basco.<br>October 25, 1967. | 1104 | × | — | — |
| 48° 123° | N.W. | Tot, Rum, Tinto View<br>Cominco Ltd.<br>G. D. Tikkanen.<br>April 5, 1967. | 936 | — | × | — |
| 48° 124° | N.E. | Yam, Ohm<br>Cominco Ltd.<br>G. D. Tikkanen.<br>April 5, 1967. | 935 | — | × | — |
| 49° 114° | S.W. | Phil No. 2 Group, Green, Huckleberry, Tatum, Red, Eager, Extra, Hawk, Leaf, Handy, Pine, Tang, Hook, Mill, Poorman, Alice, Bernice, Wilda, Prop, Bonus, Junction<br>Cominco Ltd.<br>M. R. Wolfhard and J. Richardson.<br>July 11, 1967. | 1023 | × | — | × |
| 49° 115° | S.W. | Bert, Elephant, St. Joseph<br>Rimrock Mining Corporation, Limited.<br>S. B. Hamilton.<br>January 20, 1967. | 895 | — | × | — |
| 49° 115° | N.W. | Happy Day, Red Chief, Tom<br>Cindy Mines Ltd.<br>R. W. Gedde and R. O. Crosby.<br>April 25, 1967. | 964 | — | × | — |
| 49° 115° | N.W. | Happy Day, Red Chief, Tom<br>Cindy Mines Ltd.<br>A. C. A. Howe.<br>February 27, 1967. | 945 | — | — | × |
| 49° 115° | N.W. | Happy Day, Red Chief, Tom<br>Cindy Mines Ltd.<br>J. Willars.<br>February 27, 1967. | 946 | × | — | — |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 49° 115° | S.W. | Jack, Tom<br>Vanco Explorations Limited.<br>J. F. White.<br>June 20, 1967. | 1007 | — | × | — |
| 49° 115° | S.W., N.W. | Jim<br>Placid Oil Company.<br>J. S. Scott and R. A. Buckley.<br>January 30, 1967. | 1043 | × | × | — |
| 49° 115° | N.E. | Pee Pee<br>Cominco Ltd.<br>B. Stutsky and J. Richardson.<br>September 6, 1967. | 1063 | × | — | × |
| 49° 116° | S.E. | Kid<br>Cominco Ltd.<br>H. H. Freund and J. Richardson.<br>August 30, 1967. | 1069 | × | — | × |
| 49° 116° | N.W. | War Eagle, Les<br>Silver Eagle Mines Ltd.<br>H. H. Cohen.<br>May 2, 1967. | 989 | — | × | — |
| 49° 117° | S.E. | Fresno<br>Copper Horn Mining Ltd.<br>L. J. Manning.<br>August 16, 1967. | 1083 | × | × | × |
| 49° 117° | S.E. | G. W., D, Crown, Jewel, Wolf, Arja, CU, W, Ron, Hope<br>Great West Mining Corporation Ltd.<br>A. R. Bullis.<br>February 28, 1967. | 927 | — | — | × |
| 49° 117° | N.E. | H, Whitey<br>Andex Mines Ltd.<br>H. H. Cohen.<br>November 7, 1966. | 858 | — | × | — |
| 49° 117° | S.W. | Kirkup Group<br>Royal Canadian Ventures Ltd.<br>M. J. Moreau.<br>October 12, 1967. | 1117 | — | × | — |
| 49° 117° | S.W. | Kirkup Group<br>Royal Canadian Ventures Ltd.<br>N. B. Vollo.<br>October 10, 1967. | 1068 | — | — | × |
| 49° 117° | S.W. | Kirkup Group<br>Royal Canadian Ventures Ltd.<br>N. B. Vollo.<br>September 8, 1967. | 1054 | × | — | — |
| 49° 117° | S.W. | Ross<br>Rossland Mining Co. Ltd.<br>A. C. Skerl.<br>October 31, 1967. | 1094 | — | — | × |
| 49° 118° | S.W. | Copper Queen, King Solomon<br>McIntyre Porcupine Mines, Limited.<br>Fenton Scott.<br>October 4, 1967. | 1082 | — | × | — |
| 49° 118° | N.E. | Mac, BA<br>H O. Christensen.<br>G. A. Mouritsen.<br>June 30, 1967. | 1078 | — | × | — |
| 49° 118° | S.W. | Marshall, Brandon, Little Annie, Little Brown, Custer, Tio Buracho, Glenside<br>San Jacinto Explorations Limited.<br>P. E. Walcott and A. R. Dodds.<br>February 6, 1967. | 882 | — | × | — |
| 49° 118° | S.W. | Little Ruth, Tintic, Red Metal, Toronto, Butte City, Pluto, Ah There, Hound, Frantic, Ragna Rock, Jim McRea, Hardscrabble<br>San Jacinto Explorations Limited.<br>R. K. Watson and A. R. Dodds.<br>January 19, 1967. | 881 | — | × | — |

## Reports Credited for Assessment, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 49° 118° | S.E. | North West Silver<br>Rudy Martin.<br>G. L. Mill.<br>March 2, 1967. | 930 | — | — | × |
| 49° 118° | S.W. | Stan (Rockland)<br>KRC, Inc.<br>G. A. Mouritsen.<br>November 16, 1966. | 889 | — | × | — |
| 49° 118° | S.W. | Toney, Chem, Anton, Vendela, Chum, Vicki<br>Utah Construction & Mining Co.<br>M. J. Young.<br>September 1, 1967. | 1067 | — | × | — |
| 49° 119° | S.W. | A, B, C, D, E, F, G, KS, June, Jen<br>Grand Duchess Mining Ltd.<br>H. H. Cohen.<br>September 7, 1967. | 1093 | — | × | — |
| 49° 119° | S.E. | Art, Lil, Viv<br>Ganda Silver Mines Ltd.<br>D. R. Cochrane.<br>May 3, 1967. | 1031 | — | × | — |
| 49° 119° | S.E. | Art, Lil, Viv<br>Ganda Silver Mines Ltd.<br>Jos. Sullivan.<br>May 3, 1967. | 1025 | — | × | — |
| 49° 119° | S.E. | Art, Lil, Viv<br>Ganda Silver Mines Ltd.<br>D. R. Cochrane.<br>May 3, 1967. | 1024 | — | × | — |
| 49° 119° | N.W. | Bill<br>Tro-Buttle Explorations Limited.<br>R. W. Gedde and R. O. Crosby.<br>March 14, 1967. | 942 | — | × | — |
| 49° 119° | N.W. | Collex, T.<br>Cambri Mining & Development Ltd.<br>J. F. V. Millar.<br>February 7, 1967. | 928 | × | — | × |
| 49° 119° | N.W. | Gayle, Brenda Lee, Doe<br>Brenda Mountain Exploration Syndicate.<br>J. F. McIntyre and P. Klaui.<br>December 17, 1966. | 887 | × | — | × |
| 49° 119° | N.W. | Jim, Roy<br>Kellex Mining Co. Ltd.<br>M. K. Lorimer.<br>July 20, 1967. | 1065 | — | — | × |
| 49° 119° | N.W. | Maria<br>T. C. Explorations Ltd.<br>Jos. Sullivan.<br>October 31, 1966. | 861 | — | × | — |
| 49° 119° | S.W. | Osoyoos Group<br>M. V. Nixon.<br>R. E. Renshaw.<br>May 25, 1967. | 970 | × | — | × |
| 49° 119° | N.W. | Pin<br>Forest Kerr Mines Ltd.<br>C. T. Ritchie.<br>December 6, 1966. | 880 | × | — | × |
| 49° 119° | N.W. | Silver King, Rhonda, Dawn, Molly<br>Quinalta Petroleum Ltd. and Fleetwood Resources Ltd.<br>W. S. Read and H. S. Lazenby.<br>November 16, 1967. | 1110 | — | — | × |
| 49° 119° | S.W. | Stormy, Giddy, Bounty, Summit, Prosper<br>Apex Exploration and Mining Company, Ltd.<br>Jos. Sullivan.<br>June 19, 1967. | 1044 | — | × | — |
| 49° 119° | N.W. | X<br>Lodestar Mines Ltd.<br>G. L. Mill.<br>May 5, 1967. | 984 | — | — | × |

## REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 49° 120° | N.E. | Babe, Bob, Earl<br>Wingdam & Lightning Creek Mining Co. Ltd.<br>E. A. Ramsay.<br>January 31, 1967. | 987 | × | × | × |
| 49° 120° | N.E. | Babe, Bob, Earl<br>Wingdam & Lightning Creek Mining Co. Ltd.<br>B. Mottershead.<br>January 31, 1967. | 986 | — | × | — |
| 49° 120° | N.W. | Bill, Cat, Sick Cat, Hep Cat<br>North American Platinum Corporation Ltd.<br>J. D. Mason.<br>November 30, 1967. | 1132 | — | × | — |
| 49° 120° | S.W. | Bob, Bon, Fin<br>Federated Mining Corporation Ltd.<br>J. Benitez.<br>January 26, 1967. | 920 | — | — | × |
| 49° 120° | N.E. | BrenCap, BrenColl, Sandberg, Ila, Red Rock, MacEwer, Robb<br>BrenMac Mines Ltd.<br>P. G. Hallof and R. A. Bell.<br>January 27, 1967. | 886 | — | × | — |
| 49° 120° | N.E. | Brenda Lake Property (Bill, Bruce, Cati, WP)<br>The Buttle Lake Mining Company Limited and Trojan Consolidated Mines Ltd.<br>R. A. Bell.<br>March 14, 1967. | 932 | — | × | — |
| 49° 120° | N.W. | Cache<br>Kerr-Addison Mines Limited.<br>G. E. White.<br>January 18, 1967. | 877 | — | × | — |
| 49° 120° | N.W. | Corky<br>J. R. Dawson and Roger Paterson.<br>S. W. Evans.<br>October 17, 1966. | 856 | — | × | — |
| 49° 120° | N.W. | Cousin Jack, Ymir, Morning, Oshkosh, Winibago, Black Bird, Berlin, Freddie, Burn, Anaconda<br>Nelway Mines Ltd.<br>J. A. Millican.<br>March 1, 1967. | 944 | — | — | × |
| 49° 120° | N.E. | Eln<br>Donald W. Smellie.<br>Donald W. Smellie.<br>April 28, 1967. | 982 | — | × | × |
| 49° 120° | N.W. | EM, Oct<br>Ronald Green and Ralph Matier.<br>C. B. Selmser.<br>September 8, 1967. | 1059 | — | × | — |
| 49° 120° | N.W. | FWP, Slim, Lake<br>Largo Mines Ltd.<br>D. B. Sutherland and A. W. Mullan.<br>December 1, 1967. | 1121 | — | × | — |
| 49° 120° | S.W. | Gayle S, Gail R, Woodpecker, Doreen S, Red Star<br>Spheno Mines Ltd.<br>G. B. Allen.<br>November 30, 1966. | 878 | × | × | × |
| 49° 120° | N.W. | Glen, Fire, Candle, Eagle, Decano, Stag<br>Juniper Mines Ltd.<br>R. H. D. Philp.<br>December 5, 1967. | 1141 | × | × | × |
| 49° 120° | S.E. | Good Hope, Nighthawk, Jumbo<br>Highpoint Mines Limited.<br>John Lamb.<br>May 5, 1967. | 971 | × | — | — |
| 49° 120° | S.W. | JJJ, Jill, Tow<br>Oro Mines Ltd.<br>R. G. Jury.<br>March 9, 1967. | 948 | — | — | × |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 49° 120° | N.W. | K.R.<br>Adera Mining Limited.<br>C. A. R. Lammle.<br>April 19, 1967. | 985 | — | × | × |
| 49° 120° | N.W. | M<br>Rayore Mines Ltd.<br>D. R. Cochrane.<br>February 23, 1967. | 934 | — | × | — |
| 49° 120° | N.E. | Marn, Rob, Cam, Visc, Bob, Tom, Kel, Glen<br>Kel-Glen Mines Ltd.<br>P. Norgaard, R. Pedersen, and Everett J. Lees.<br>November 22, 1966. | 875 | × | × | — |
| 49° 120° | N.E. | Orecan, Boyd<br>Komo Explorations Ltd.<br>R. Philp.<br>April 26, 1967. | 980 | — | × | — |
| 49° 120° | N.E. | Poke, Dan, K.G.<br>Sheep Creek Mines Limited.<br>R. O. Crosby and J. S. McIntosh.<br>January 26, 1967. | 923 | — | × | × |
| 49° 120° | N.E. | Poke, Dan, Kay, No Sense<br>Sheep Creek Mines Limited.<br>R. O. Crosby and J. S. McIntosh.<br>January 26, 1967. | 911 | — | × | × |
| 49° 120° | S.W. | Ray<br>Copper Mountain Consolidated Limited.<br>R. D. Falconer.<br>March 31, 1967. | 940 | — | × | — |
| 49° 120° | S.W. | Ray<br>Copper Mountain Consolidated Limited.<br>C. A. R. Lammle.<br>March 31, 1967. | 941 | × | × | × |
| 49° 120° | N.E. | R.T.<br>Kathleen Mountain Mines Limited.<br>W. M. Sharp.<br>May 24, 1967. | 1040 | — | — | × |
| 49° 120° | N.W. | Ski, Doo, Adit, CU, Creek<br>Chataway Exploration Co. Ltd.<br>S. W. Wright.<br>March 1, 1967. | 925 | — | — | × |
| 49° 120° | N.E. | Slim, Pod<br>Fleetwood Resources Ltd. and Quinalta Petroleum Ltd.<br>Jos. Sullivan.<br>November 14, 1966. | 876 | — | × | — |
| 49° 120° | N.E. | Spruce, Lucky Jack, Baron, Lorna, Barbara, Lotus, Budd, Alix, Freddy B<br>Silver Arrow Explorations Ltd.<br>R. D. Falconer.<br>October 27, 1966. | 943 | — | × | — |
| 49° 120° | N.W. | Strike, Lorna, Spike<br>Adera Mining Limited.<br>C. A. R. Lammle.<br>April 19, 1967. | 977 | × | × | — |
| 49° 120° | N.W. | Strike, Lorna, Spike<br>Adera Mining Limited.<br>W. Schuur.<br>April 19, 1967. | 978 | — | × | — |
| 49° 120° | N.E. | Toe<br>Consolidated Skeena Mines Ltd.<br>W. M. Sharp.<br>October 18, 1967. | 1089 | — | × | — |
| 49° 120° | N.E. | Toe, Echo<br>Consolidated Skeena Mines Ltd.<br>W. M. Sharp.<br>August 16, 1967. | 1049 | — | — | × |

## REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 49° 120° | N.W. | Vida, Red<br>Marengo Mines Ltd.<br>A. D. Tidsbury.<br>April 27, 1967. | 1016 | — | × | — |
| 49° 120° | S.E. | West, Central, East, JDL, DO, GO, JO<br>Kelpen Mining Corporation Ltd.<br>C. T. Ritchie.<br>March 8, 1967. | 988 | × | × | × |
| 49° 121° | S.E. | Bea, Giant, P, Mill<br>Kelso Explorations Ltd.<br>D. R. Cochrane.<br>September 18, 1967. | 1085 | — | × | — |
| 49° 121° | S.E. | Bea, Giant<br>Kelso Explorations Ltd.<br>D. A. McDonald.<br>April 21, 1967. | 963 | — | × | — |
| 49° 121° | N.E. | Max, Mac, Iago, Bar<br>Iago Mines Ltd.<br>J. G. LeBrun and J. A. Mitchell.<br>June 7, 1967. | 1125 | — | — | × |
| 49° 121° | S.E. | Mill<br>Kelso Explorations Ltd.<br>J. A. Mitchell.<br>July 7, 1967. | 1032 | — | — | × |
| 49° 122° | N.W. | Pitt, SE, Explorer, DD<br>Caribbean Exploration Corporation.<br>Robert E. Chaplin.<br>October 26, 1967. | 1100 | — | × | — |
| 49° 124° | S.E. | Strike<br>Ian M. Sherwin.<br>D. W. Smellie.<br>April 18, 1967. | 950 | — | × | — |
| 49° 125° | N.E. | Blue Jay, Grouse, Bell, Charles<br>Mt. Washington Copper Co. Ltd.<br>W. G. Stevenson.<br>November 23, 1967. | 1142 | — | × | × |
| 49° 125° | N.E. | MJ, GMB, JLG, TSM, Chuck, JGG, EM, Mag, ME, GAM, SS<br>Qualicum Mines Limited.<br>W. G. Stevenson.<br>October 23, 1967. | 1120 | × | — | × |
| 50° 116° | S.W. | Fog<br>KRC, Inc.<br>M. C. Robinson.<br>July 4, 1967. | 1015 | — | — | × |
| 50° 116° | S.W. | HI-LO<br>Copper Horn Mining Ltd.<br>D. C. Malcolm.<br>November 8, 1967. | 1126 | × | — | — |
| 50° 116° | N.E. | Jersey<br>Magnet Cove Barium Corporation Ltd.<br>D. R. Cochrane.<br>October 19, 1967. | 1101 | — | × | — |
| 50° 116° | N.W. | Sun<br>Kamloops Copper Consolidated Ltd.<br>E. Amendolagine.<br>December 1, 1966. | 901 | × | — | — |
| 50° 117° | S.E. | Pak, Ant, Mari, Sparkle, T<br>Silver Summit Mining Co. Ltd.<br>G. E. White.<br>March 14, 1967. | 915 | — | × | — |
| 50° 117° | S.E. | Pak, Ant, Mari, Sparkle, T<br>Silver Summit Mining Co. Ltd.<br>I. E. Thurber.<br>March 14, 1967. | 916 | × | — | — |
| 50° 118° | S.W. | Bisson, J.L., L.B., Lucky, Molly, Monday, XL, Lulu<br>Noranda Exploration Company, Limited.<br>D. K. Fountain.<br>July 12, 1967. | 1022 | — | × | — |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 50° 119° | S.W. | AT<br>Noranda Exploration Company, Limited.<br>B. O. Brynelsen and J. D. Knauer.<br>September 18, 1967. | 1071 | — | — | × |
| 50° 119° | S.W. | Jim<br>S. Brewer.<br>A. F. Roberts.<br>February 1, 1967. | 884 | — | × | × |
| 50° 119° | S.E. | KIK<br>Kokanee Moly Mines Ltd.<br>G. P. E. White.<br>October 11, 1967. | 1095 | — | — | × |
| 50° 119° | S.W. | Pat<br>Noranda Exploration Company, Limited.<br>B. O. Brynelsen.<br>August 11, 1967. | 1039 | — | — | × |
| 50° 119° | N.W. | Pritchard, CB<br>Nordco Explorations Ltd.<br>R. O. Crosby and J. Foster Irwin.<br>May 30, 1967. | 1008 | — | × | — |
| 50° 120° | S.W. | Aden Group, Joe, Toad, Hop, Moly<br>Aden Mines Ltd.<br>P. Norgaard.<br>March 2, 1967. | 1034 | — | × | — |
| 50° 120° | N.E., N.W. | Afton, Pot, Add<br>Afton Mines Ltd.<br>W. Schuur.<br>November 28, 1966. | 879 | — | × | — |
| 50° 120° | S.W. | Alpha, Peg, MMM<br>Noranda Exploration Company, Limited.<br>B. O. Brynelsen and J. D. Knauer.<br>December 7, 1967. | 1144 | — | — | × |
| 50° 120° | N.W. | BO, Alf<br>Newconex Canadian Exploration Ltd.<br>J. S. Ives.<br>June 8, 1967. | 1124 | — | — | × |
| 50° 120° | S.W. | Chris, Roxie<br>Rocket Mines Ltd.<br>F. L. C. Price.<br>July 21, 1967. | 1074 | — | — | × |
| 50° 120° | S.W. | CM<br>Cleveland Mining & Smelting Co. Ltd.<br>F. J. Hemsworth.<br>August 24, 1967. | 1045 | — | — | × |
| 50° 120° | N.E. | DM, RO, Lorna, Pot<br>Comet-Krain Mining Corp. Ltd.<br>G. E. White.<br>May 8, 1967. | 1011 | — | — | × |
| 50° 120° | N.E. | DM, RO, Lorna, Audra<br>Comet-Krain Mining Corp. Ltd.<br>G. E. White.<br>September 22, 1966. | 891 | — | × | — |
| 50° 120° | N.W. | Dominic Lake Group, TC, Spur, Bruce, MO<br>Dominic Lake Mining Company Ltd.<br>G. A. Dirom.<br>April 26, 1967. | 1009 | — | — | × |
| 50° 120° | N.E. | Eve<br>Western Canada Steel Limited.<br>J. M. Black.<br>May 25, 1967. | 1003 | — | × | — |
| 50° 120° | N.W. | GB, Spur<br>Noranda Exploration Company, Limited.<br>B. O. Brynelsen and J. D. Knauer.<br>October 16, 1967. | 1099 | — | — | × |
| 50° 120° | S.W. | GCM<br>Gump Creek Mining Ltd.<br>D. W. Smellie and G. A. Brand.<br>January 12, 1967. | 873 | — | × | — |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position | | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 50° 120° | N.E. | Jeep, Dan, Alf, Kimberley, Last Chance, Charlotte, Morning Star, Keystone, Stemwinder<br>Kimberley Copper Mines Ltd.<br>L. G. Phelan.<br>May 30, 1967. | 993 | — | × | — |
| 50° 120° | S.W. | Jericho, Bob, Gem, Mark, Hatch, James, Jim, J.C., Gnat, Stibbard<br>Canadian Superior Exploration Limited.<br>R. A. Dujardin and A. P. Fawley.<br>January 13, 1967. | 922 | × | × | × |
| 50° 120° | S.W. | MLM<br>Mamit Lake Mining Ltd.<br>D. R. Cochrane.<br>July 12, 1967. | 1027 | — | × | — |
| 50° 120° | S.W. | MM, Rob, Oro<br>Oro Mines Ltd.<br>R. G. Jury.<br>May 8, 1967. | 975 | — | × | × |
| 50° 120° | S.W. | Mouse<br>Nicola Lake Mining Company Ltd.<br>P. Norgaard and J. A. Mitchell.<br>November 10, 1966. | 890 | × | × | × |
| 50° 120° | S.W. | Mouse<br>Nicola Lake Mining Company Ltd.<br>J. A. Mitchell.<br>June 21, 1967. | 1052 | — | — | × |
| 50° 120° | S.W. | Mouse<br>Nicola Lake Mining Company Ltd.<br>J. A. Mitchell.<br>June 21, 1967. | 1053 | — | — | × |
| 50° 120° | S.W. | Pay, Bay<br>Bethlehem Copper Corporation Ltd.<br>B. R. Sharan.<br>October 19, 1967. | 1112 | — | — | × |
| 50° 120° | N.E. | Pinnacle Claim Group (A, C, Cle)<br>Pinnacle Mines Ltd.<br>P. G. Hallof and R. A. Bell.<br>November 21, 1967. | 965 | — | × | — |
| 50° 120° | S.W. | Porcupine<br>Amalgamated Resources Ltd.<br>R. A. Bell and D. B. Sutherland.<br>April 24, 1967. | 962 | — | × | — |
| 50° 120° | S.W. | Price, CN<br>Oro Mines Ltd.<br>R. G. Jury.<br>April 7, 1967. | 974 | — | — | × |
| 50° 120° | S.W. | Price, MM, Rob<br>Oro Mines Ltd.<br>A. R. Dodds and P. E. Lane.<br>April 7, 1967. | 973 | — | × | — |
| 50° 120° | S.W. | Roc, Lucky, Zowie<br>Lodestar Mines Ltd.<br>G. L. Mill.<br>April 21, 1967. | 966 | — | — | × |
| 50° 120° | S.W. | Roc, Lucky, Zowie<br>Lodestar Mines Ltd.<br>S. W. Evans.<br>April 21, 1967. | 967 | × | — | — |
| 50° 120° | S.W. | Sheba, Mark, CU, DO, Ann, JJ, J, Jay<br>Sheba Copper Mines Limited.<br>Takeo Yokoyama.<br>September 20, 1967. | 1087 | — | × | — |
| 50° 120° | S.W. | Valley Copper Group (Outrider, Bay, Or)<br>Cominco Ltd. and Valley Copper Mines Limited.<br>J. M. Allen.<br>July 10, 1967. | 1014 | — | × | — |

## Reports Credited for Assessment, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 50° 120° | S.E. | Vip, ID<br>Sheep Creek Mines Limited.<br>J. S. McIntosh and R. O. Crosby.<br>May 29, 1967. | 983 | — | × | × |
| 50° 120° | S.W. | WS, JW, Alf, RS<br>International Copper Corporation Ltd.<br>A. R. Allen.<br>April 14, 1967. | 995 | — | × | — |
| 50° 121° | S.E. | A-300<br>Rocket Mines Ltd.<br>F. L. C. Price.<br>August 4, 1967. | 1088 | — | — | × |
| 50° 121° | S.E. | Bay, Jef<br>Cleveland Mining & Smelting Co. Ltd., New Indian Mines Limited, and Vananda Explorations Limited.<br>F. J. Hemsworth.<br>March 8, 1967. | 931 | — | — | × |
| 50° 121° | N.E. | Den<br>Adera Mining Limited.<br>C. A. R. Lammle.<br>May 2, 1967. | 990 | × | × | × |
| 50° 121° | S.E. | Ezz, O.K., Call, Pal<br>Alwin Mining Company Ltd.<br>J. G. Baird and R. O. Crosby.<br>July 26, 1967. | 1028 | — | × | — |
| 50° 121° | N.E. | Key<br>Riviera Mines Limited.<br>A. R. Dodds and R. G. Jury.<br>November 29, 1966. | 892 | — | × | × |
| 50° 121° | S.E. | Lorna, Mat, Mars, Pam, Zen, Mac<br>Zenith Mining Corporation Ltd.<br>M. P. Stadnyk.<br>November 29, 1967. | 1137 | — | — | × |
| 50° 121° | S.W., N.W. | Nancy, Joyce, Mud, Cherry<br>Dalex Mines Ltd.<br>S. A. Mouritsen.<br>October 26, 1967. | 1098 | — | × | — |
| 50° 121° | N.E., S.E. | Nim<br>New Indian Mines Limited.<br>F. J. Hemsworth.<br>June 30, 1967. | 1019 | — | — | × |
| 50° 121° | S.W. | Rio<br>Rio Tinto Canadian Exploration Limited.<br>L. B. Gatenby.<br>May 15, 1967. | 997 | × | × | × |
| 50° 121°<br>50° 120° | S.E.<br>S.W. | San Jose, Alamo<br>San Jose Mines Ltd. and San Jacinto Explorations Limited.<br>D. A. Chapman.<br>July 17, 1967. | 1081 | — | × | × |
| 50° 122° | N.E. | King, Mineral King<br>Benn Explorations Ltd.<br>E. J. Schutz and R. C. Tomlinson.<br>April 14, 1967. | 994 | — | — | × |
| 50° 126° | S.W. | Bob<br>Cominco Ltd.<br>A. C. N. deVoogd.<br>April 19, 1967. | 953 | × | × | — |
| 50° 126° | S.W. | Rugged, Black Knight<br>Malaspina Mining Company Limited.<br>T. Kalnins.<br>December 15, 1966. | 868 | × | × | × |
| 50° 126° | S.W. | Zip<br>Cominco Ltd.<br>A. C. N. deVoogd.<br>May 23, 1967. | 972 | — | — | × |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position | | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 50° 127° | N.W. | Ace, Beta<br>Western Canada Steel Limited.<br>J. M. Black.<br>August 25, 1967. | 1060 | × | × | — |
| 50° 127° | N.W. | Aero<br>Western Canada Steel Limited.<br>J. M. Black.<br>August 7, 1967. | 1033 | × | × | — |
| 50° 127° | N.W. | Beta<br>Western Canada Steel Limited.<br>J. M. Black.<br>August 25, 1967. | 1050 | — | × | — |
| 50° 127° | N.W. | HPH, Norman, Lake<br>Giant Explorations Limited.<br>R. Sutherland.<br>December 13, 1966. | 870 | × | — | × |
| 50° 127° | N.E. | Reef<br>Gordon Milbourne.<br>A. G. Humphrey.<br>February 1, 1967. | 894 | — | — | × |
| 50° 127° | N.E. | Road<br>Western Canada Steel Limited.<br>J. M. Black.<br>October 6, 1967. | 1079 | — | × | — |
| 50° 127° | S.W. | Sinker<br>E. R. Flesher and T. H. C. Wilson.<br>E. R. Flesher and T. H. C. Wilson.<br>April 17, 1967. | 961 | — | × | × |
| 51° 116° | S.W. | Collex<br>Cambri Mining & Development Company Ltd.<br>C. B. Selmser.<br>December 21, 1966. | 874 | — | × | — |
| 51° 118° | N.E. | Timbasket, Mogul<br>J. F. V. Millar.<br>J. F. V. Millar.<br>October 26, 1967. | 1116 | — | — | × |
| 51° 118° | S.W. | Shuswap<br>Great Northern Petroleums & Mines Ltd.<br>B. I. Nesbitt.<br>March 23, 1967. | 958 | — | × | — |
| 51° 119° | S.W. | Agate, Karen, Tom, Glen, Joe<br>Buchanan Mines Ltd.<br>John Lloyd.<br>May 2, 1967. | 1114 | — | × | — |
| 51° 119° | S.W. | Elmoore<br>Cannon Mines Limited.<br>C. T. Pasieka.<br>February 6, 1967. | 904 | × | × | × |
| 51° 119° | N.W. | Hail<br>Quebec Cartier Mining Company.<br>Albert F. Reeve.<br>July 12, 1967. | 1035 | × | — | × |
| 51° 119°<br>51° 120° | N.W.<br>N.E. | Jud<br>Secondo Mining Ltd.<br>W. J. Wilkinson and D. D. Campbell.<br>July 13, 1967. | 1046 | × | — | × |
| 51° 119° | N.W. | Leemac, Boomac, B-Mac, Star, Lee<br>Kamstar Mines Ltd.<br>C. T. Pasieka.<br>June 21, 1967. | 1041 | — | × | — |
| 51° 119° | S.W. | M, H<br>Royal Canadian Ventures Ltd.<br>N. B. Vollo.<br>September 20, 1967. | 1062 | × | — | × |
| 51° 120° | N.W. | Barb<br>Quebec Cartier Mining Company.<br>Albert F. Reeve.<br>August 4, 1967. | 1057 | × | × | × |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position | | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 51° 120° | N.E. | Blue, Red, Green, Yellow, Purple, Web, Sun, Aku<br>Falconbridge Nickel Mines Limited.<br>D. H. Helgesen.<br>July 28, 1967. | 1026 | — | — | × |
| 51° 120° | S.W. | C-Soo<br>Copper Soo Mining Company Limited.<br>A. R. Dodds.<br>February 23, 1967. | 938 | — | × | — |
| 51° 120° | S.W. | C-Soo<br>Copper Soo Mining Company Limited.<br>R. G. Jury.<br>February 23, 1967. | 939 | — | — | × |
| 51° 120° | N.E. | CL<br>Anaconda American Brass Limited.<br>P. E. Hirst.<br>October 5, 1967. | 1092 | — | — | × |
| 51° 120° | N.E., S.E. | EC<br>Royal Canadian Ventures Ltd.<br>N. B. Vollo.<br>October 3, 1967. | 1055 | × | — | × |
| 51° 120° | N.W., N.E. | Friendly Lake Group, SO<br>Anaconda American Brass Limited.<br>Peter E. Hirst and Bruce W. Brown.<br>March 31, 1967. | 952 | — | — | × |
| 51° 120° | N.E. | Ice, Mud<br>Falconbridge Nickel Mines Limited.<br>D. H. Helgesen.<br>March 2, 1967. | 957 | — | — | × |
| 51° 120° | S.E. | Judy<br>Quebec Cartier Mining Company.<br>Albert F. Reeve.<br>July 11, 1967. | 1047 | × | — | — |
| 51° 120° | N.E. | Kala<br>Anaconda American Brass Limited.<br>T. A. Conto.<br>October 11, 1967. | 1123 | — | × | — |
| 51° 120° | S.E. | Kira<br>Noranda Mines, Limited.<br>J. D. Knauer and B. O. Brynelsen.<br>August 22, 1967. | 1051 | — | — | × |
| 51° 120° | N.E., N.W. | Mad, Nod, MO<br>Noranda Exploration Company, Limited.<br>W. Rainboth.<br>May 26, 1967. | 1013 | — | — | × |
| 51° 120° | N.E. | Mae, S.P., Bill, Silver<br>United Copper Corporation Limited.<br>Alex Burton.<br>October 3, 1967. | 1061 | — | — | × |
| 51° 120° | N.E. | Silver<br>United Copper Corporation Limited.<br>R. Jury.<br>April 7, 1967. | 981 | — | — | × |
| 51° 120° | N.E., S.E. | TC<br>Anaconda American Brass Limited.<br>Peter E. Hirst and Bruce W. Brown.<br>February 17, 1967. | 905 | — | — | × |
| 51° 120° | N.E., S.E. | TC<br>Anaconda American Brass Limited.<br>Peter E. Hirst and Bruce W. Brown.<br>February 17, 1967. | 910 | — | — | × |
| 51° 120° | N.E., S.E. | TC<br>Anaconda American Brass Limited.<br>Peter E. Hirst and Bruce W. Brown.<br>February 17, 1967. | 907 | — | — | × |
| 51° 121° | S.E. | C-Soo<br>Monarch Metal Mines Limited.<br>R. G. Jury.<br>January 12, 1967. | 872 | — | — | × |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position | | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 51° 121° | S.E. | I.D.S.<br>Cominco Ltd.<br>D. L. Cooke and J. Richardson.<br>November 28, 1966. | 859 | — | × | × |
| 51° 121° | S.E. | Joe<br>Rayfield Mining Company Ltd.<br>L. J. Manning and Richard O. Crosby.<br>March 13, 1967. | 954 | — | × | — |
| 51° 121° | N.E. | Peach, Tim<br>Coranex Limited.<br>W. Schuur.<br>September 5, 1967. | 1131 | — | × | — |
| 51° 121° | N.E. | Peach<br>Coranex Limited.<br>R. H. Janes.<br>July 31, 1967. | 1037 | — | × | — |
| 51° 121° | N.E. | Peach<br>Coranex Limited.<br>R. H. Janes.<br>July 31, 1967. | 1038 | — | — | × |
| 51° 122° | S.W. | Churn<br>Canzac Mines Ltd.<br>Jos. Sullivan.<br>March 3, 1967. | 926 | — | × | — |
| 51° 122° | S.W. | Hill<br>Burlington Mines Ltd.<br>Jos. Sullivan.<br>April 18, 1967. | 968 | — | × | — |
| 51° 122° | S.W. | Sheep, Goat<br>Duffey Lakes Mines Ltd.<br>Jos. Sullivan.<br>April 20, 1967. | 979 | — | × | — |
| 52° 119° | N.W. | Summit<br>Scurry-Rainbow Oil Limited.<br>A. Allan.<br>November 7, 1967. | 1140 | — | × | — |
| 52° 121° | N.W. | C.G.Q.<br>The Cariboo Gold Quartz Mining Company Limited.<br>E. E. Mason.<br>March 28, 1967. | 960 | — | — | × |
| 52° 121° | S.E. | GI<br>Helicon Explorations Limited.<br>G. Hunter Ware.<br>August 29, 1966. | 883 | — | × | — |
| 52° 121° | N.E. | Jacobie Group (JAC, COB, BIE, CHA, CE, CEA)<br>Chataway Exploration Co. Ltd.<br>S. W. Wright.<br>January 30, 1967. | 885 | — | — | × |
| 52° 121° | N.W. | Lar, Chuck, Doll<br>Mollusca Oils Ltd.<br>A. G. Hodgson.<br>February 15, 1967. | 924 | — | — | × |
| 52° 121° | N.W. | Limecap, Copper Ridge, Moorehead, Ace<br>Milestone Mines Limited.<br>D. R. Cochrane.<br>October 16, 1967. | 1097 | × | × | — |
| 52° 121° | N.W. | Liz<br>New Jersey Zinc Exploration Company (Canada) Ltd.<br>J. B. Seaton and R. C. MacDonald.<br>December 21, 1966. | 871 | — | × | × |
| 52° 121° | S.E. | Rover<br>Coranex Limited.<br>R. H. Janes.<br>April 11, 1967. | 949 | — | — | × |
| 52° 121° | N.W. | Sue<br>Silver City Petroleums Ltd.<br>A. G. Hodgson.<br>June 8, 1967. | 1005 | — | — | × |

## Reports Credited for Assessment, 1967—*Continued*

| Geographic Position | | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 52° 121° | N.W. | W.P.<br>Burdos Mines Ltd.<br>C. B. Selmser.<br>March 8, 1967. | 947 | — | × | — |
| 52° 122° | S.E. | Ann<br>Fidelity Mining Investment Limited.<br>Albert F. Reeve.<br>January 23, 1967. | 908 | × | × | × |
| 52° 122° | N.E. | G<br>A. Lenec and O. Baker.<br>R. O. Crosby and H. O. Seigel.<br>February 16, 1967. | 903 | — | × | — |
| 52° 122° | N.E. | GM<br>Keevil Mining Group Limited.<br>S. H. Ward.<br>March 2, 1967. | 959 | — | × | — |
| 52° 122° | N.E. | JJ, GA, BK, AL<br>Calta Mines Ltd.<br>J. G. Baird.<br>May 12, 1967. | 1029 | — | × | — |
| 53° 122° | N.W. | Burn<br>C. F. O'Brien.<br>J. J. Royall.<br>September 8, 1967. | 1129 | × | — | — |
| 53° 124° | N.W. | Dip<br>Endako Mines Ltd.<br>R. A. Bell and D. B. Sutherland.<br>March 16, 1967. | 933 | — | × | — |
| 53° 124° | N.W. | Gel<br>Amax Exploration, Inc.<br>D. B. Sutherland and P. G. Hallof.<br>September 6, 1967. | 1107 | — | × | — |
| 53° 124° | N.W. | Gel<br>Amax Exploration, Inc.<br>N. Shepherd and R. A. Barker.<br>September 6, 1967. | 1108 | — | — | × |
| 53° 124° | N.W. | Owl<br>Anaconda American Brass Limited.<br>D. L. Brown and R. Macrae.<br>June 9, 1967. | 1002 | — | — | × |
| 53° 127° | N.E. | OVP<br>Silver Standard Mines Limited.<br>H. Neugebauer and D. H. Olson.<br>September 18, 1967. | 1091 | × | — | — |
| 53° 127° | N.E. | Troitsa<br>Kennco Explorations, (Western) Limited.<br>P. G. Hallof and R. A. Bell.<br>September 1, 1967. | 1073 | — | × | — |
| 53° 129° | N.E., N.W. | How<br>Strato Exp. & Dev. Ltd. and Quamco Limited.<br>C. B. Selmser.<br>October 12, 1967. | 1113 | — | — | × |
| 54° 124° | N.E., N.W. | Toad<br>Cominco Ltd.<br>D. W. Heddle.<br>July 21, 1967. | 1020 | — | — | × |
| 54° 125° | S.E. | Don<br>Donald W. Smellie.<br>Donald W. Smellie.<br>September 26, 1967. | 1103 | — | × | × |
| 54° 125° | S.E. | Gem<br>Amax Exploration, Inc.<br>N. Shepherd and R. A. Barker.<br>July 20, 1967. | 1021 | × | — | × |
| 54° 125° | S.E. | Grub<br>Amax Exploration, Inc.<br>N. Shepherd.<br>October 16, 1967. | 1096 | — | — | × |

## REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position | | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 54° 125° | S.E. | J, T<br>Tapin Copper Mines Limited.<br>E. D. Dodson.<br>October 17, 1967. | 1111 | — | × | — |
| 54° 125° | S.E. | Lorne<br>Amax Exploration, Inc.<br>D. B. Sutherland and P. G. Hallof.<br>June 16, 1967. | 1018 | — | × | — |
| 54° 126° | S.W. | Barr, Lybdenum<br>Amax Exploration, Inc.<br>D. B. Sutherland and P. G. Hallof.<br>December 18, 1967. | 1139 | — | × | — |
| 54° 126° | S.W. | Barr, Lybdenum<br>Amax Exploration, Inc.<br>P. G. Hallof.<br>December 23, 1966. | 869 | — | × | — |
| 54° 126° | N.W. | Bob, Mert, Cu<br>Tro-Buttle Exploration Limited.<br>G. A. Dirom.<br>November 27, 1967. | 1143 | — | — | × |
| 54° 126° | N.W. | Bob, Mert, Cu<br>Tro-Buttle Exploration Limited.<br>G. A. Dirom.<br>June 28, 1967. | 1017 | — | — | × |
| 54° 126° | N.W. | Bob, Mert, Cu<br>Tro-Buttle Exploration Limited.<br>G. A. Dirom.<br>October 13, 1967. | 1122 | — | — | × |
| 54° 126° | N.E. | Kare<br>Tro-Buttle Exploration Limited.<br>G. A. Dirom.<br>April 12, 1967. | 951 | — | — | × |
| 54° 126° | N.E. | Ketza, Jen, Rum<br>Bayland Mines Ltd.<br>D. R. Cochrane.<br>August 24, 1967. | 1072 | — | × | — |
| 54° 126° | S.W. | Nad, Nadina, Owl, Angus<br>Kennco Explorations, (Western) Limited.<br>G. O. M. Stewart and P. T. Black.<br>December 1, 1967. | 1133 | — | — | × |
| 54° 126° | S.W. | Star, Klondike<br>Normont Copper Ltd.<br>P. E. Walcott and A. R. Dodds.<br>February 15, 1967. | 909 | — | × | — |
| 54° 126°<br>55° 126° | N.E.<br>S.E. | Trek<br>Bethex Explorations Ltd.<br>T. Suzuki and T. Yokoyama.<br>January 20, 1967. | 893 | — | × | — |
| 54° 127° | S.E. | Duchess, Santa Maria, Moosekin Johnny, War Eagle, PR, Cary, SQ<br>Norcan Mines Ltd.<br>W. D. Tompson.<br>January 10, 1967. | 918 | — | — | × |
| 54° 127° | S.E. | Duchess, Santa Maria, War Eagle, Moosekin Johnny<br>Norcan Mines Ltd.<br>W. G. Stevenson.<br>January 10, 1967. | 929 | × | — | — |
| 54° 127° | N.E. | Meg, John, King, Helen, West<br>Canadian American Mining Company, Inc.<br>J. G. Baird.<br>September 11, 1967. | 1086 | — | × | — |
| 54° 127° | S.E. | PR, SQ, Joker, Creek, Goat<br>Norcan Mines Ltd.<br>C. B. Selmser.<br>January 10, 1967. | 919 | — | × | — |
| 54° 127° | S.E. | PR, SQ<br>Norcan Mines Ltd.<br>G. E. White.<br>January 10, 1967. | 917 | — | × | — |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 54° 127° | N.E. | Seymour, Canadian Citizen, American Citizen<br>Buval Mines Ltd.<br>P. E. Walcott and A. R. Dodds.<br>February 21, 1967. | 902 | — | × | — |
| 54° 127° | N.E. | Seymour<br>Buval Mines Ltd.<br>R. E. Anderson.<br>February 24, 1967. | 906 | — | — | × |
| 54° 128° | S.E. | Barb, Be, El, Frankie, Liz, Mel, Pen, Barbs, Bee, Hony, Ell, Liza, Melo, Penny<br>Amax Exploration, Inc.<br>A. C. Gambardella and P. W. Richardson.<br>May 31, 1967. | 1000 | × | — | × |
| 54° 128° | N.W. | Big, Joe<br>Silver Standard Mines Limited.<br>N. W. Burmeister.<br>November 10, 1966. | 857 | — | — | × |
| 54° 128° | N.E. | Gold Star<br>New Gold Star Mines Ltd.<br>D. R. Cochrane.<br>May 29, 1967. | 999 | — | × | — |
| 54° 128° | N.E. | Gold Star, Eastern Star<br>New Gold Star Mines Ltd.<br>D. R. Cochrane.<br>September 21, 1967. | 1090 | × | — | × |
| 54° 128° | N.E. | Lynda, Sno<br>Amax Exploration, Inc.<br>J. N. Schindler and R. A. Barker.<br>December 9, 1966. | 866 | × | — | × |
| 54° 128° | S.W. | Mag<br>Virginia S. Crossie, J. F. McIntyre, and J. Scherger.<br>Jos. Sullivan.<br>October 11, 1967. | 1118 | — | × | — |
| 55° 124° | S.W. | Night Hawk, Tan, RT, SK, Cab, Lin<br>West Coast Mining and Exploration.<br>S. A. Mouritsen.<br>September 6, 1967. | 1056 | — | × | — |
| 55° 125° | S.E. | B<br>Cominco Ltd.<br>D. D. MacGregor and J. Richardson.<br>August 15, 1967. | 1064 | × | — | × |
| 55° 125° | N.E. | Duck<br>Belcarra Explorations Ltd.<br>M. G. Mooney.<br>June 6, 1967. | 1012 | — | — | × |
| 55° 125° | S.E. | Wit, Wag<br>Royal Canadian Ventures Ltd.<br>N. B. Vollo.<br>October 27, 1967. | 1119 | × | × | × |
| 55° 126° | S.E. | Dot, Lory<br>Golden West Mines Ltd.<br>H. H. Cohen.<br>May 3, 1967. | 992 | — | × | — |
| 55° 126° | S.E. | HA, GE, FO, EX, DA, CU, VO, AX<br>Noland Mines Ltd.<br>D. R. Cochrane.<br>August 30, 1967. | 1070 | — | × | — |
| 55° 126° | S.E. | Hudson<br>Babine Lake Mines Ltd.<br>J. H. Oliver.<br>August 10, 1967. | 1048 | — | — | × |
| 55° 126° | S.E. | Hudson, Ken<br>Babine Lake Mines Ltd.<br>F. C. Tomlinson.<br>October 10, 1967. | 1127 | — | × | — |
| 55° 126° | S.E. | K, A, B, C (Kofit)<br>Tro-Buttle Exploration Limited.<br>G. A. Dirom.<br>August 2, 1967. | 1102 | — | × | × |

## REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Geographic Position: Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Kind of Work: Geophysical | Kind of Work: Geochemical |
|---|---|---|---|---|---|---|
| 55° 126° | S.E. | Lucha, Maria, Luz, Elena, Ruth, Bay, Miami<br>Norfal Mining Ltd.<br>J. A. Coope.<br>May 8, 1967. | 969 | × | × | × |
| 55° 126° | S.E. | Mick, Zora<br>Grandora Explorations Ltd.<br>D. L. Hings.<br>May 18, 1967. | 998 | — | × | — |
| 55° 126° | S.E. | Penn<br>Giant Explorations Limited.<br>H. A. Fader.<br>August 17, 1967. | 1115 | × | — | × |
| 55° 126° | S.E. | VEZ, TAL<br>New Far North Exploration Limited.<br>J. Walker and A. E. Storey.<br>March 30, 1967. | 976 | × | — | × |
| 55° 127° | S.E. | Ace<br>Mastodon-Highland Bell Mines Limited.<br>W. R. Bacon.<br>September 11, 1967. | 1066 | × | — | × |
| 55° 128° | S.E. | Kit<br>Mastodon-Highland Bell Mines Limited.<br>W. R. Bacon.<br>August 14, 1967. | 1036 | × | — | × |
| 55° 129° | S.E. | Bolo, Vetter<br>Nass River Mines Limited.<br>F. Charlton.<br>November 9, 1966. | 888 | × | — | — |
| 55° 129° | S.E. | Kay<br>Nass River Mines Limited.<br>F. Charlton.<br>September 8, 1967. | 1058 | × | — | — |
| 55° 129° | N.E. | Kit (Kitsault Barite Project)<br>Coranex Limited.<br>J. R. Woodcock.<br>June 13, 1967. | 1001 | × | — | — |
| 55° 129° | N.W. | Mobile<br>Anglo United Development Corporation Limited.<br>G. W. Moore.<br>April 7, 1967. | 1010 | — | — | × |
| 55° 129° | N.W. | Nero, Motherlode, Nimrod, Vanguard, Vanguard Extension, Dreamland, Venus, Highland Boy<br>Canex Aerial Exploration Ltd.<br>S. J. Tennant.<br>January 24, 1967. | 956 | × | × | × |
| 55° 129° | S.E. | Ridge<br>Nass River Mines Limited.<br>F. Charlton.<br>July 4, 1966. | 913 | × | — | — |
| 55° 129° | S.E. | Ridge, Snafu, Valley<br>Nass River Mines Limited.<br>P. K. Geisterfer.<br>July 4, 1966. | 914 | × | — | — |
| 55° 129° | N.E. | THM<br>Kennco Explorations, (Western) Limited.<br>C. S. Ney.<br>April 6, 1967. | 955 | × | — | × |
| 56° 124°<br>56° 125° | S.W.<br>S.E. | Beveley, Robin, Grouse, Pine, Balsam, Spruce, Willow, Donna<br>Donna Mines Ltd.<br>R. K. Watson and W. A. Finney.<br>August 28, 1967. | 1080 | — | × | — |
| 56° 125° | S.W. | Slide<br>Kennco Explorations, (Western) Limited.<br>R. W. Stevenson.<br>April 20, 1967. | 1004 | — | — | × |
| 56° 125° | S.W. | Slide<br>Kennco Explorations, (Western) Limited.<br>R. W. Stevenson.<br>May 10, 1967. | 996 | — | — | × |

## REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position: 1° Quadr. | Quarter | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work: Geological | Geophysical | Geochemical |
|---|---|---|---|---|---|---|
| 56° 126° | S.E. | Can, Ski, Wick, Ged<br>Northstar Copper Mines Ltd.<br>W. H. White.<br>July 4, 1967. | 1084 | — | — | × |
| 56° 126° | N.W. | Marmot<br>New Wellington Mines Limited.<br>G. A. Mouritsen.<br>March 28, 1967. | 991 | — | × | — |
| 56° 129° | S.W. | Trail, Big Slide, Grey Copper. Ven, Bessie, Kid, Chicago, Paris, London, New York, Van, Kensington, Speculator, Boston, Elgin, Mamie<br>Cominco Ltd.<br>D. W. Heddle.<br>November 15, 1967. | 1109 | × | — | — |
| 56° 130° | N.E. | Arbee, D-R, JB<br>Kennco Explorations, (Western) Limited.<br>C. S. Ney.<br>June 26, 1967. | 1006 | × | — | × |
| 56° 130° | S.E. | Stewart-Wikstrom Group, Big Missouri<br>Falconbridge Nickel Mines Limited.<br>D. H. Brown.<br>February 17, 1967. | 912 | × | — | × |
| 56° 131° | N.E. | Joann<br>Iskut Silver Mines Limited.<br>R. D. Wesemann.<br>October 20, 1966. | 921 | — | × | — |
| 57° 130° | S.W. | Nabs<br>Paramount Mining Ltd.<br>C. A. R. Lammle.<br>January 23, 1967. | 900 | × | × | × |
| 57° 131° | S.E. | CW<br>Conwest Exploration Company Limited.<br>A. R. Dodds and P. E. Lane.<br>March 20, 1967. | 937 | — | × | — |
| 58° 125° | S.E. | Kid, Nanny, Sam, Billy, Goat, Ram<br>Racing River Mines Ltd.<br>C. B. Selmser.<br>March 31, 1967. | 1042 | × | — | — |
| 58° 128° | S.W. | Flat<br>Cassiar Asbestos Corporation Limited.<br>P. S. White.<br>August 12, 1967. | 1077 | — | × | — |
| 58° 128° | S.W. | Joe, Matt, Jules, N, B, Fred, Gary, Bill<br>Cassiar Asbestos Corporation Limited.<br>P. S. White.<br>September 22, 1967. | 1076 | — | × | — |
| 58° 128° | S.W. | Joe, N, John, Ed, Bob, Rib, Matt, Bill, Ridge, Bell<br>Cassiar Asbestos Corporation Limited.<br>M. S. Bell and W. N. Plumb.<br>September 22, 1967. | 1075 | × | — | — |
| 58° 129° | S.W. | Dalvenie, Mac, New Deal<br>Copper Pass Mines Ltd.<br>M. A. Roed.<br>January 13, 1967. | 898 | × | — | — |
| 58° 129° | S.W. | Dalvenie, Mac, New Deal<br>Copper Pass Mines Ltd.<br>M. A. Roed and E. Lipsett.<br>January 13, 1967. | 899 | — | × | — |
| 58° 129° | S.W. | Dalvenie, Mac, New Deal<br>Copper Pass Mines Ltd.<br>M. A. Roed and N. W. Reynolds.<br>January 13, 1967. | 896 | — | — | × |
| 58° 129° | S.W. | Dalvenie, Mac, New Deal<br>Copper Pass Mines Ltd.<br>M. A. Roed.<br>January 13, 1967. | 897 | × | — | — |

REPORTS CREDITED FOR ASSESSMENT, 1967—*Continued*

| Geographic Position | | Property / Owner or Principal / Author of Report / Date of Submission of Report | Report No. | Kind of Work | | |
|---|---|---|---|---|---|---|
| 1° Quadr. | Quarter | | | Geological | Geophysical | Geochemical |
| 58° 129° | S.W. | Horn<br>United States Smelting, Refining and Mining Company.<br>P. Norgaard.<br>November 23, 1967. | 1130 | — | × | — |
| 58° 129° | N.W. | Mac<br>Maurice Shugarman.<br>M. A. Roed.<br>October 30, 1967. | 1105 | × | — | — |
| 58° 129° | S.W. | Moss<br>Lytton Minerals Limited.<br>D. W. Asbury.<br>November 8, 1967. | 1106 | × | × | × |
| 58° 132° | N.E. | Ace<br>Canadian Johns-Manville Company Limited.<br>C. Aspinall.<br>June 27, 1967. | 1030 | × | × | — |

# Placer

CONTENTS

## ATLIN MINING DIVISION

By H. Bapty

### Pine Creek (59° 133° N.W.)

Karl Sieger sluiced 200 yards and recovered 35 ounces of gold.

William Husselbee worked alone doing assessment work on his lease.

Fred Graham sluiced 62 yards.

W. R. Fraser worked over 17 yards of gravel.

S. R. Craft recorded that he had recovered approximately 35 ounces of gold from his lease.

### Goldrun Creek (59° 133° N.W.)

Mattson brothers performed their assessment work.

### Birch Creek (59° 133° N.E.)

D. McLean performed assessment work.

C. Guyett did his assessment work.

### Ruby Creek (59° 133° N.E.)

Sidney R. Craft and George R. Craft removed 12 yards on Ruby Creek.

### Otter Creek (59° 133° N.E.)

Compagnie Francaise des Mines d'Or du Canada did $1,200 work on its special mining lease No. 1437. Atlin Placers Ltd. and Compagnie Francaise also worked placer mining leases Nos. 1604, 1605, and 1608.

### McKee Creek (59° 133° S.W.)

Luigi Piccolo and sub-lessee Marshall Robertson hydraulicked gravel on McKee Creek.

### Spruce Creek (59° 133° N.W.)

Spruce Creek Placers, Ltd., performed its assessment work.

Fred LaRoche moved 26 yards of gravel and recovered 7¼ ounces of gold.

P. Del Cozzo did assessment work only.

### Wright Creek (59° 133° N.E.)

Atlin Placers Ltd. and Compagnie Francaise des Mines d'Or du Canada used a clamshell shovel on their placer mining leases Nos. 1538 and 1539.

## LIARD MINING DIVISION

By W. G. Clarke

### McDame Creek (59° 129° S.E.)

George Zimick worked his leases at Centreville, producing both gold and jade. He has a diamond saw and a rock tumbler on the property and makes jewellery from jade and gold nuggets.

### Dease Lake (59° 130° N.E.)

Ben Seywerd and Ben Able mined some jade on Sawmill Creek.

### Wheaton Creek (58° 128° S.W.)

Gerry Davis flew several thousand pounds of jade from his lease on Wheaton Creek to the Dease Lake airport. He is reported also to have produced a small amount of placer gold.

Earl Faulkner spent the season working his gold placer.

## OMINECA MINING DIVISION

By W. G. Clarke

### Manson Creek (55° 124° N.W.)

Gordon Barrett worked the old Slate Creek placer under an agreement with Mrs. W. Tait and Cominco Ltd. He had a crew of three men, a bulldozer, and a washing plant. He washed a few thousand yards of gravel. This was the only placer-gold production in the Omineca, but there was some placer exploration on Manson Creek, south of the village, and some on the Nation River below the crossing.

Alvin Anderson and two men had some equipment, including a front-end loader, working on placer mining lease No. 1779.

Frank Plut worked up Kildare Gulch, using a D-8 tractor.

There was widespread jade-mining from Kwanika Creek north to Old Hogem. Several tons was reported to have been brought out.

## CARIBOO MINING DIVISION

By W. G. Clarke, Except as Noted

### Hixon Creek (53° 122° S.W.)

**Hixon Creek Placers**
*Chilco Developments Limited*

Company office, 407, 475 Howe Street, Vancouver 1. H. B. Mills, president. A group of 14 placer leases under lease to Chilco Developments Limited is on Hixon Creek just above the canyon at the mouth of Government Creek. It is 5 miles from Hixon by a good access road. During the winter and spring the pit was filled by a slide of overburden. A crew of four men worked from May until October hydraulicking 500,000 cubic yards of overburden with two monitors. H. B. Mills was in charge of the work. There was no gold production and no gravel was washed.

Some bulldozer work was done on Johnson's placer, and there was some exploration done on Thorp's placer.

### Lodi Lake (53° 122° S.E.)

**Lodi Lake Placer**
*Vanco Explorations Limited*

Company office, 900, 1111 West Hastings Street, Vancouver 1. Vanco Explorations Limited holds six placer leases at Lodi Lake. The leases are accessible from Strathnaver, 35 miles away on Highway No. 97, by logging-roads. Vanco Explorations Limited optioned the property from Lodi Mines Ltd. A crew of five men worked for two months under the direction of O. T. McShane, consultant, churn drilling five 6-inch-diameter test-holes totalling 314 feet.

### Cottonwood River (53° 121° N.W.)

The Gayson placer mine near the mouth of the Cottonwood River, formerly owned by Len Lacasse, has been purchased by Joe Allen, formerly of California. Mr. Allen did some trenching and put down a shallow shaft.

Oliver R. Freel worked his lease below the Cottonwood River bridge on the old highway.

Above the bridge, Chet Estabrooke worked the Jeabet placer using a small suction dredge.

There were several other one-man placers on the Cottonwood in 1967.

LIGHTNING CREEK (53° 122° S.E.)

Below Wingdam, on the Hannador leases, Vigor Exploration Ltd. had a crew of three or four men working most of the season. An attempt to mine using front-end loaders was made but was unsuccessful, so a dragline bucket on a highline was set up.

At Stanley a small suction dredge did some test work on Tom Crawford's ground. Recoveries were not satisfactory, so he is hand mining again. He worked for 11 months.

COULTER CREEK (53° 121° S.E.)

Fleurmont Placer Development Ltd. did a small amount of work on its leases.

FRENCH CREEK (53° 121° S.W.)

Bud Locke and a partner built a headframe and collared a shaft for Mt. Hyland Mines Ltd.

GROUSE CREEK (53° 121° S.E.)

Upstream and adjacent to Grouse Creek Mines Ltd., the Kloopman brothers drove an adit 30 feet in search of the channel. Hydraulic mining was resumed when it was not located.

Further up Grouse Creek, Andy McGuire worked his claim with George Gebhard. They ground-sluiced to expose bedrock on the east side of the creek and collared an adit for underground exploration.

**Grouse Creek Mines Ltd.** Company office, 417, 402 West Pender Street, Vancouver 3. John P. Queguiner, director. The property is on Grouse Creek 5 miles by road from Barkerville. The company has been attempting for several years to find an extension of the channel that was mined from the Heron shaft a century ago. Five shafts have been put down; all have been unsuccessful. During 1967 the company explored the old workings from an inclined shaft. The headings had to be abandoned at the end of June owing to poor ground conditions. A new incline was collared near the Jimmie Alan shaft, which connected with the old workings. The property then closed for the season in December. A crew of 8 to 12 men was employed under various superintendents.

ANTLER CREEK (53° 121° S.E.)

On the Beard lease a small shaft was collared and put down 8 feet as assessment work.

At Beggs Gulch, John Wade did some hydraulic mining.

John Striker worked on Antler Creek, and Ray Gorman worked at Cunningham Gulch.

### Cedar Creek (52° 121° N.E.)

By T. M. Waterland

**P.M.L. Nos. 5907, 5908**
*Spanish Placers Ltd.*

Spanish Placers Ltd. continued with its options on the Percy Ogden placer-mining leases Nos. 5907 and 5908 on Cedar Creek. The plant is located about 600 feet above Quesnel Lake and is reached by road from Likely. Since last year the treatment plant has been modified so that the material is now fed by a Telesmith plate feeder onto a vibrating screen before being washed to the sluice by a series of fixed-water sprays. The oversize material (plus 4 inches) is conveyed to tailings and is impounded by a brush dam.

Placer gravel is hauled from the placer pit by tandem truck, which is loaded by a 2½-yard diesel-powered shovel. Electrical power is supplied by a 75-kilowatt generating plant. Production during the summer was interrupted by water shortages.

### Keithley Creek (52° 121° N.E.)

By T. M. Waterland

**P.M.L. 3829** Ernest Lang, with one man, worked on his underground placer operation about 1,700 feet south of the confluence of Snowshoe and Keithley Creeks. During 1967 an adit was driven through placer gravels to reach a " pocket of high grade " which had been located by surface drilling. Charles H. Pitt, of Vernon, is a partner in this operation.

### Little Snowshoe Creek (52° 121° N.W.)

By T. M. Waterland

**P.M.L. 3198** Tom Kinvig worked on his lease on Little Snowshoe Creek with a TD-18 tractor dozer. He plans to deepen the river channel and remove boulders so that the gravels can be sluiced.

## CLINTON MINING DIVISION

By T. M. Waterland

### Fairless Creek and Borin Creek (51° 122° S.W.)

**Fairborn Mines Ltd.** Company address, 401, 402 West Pender Street, Vancouver 3. Access to this property is by road from Clinton, a distance of approximately 105 miles. The property is between elevations of 4,000 to 5,000 feet at the head of Fairless and Borin Creeks on the west side of Black Dome Mountain. During 1967 five men worked for a period of seven months under the direction of J. L. Frese, company president. It is reported that the work consisted of approximately 1,500 feet of bulldozer trenching and construction of 4½ miles of road.

## LILLOOET MINING DIVISION

By T. M. Waterland

### Fraser River (50° 121° N.W.)

**Bridge Bar P.M.L. 854**
*Champ Copper Mines Ltd.*

Company address, 1974 West 18th Avenue, Vancouver 9. Placer-mining lease No. 854 is located on the Fraser River adjacent to Lillooet. Work during 1967 consisted of building a road to the lease and testing the gravels.

## NEW WESTMINSTER MINING DIVISION

### FRASER RIVER (49° 121° S.E. AND S.W.)

**P.M.L. Nos. 545, 591, 599** By T. M. Waterland — The three leases owned by G. McGannon, of Yale, are located on the Fraser River one-half mile from Choate. Access is via road through Indian Reserve No. 8. Work during 1967 was done by the owner and consisted of the construction of one-quarter mile of access road and digging fifteen 15-foot trenches with a backhoe.

**Rio Del Oro Mines Ltd.** By A. R. C. James — Company office, 1234 Marine Drive, North Vancouver. The company holds six placer leases in the vicinity of the Peters Indian Reserves Nos. 1 and 2 near Laidlaw on the south bank of Fraser River. In 1967 a 1-mile access road was built to the property.

## SIMILKAMEEN MINING DIVISION

By David Smith

### TULAMEEN RIVER (49° 120° N.W.)

**Gra-Dorphan Mines Ltd.** Company office, P.O. Box 8, Murrayville. The property is on the Tulameen River near Bear Creek, 4 miles upstream from Tulameen village, whence access is by road. Three men worked for a period of three weeks under the supervision of Lincoln Mines Ltd.

# Structural Materials and Industrial Minerals

CONTENTS



Drawings



## ASBESTOS

**Cassiar Asbestos Corporation Limited**
By W. G. Clarke

Mount McDame (59° 129° S.W.) Head office, 1001, 85 Richmond Street West, Toronto, Ont.; mine office, Cassiar. J. D. Christian, president; A. C. Beguin, general superintendent. The property, which consists of 42 Crown-granted claims and five leased claims, is 86 miles by road southwesterly from Mile 648.8 on the Alaska Highway. The open-pit mine is on the top of Mount McDame, between 5,870 and 7,000 feet elevation, while the mill and townsite are in Troutline Creek valley at 3,500 feet elevation.

Annual production increased again in 1967. Slightly over 1 million tons of ore was mined from seven benches between 5,870 and 6,050 feet elevation and slightly over 4 million tons of waste was removed from 18 benches between 5,870 and 6,710 feet elevation. The rock-reject plant treated 800,679 tons, rejecting 252,521 tons or 31 per cent. A total of 776,953 tons of concentrates and raw ore was delivered to the mill, about 65 per cent by tram-line and the remainder by truck. The mill produced 92,093 tons of fibre. There were approximately 500 employees.

In the townsite, four houses were constructed, the school and commissary were enlarged, a telephone exchange was erected, and a swimming-pool and a skating arena were built. At the mine new equipment consisted of a 3½-cubic-yard shovel, a 6-inch rotary drill, a bus, and a front-end loader. The tram-line was partially automated.

**Kutcho Creek**
*Kutcho Creek Asbestos Company Limited*
By J. W. McCammon

Letain Lake (58° 128° S.W.) Company office, 1001, 85 Richmond Street West, Toronto 1, Ont. During 1967 this company had 288 line miles of helicopter aeromagnetic surveying flown and had extensive geological mapping done on the 465-claim Kutcho Creek (formerly Letain) asbestos prospect. The prospect is between 4,600 and 7,125 feet elevation on the ridge northeast of Letain Lake, 46 miles by air southwest of Dease Lake. Access is by air.

## BARITE

**Mountain Minerals Limited**
By J. W. McCammon

Company office, P.O. Box 700, 529 Sixth Street South, Lethbridge, Alta. R. A. Thrall, managing director; William McPherson, superintendent. This company owns and operates barite properties at Parson (51° 116° S.W.) and Brisco (50° 116° N.E.) in the Columbia valley, south of Golden. In 1967 the company shipped 8,926 tons of barite from Brisco to its processing plant in Lethbridge.

**Baroid of Canada, Ltd.**
By J. W. McCammon

Spillimacheen (50° 116° N.E.) Company office, 44 King Street West, Toronto, Ont. This company produced 12,688 tons of barite concentrate from the old tailings dump of the former Silver Giant lead-zinc mine.

**Yornoc**
*Yornoc Mining Co. Ltd.*
By J. W. McCammon

(50° 116° S.E.) *See* report on page 266. Barite occurs as gangue with quartz in silver-lead-zinc mineralization.

## BUILDING-STONE

**Layers Group**
*Interior Quarries Ltd.*
By W. G. Clarke

Whiskey Creek (52° 122° S.E.) Company address, P.O. Box 1298, Williams Lake. The quarry and crushing plant are on the east bank of the Fraser River about 1½ miles south of the mouth of Whiskey Creek. A good access road, 6½ miles long, leads from the plant to the old Cariboo highway. A diesel generating plant was installed in 1967, and electric motors were put on the crushers and screens. Building-stone, stucco dash, aggregate, and sand were produced by two men, employed until October, when operations ceased for the season.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 261.]

**International Marble & Stone Company Ltd.**
By P. E. Olson

Sirdar (49° 116° S.W.) Company office, 4030 Seventh Street Southeast, Calgary, Alta.; plant office, Sirdar. H. Rennich, manager; A. Rennich, pit superintendent; W. Cyzborr, plant superintendent. The company operates a crushing, screening, and bagging plant near Sirdar and quarries at Sirdar and Crawford Bay.

A dolomite quarry is operated on Sub-lot 40 at Crawford Bay through an agreement with Canadian Pacific Railway, who own the quarry rights on the land. Crushed dolomite is trucked to Sirdar, where it is converted to roofing chips of high quality.

Quartzite, limestone, and granite are also quarried by the company at pits at Crawford Bay and Sirdar.

The company has increased its sales each year for the past three years, chiefly in Alberta.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 261.]

**Sheep Creek** (49° 117° S.E.) About 200 tons of quartzite facing-stone was
By P. E. Olson
produced from talus slopes on Sheep Creek and Waldie Creek. The thickness of the stone varies up to 4 inches, and is sold mainly to local markets for about 75 cents per square foot.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 262.]

**Valley Granite Products Ltd.** Cheam View (49° 121° S.W.) Company office,
By A. R. C. James
10070 Timberline Place, Chilliwack; plant, Cheam View. K. Jessiman, general manager. The quarry and plant are on the west side of the Trans-Canada Highway about 10 miles west of Hope. A crew of six men produced 5,800 tons of granite products, including poultry grits, stucco dash, and sand-blast materials.

**Ocean Cement Limited (Gilley Quarry)** Pitt River (49° 122° S.W.) Company
By W. C. Robinson
office, 1295 West 77th Avenue, Vancouver 14. N. D. MacRitchie, manager, Evco Aggregates Division; Francis J. MacDonald, quarry superintendent. The quarry is on the west bank of Pitt River immediately south of its confluence with Munro Creek. During 1967 a crew of 14 men produced 95,273 tons of quartz diorite. New construction included the installation of a secondary crushing plant, having a capacity of 125 tons per hour.

**Gulf Drilling Ltd.** Pitt River (49° 122° S.W.) Company office, 16211—84th
By W. C. Robinson
Avenue, Cloverdale. D. Keating, quarry superintendent. This company operated a quartz diorite quarry on the east bank of Pitt River on the northern side of Sheridan Hill. In 1967 a crew of nine men quarried 44,836 tons of quartz diorite.

**McKenzie Barge & Derrick Co. Ltd.** Port McNeill (50° 127° N.E.) Company
By W. C. Robinson
office, foot of Victoria Drive, Vancouver 6. This company holds Special-use Permit No. 6000, issued for the development of a quarry about 3 miles south of Port McNeill. In 1967 M.L. & S. Contracting Co. Ltd. used open-pit bench mining to produce limerock for fill purposes.

**Ramshead Quarries** Company office, 301, 402 West Pender Street, Vancouver 3.
By J. W. McCammon
This company took over the quarrying operations for Northwestern Quarries Ltd. and shipped 1,500 tons of crushed andesite from the Twin Lake quarry, 4 miles northeast of Olalla.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 262.]

## CEMENT

**Ocean Cement Limited (B.C. Cement Division)** Bamberton (48° 123° N.W.) Head office, north foot of Columbia Street, Vancouver 4. W. F. Foster, presi-
By J. W. McCammon
dent. In April, 1967, the new kiln at Bamberton went into operation. This brings the modern production capacity to 4,000,000 barrels per year with two older kilns in reserve. Production for the year was 372,500 tons.

**Lafarge Cement of North America Ltd.** Lulu Island (49° 123° S.E.) During
By J. W. McCammon
1967 this company completed construction of its second kiln and grinding-mill. Total plant capacity is now rated at 3½ million barrels per year. Production was 336,355 tons of cement.

## CLAY AND SHALE

**Mountain Minerals Limited** Canal Flats (50° 115° S.W.) This company
By J. W. McCammon
shipped 1,200 tons of shale to its Lethbridge processing plant from its quarry at the bottom of Thunder Hill, 2 miles west of Canal Flats.

**Clayburn-Harbison Ltd.** (49° 122° S.E.) Head office, 1690 West Broadway,
By W. C. Robinson
Vancouver 9; plants, Kilgard and Abbotsford. R. M. Hungerford, president; G. H. Peterson, general manager; Brian Stephens, mine superintendent. Two plants are operated by this company—one at Kilgard, where sewer pipe and flue linings are manufactured, and the other at Abbotsford, where face and refractory bricks are made. In 1967 clay was produced from one underground and three open-pit operations. Eight men employed underground in the Fireclay mine at Kilgard produced 29,468 tons of clay. Five men employed at the Kilgard No. 9 and Straiton pits at Kilgard and at the Selby pit, 2½ miles east of Abbotsford, produced 50,630 tons of clay.

**Haney Brick and Tile Limited** Haney (49° 122° S.W.) Company office and
By W. C. Robinson
plant, Haney. E. G. Baynes, president; J. Hadgkiss, managing director. Two men were employed removing clay from a pit adjacent to the plant, which is on the north bank of the Fraser River at Haney. Twenty-seven men were employed at the plant, which produced 10,845 tons of clay products consisting of facebrick, common brick, drain and structural tile, flue lining, and flower-pots.

**Pitkethly Brothers Building Supplies Limited** Barnet (49° 122° S.W.) This
By J. W. McCammon
company operated a brick plant at Barnet until November 1, 1966. Subsequent to the closure the plant was completely demolished and removed.

**Fairey & Company Limited** Vancouver (49° 123° S.E.) L. T. Fairey, presi-
By J. W. McCammon
dent. This company produced a variety of bricks, shapes, and cements from local and imported materials.

**British Columbia Lightweight Aggregates Ltd.** Saturna Island (48° 123° N.E.) Head office, 885 West Broadway, Vancouver 9; plant office,
By W. C. Robinson
Saturna Island. F. Begon, plant manager. Shale is quarried one-quarter mile east of the head of Winter Cove and trucked one-quarter mile to a plant located on the peninsula between Winter Cove and Lyall Harbour on the north end of Saturna Island. At this plant the shale is crushed and then expanded by passing through a kiln to produce coated light-weight aggregate. A crew of 19 men produced and shipped 48,000 tons of expanded shale aggregate in 1967.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 264.]

## DIATOMITE

**Fairey & Company Limited** Quesnel (53° 122° S.W.) This company produced
By J. W. McCammon
a small amount of diatomite for use in its Vancouver plant, from Lot 6182 at Moose Heights, north of Quesnel.

**Crownite Industrial Minerals Ltd.** Quesnel (52° 122° N.W.) This company
By J. W. McCammon
changed its name from Crownite Diatoms Limited. It mined 100 tons of diatomite from Lot 906, west of Quesnel. *See* write-up under " Pozzolan," page 315 in this Report.

## FLUORITE

**Haney Lake** (54° 125° S.E.) Western office, 535 Thurlow Street,
*Amax Exploration, Inc.* Vancouver 5. R. A. Barker, manager. The group of
By W. G. Clarke
20 claims, owned by the company, is southwest of the village of Endako and is accessible by 3 miles of dirt road from Highway No. 16. In 1967 W. Lodder and an assistant spent one month making geological and geochemical surveys.

**Eagle Fluorite (Eaglet)** Quesnel Lake (52° 120° N.W.) Company
*Canex Aerial Exploration Ltd.* address, 800, 1030 West Georgia Street, Van-
By T. M. Waterland
couver 5. This 32-claim property was optioned from H. H. Forster and C. D. P. Johnson in 1966, and work in that year included a geochemical soil survey and about 8,600 feet of bulldozer trenching. In 1967, 3,050 feet of 2-inch rotary drilling was done in 12 holes. Deeg Drilling Co. Ltd. contracted this drilling work. Canex terminated its option on the property.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1965, p. 263; 1966, p. 265.]

**Whiteman Creek Fluorite** Whiteman Creek (50° 119° S.E.) This is a long-
By J. W. McCammon
known fluorite occurrence on the hill 2 miles southwest of the mouth of Whiteman Creek. The creek flows east into Okanagan Lake opposite Vernon. A ⅓-mile-long road to the main workings branches north from the Bouleau Lake road 1 mile west of the main road along the west side of Okanagan Lake. A preliminary report on the property was published under the name View group in the Annual Report for 1966, page 265.

The hill is a circular mass about 3,000 feet in diameter. Rock exposures are fair to good from 1,800 feet elevation to the summit at 2,800 feet. Small isolated showings of fluorite occur scattered over the entire hill. The main exploration work done to date has been concentrated in an area half a mile long and one-quarter mile wide, situated between 1,800 and 2,100 feet elevation, in the southwest quarter of Lot 4323 at the southeast corner of the hill. A small amount of additional trenching has been done on the top and at the northeast corner of the hill.

Most of the hill is underlain by quartz monzonite. This has been intruded by numerous dykes of various types and sizes. A north-trending fault and fracture zone cuts all the rocks. It is within elements of this zone that the fluorite is found.

The quartz monzonite is a medium-grained reddish to grey rock consisting of oligoclase-andesine, orthoclase, microcline, quartz, biotite, hornblende, and minor sphene, magnetite, and apatite. Some of the plagioclase is well zoned, and there is occasional development of vermicular perthite on crystal edges. Map 1059A of the Geological Survey of Canada shows this rock as part of one of the Jurassic and (or) Cretaceous Coast Intrusions. Most and the largest of the dykes are grey to brownish feldspar porphyries made up of 4- to 10-millimetre-long oligoclase-andesine phenocrysts with elongate altered hornblende crystals scattered in a fine-grained groundmass, probably largely quartz and plagioclase. One dyke of brown amygdaloidal andesite and another of biotite andesite were noted. The larger dykes trend east, but the smaller ones have random orientations.

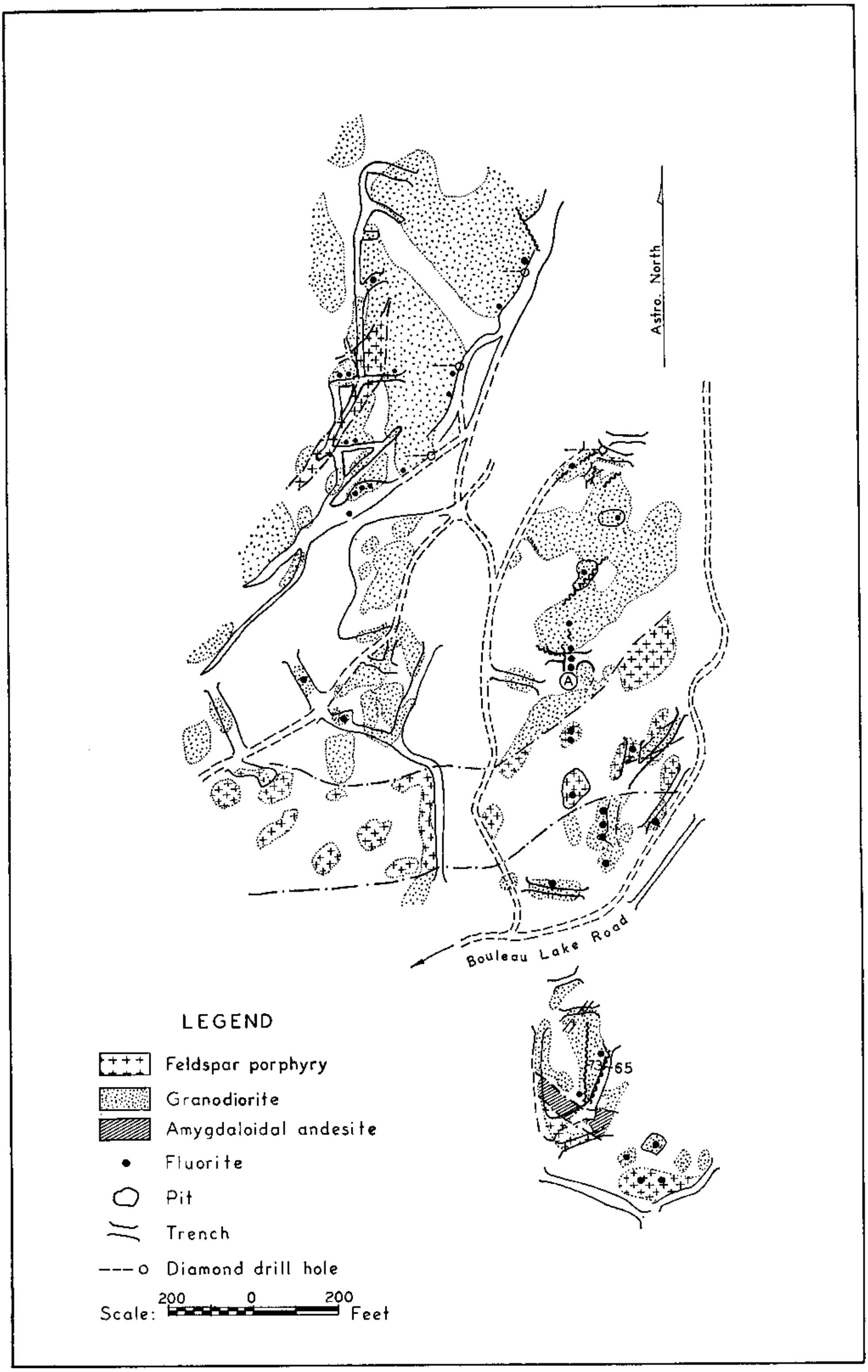


Figure 32. Whiteman Creek fluorite, plan of the workings.

The fracture zone strikes northerly along the length and extends sidewise across the entire width of the hill. There appears to be a somewhat greater concentration and closer spacing of individual fractures along the east side of the hill. Some of the bluffs that form this slope are actually fracture planes. Though the zone as a whole trends north, component fractures strike in various directions between 25 degrees west of north and 60 degrees east of north, most commonly about zero degrees or in the 30 to 40 degrees east of north range. Dips are vertical or steep to the east. Some fractures are filled with veins, others are open and show little evidence of movement, and others contain gouge or show slickensides or brecciation. A few slickensides indicate the last movement on them was vertical and others indicate horizontal movement. Where dykes are seen to be offset by faults, the west sides have usually moved north relative to the east sides.

Mineralization on the property occurs as fracture fillings. In some cases the fractures are completely filled to form solid veins, but in other cases the fractures are only partly filled, so the resulting veins are vuggy or drusy. Most veins are short and only a few inches wide, the widest measured being 32 inches. Rapid pinching and swelling are characteristic of the veins, and frequently small lenses or pods of mineralized material are all that can be seen. Most vein fillings consist of milky quartz. Fluorite occurs as lenses and irregular masses scattered in quartz veins, as thin veins by itself, and as films on fracture faces. Lenses of fluorite 8 inches in diameter and half an inch thick were found in several places, and solid veins between one-quarter inch and 2 inches thick and 1 to 2 feet long were noted in scattered locations. The largest mass seen was in the north wall of the open cut at A (Fig. 32), where a 9-inch width of fluoride extends for 18 inches up the wall within a 32-inch-wide quartz vein. What appears to be the same vein is exposed at points 20 and 65 feet to the north of the trench, but the fluorite content in these exposures is negligible. The fluorite is usually coarsely crystalline and is mostly pale green or white and rarely purple. Occasionally black manganese oxide is present with fluorite mineralization. The walls of some fractures are altered to extremely fine-grained white or blue cherty silica with a few patches of coarse-grained white calcite. Except for scattered grains of pyrite, no sulphides were seen. There are areas where the country rock is closely jointed, kaolinized, and heavily iron stained but contain no recognizable fluorite. Sometimes unmineralized faults can be traced through such areas. Several of the trenches and pits have been excavated at places of this kind.

A tape-compass plan of the main workings is shown on Figure 32. Most are 2 to 3 feet deep and were dug by a bulldozer. The floors have all been ripped, and, as a result, where fluorite was noted in the trenches, it was usually in scattered pieces or in rock chunks, and so the extent and shape of the original occurrences could not be accurately assessed. The amount of fluorite found was small, and nowhere was a concentration found that seemed large enough to warrant sampling. All occurrences noted are indicated on the plan. The sites of four diamond-drill holes were noted as indicated. Cores or parts of cores for three were found and examined, but these revealed nothing of consequence.

[Reference: *Minister of Mines, B.C.,* Ann. Rept. 1966, pp. 265–266.]

**Rock Candy**
*Cominco Ltd.*
By J. W. McCammon

(49° 118° S.E.) Exploration office, 1150 Bay Avenue, Trail. The Rock Candy fluorite property, consisting of nine Crown-granted and 14 located claims, is on the north bank of Kennedy Creek, a tributary that flows east into the Granby River. The main showing and workings are on the Rock Candy No. 1 claim (Lot 1646 (S.)), 1.6 miles due west of the Granby River road at a point 16 miles due north of Grand Forks. Access is by a logging-road up Pass Creek that branches west off the road up the west side of the Granby River at a point 12 miles north of Grand Forks. The Pass Creek road is followed 2 miles to the forks at Rock Candy Creek and then the north fork, up Rock Candy Creek, is followed about 5 miles to Kennedy Creek opposite the property.

The fluorite mineralization is reported to have been discovered by prospectors in 1916. The Stewart-Calvert company began exploration work on it in 1917. Cominco took the property over, began development work, and shipped 177 tons of crude ore in 1918. Cominco has continued to hold title to the ground to date. Most underground work and mining were done in 1919 and 1920. Additional shipments of crude ore and concentrates are recorded for 1921, 1922, 1923, 1925, 1929, and 1942. In 1965 some 508 feet of diamond drilling was done to explore the area north of the old workings.

The main showing consists of a zone containing numerous veins filling a series of near-parallel fractures in syenite. Geological Survey of Canada Map 6-1957 shows the syenite as part of one of the Paleocene(?) Coryell intrusions. The zone as exposed on surface is 525 feet long in a northerly direction and averages 40 feet wide. Mineralization is reported to extend to a depth of more than 200 feet underground. Most vein widths range from an inch or so to 2 feet with occasional irregular replacement patches and lenses much wider. The widest solid vein noted in 1967 was a 10-foot-wide segment in a small pillar near the centre of the largest open stope. Material between veins is highly altered syenite. The surface showing is entirely surrounded by drift, and no ore-zone walls were seen in the accessible workings, so the nature of such walls could not be determined. The closest outcrop to the east is 200 feet from the south end of the main showing. It is red-brown coarse-grained slightly porphyritic syenite which consists essentially of perthitic orthoclase with lesser oligoclase and biotite and minor quartz and hornblende. Accessory minerals include apatite, sphene, and magnetite. Some of the larger feldspar crystals are almost half an inch long. About the same distance to the west, in the bed of an intermittent creek, is an outcrop of highly altered fine-grained porphyry. This now consists of partly resorbed quartz phenocrysts in a groundmass of kaolinized feldspar and indeterminate fine-grained material with scattered pyrite grains and limonite pseudomorphs of pyrite. Another 150 feet west beyond the altered porphyry is a bluff of syenite similar to that on the east. Here the syenite is highly fractured, breaking into 2-inch cubes, and part is recemented breccia with scattered 1-inch-wide quartz veins. About 60 feet west of the north end of the mineralized zone is an outcrop of altered syenite.

The veins strike and are jointed and banded in a direction 6 to 12 degrees east of north and dip 59 to 65 degrees west. Most pinch and swell rapidly, and individual veins are not continuous far along strike. Some are completely filled fractures containing massive quartz and fluorite, whereas others are only partly filled and show comb structure and vugs lined with well-developed crystals with faces as long as 2 inches. In some places, patches of silica boxwork remain where fluorite has been dissolved from a siliceous groundmass.

The chief minerals recognized in the veins were fluorite, quartz, and massive cherty silica with a few scattered patches of barite and scarce grains of pyrite. Other writers have reported kaolin, chalcopyrite, limonite, galena, chalcocite, covellite, and calcite. The fluorite is mainly pale sea-green or white and only occasionally purple. The quartz is fine grained or crystalline and often intergrown with fluorite. The barite occurs in well-formed pale-yellow transparent crystals.

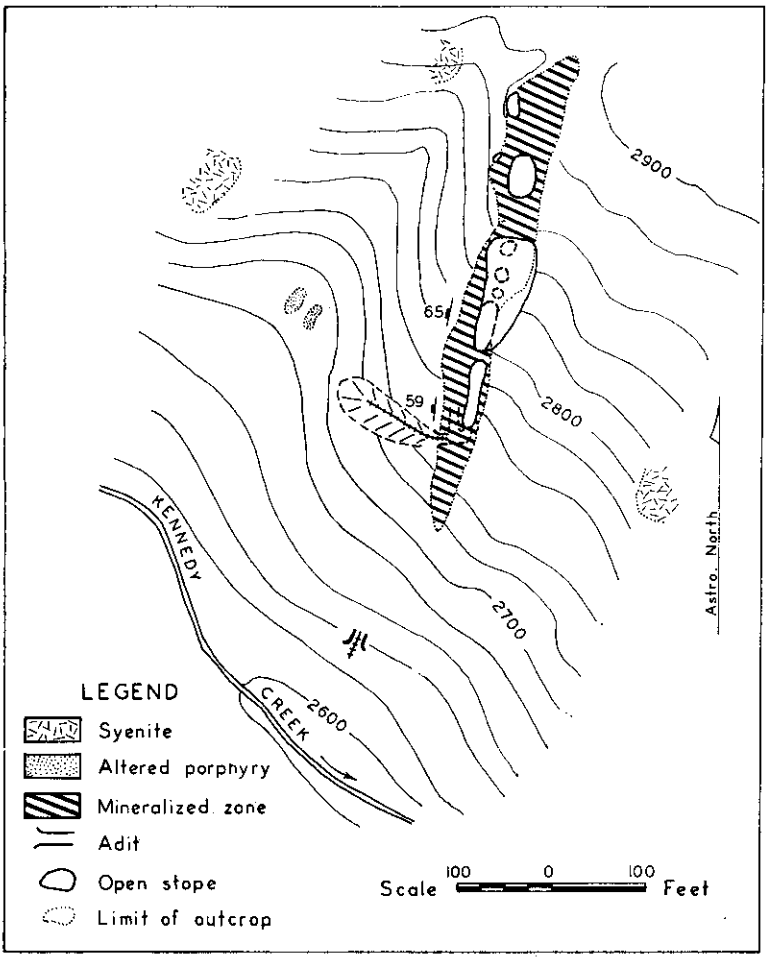


Figure 33. Rock Candy fluorite property, plan of the workings.

When the property was in operation, widths up to 45 feet of the mineralized zone were mined. No grades have been published, but calculations based on reported tonnages milled, concentrate produced, and grade of concentrate indicate the material put through the mill must have averaged 22 to 32 per cent fluorite. Approximately 40,000 tons of crude and concentrates have been produced from the deposit. The chief reserves appear to be the fluorite contained in the pillars left in the stopes and in the low-grade walls of the workings. The quantity would not be large. Results of drilling below the lower adit and on strike extensions of the mineralized zone have not been made public and might indicate more optimistic estimates.

Workings on the main showing consist of two adit levels and five open stopes as indicated on the accompanying plan (Fig. 33). This plan was made from a tape-compass survey done in 1967 with contours transferred from the map by Dolmage (Ref. 2). The lower adit is now caved at the portal and inaccessible, as is much of the upper level. Old reports record that more than 1,500 feet of crosscutting and drifting and at least 360 feet of raising were done in addition to stoping. An unreported amount of diamond drilling was done also.

From the main showing a narrow straight gully extends for nearly a mile northward to Fluorine Lake. At three places, about one-quarter, one-half, and three-quarters of a mile north of the main showing, evidence of diamond drilling was found. At the ½-mile point a rib of altered " mineralized zone " similar to that at the main workings is exposed for 200 feet on strike. It forms a 20-foot-high bluff along the east side, and a 15-foot-long adit has been driven westward into the bluff. No wallrock is exposed. Fluorite is scarce in the outcrop. At the ¾-mile point a 10- by 4-foot pit has been dug on typical " mineralized zone " rock. Fluorite is scarce in this showing.

[References: (1) *Minister of Mines, B.C.*, Ann. Repts., 1917–25, 1929, 1965; particularly 1919, p. 164; (2) *Geol. Surv., Canada*, Economic Geology Series No. 6, Fluospar Deposits of Canada, 1929, p. 22; Map 6-1957, Kettle River, East Half.]

**Oliver Silica Quarry** (49° 119° S.W.) This quarry produced 80 tons of fluorite. By J. W. McCammon. *See* report under this name on page 321 *under* " Silica."

## GYPSUM

**Western Gypsum Mines Ltd.** By P. E. Olson. Windermere (50° 115° S.W.) Head office, 2650 Lakeshore Highway, Clarkson, Ont.; Nigel Puttock, president; K. C. French, vice-president of production. Quarry office, P.O. Box 217, Invermere; A. E. Portman, quarry manager. The company owns 84 mineral claims, ranging in elevation from 4,000 to 5,000 feet, on the east side of the Rocky Mountain Trench some 10 miles from Invermere. There are very large reserves of gypsum on the property.

The gypsum is mined by open-pit methods. Drilling is done by rotary methods using a chisel-shaped bit. Broken gypsum is transported by front-end loaders to a crushing plant in the pit. Fine material is left near the pit and the coarse product is truck-hauled to the main plant at Wilmer via 11 miles of paved private road. During 1967, 226,026 tons of crude gypsum was shipped to customers in Alberta, Washington, and British Columbia.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 266.]

## LIMESTONE

**Terrace Calcium Products Ltd.** By H. Bapty. Terrace (54° 128° N.W.) Company address, P.O. Box 207, Terrace; registered office, 4635 Lazelle Avenue, Terrace. Ernest C. Sands, president. The company holds 10 recorded mineral claims on Copper Mountain, 6 miles east of Terrace; 12 mineral claims west of the Terrace airport; a 20-acre quarry lease on Copper Mountain; and a 20-acre mill-site adjacent to the Terrace golf course. Four men working throughout the year under the supervision of E. C. Sands did $30,000 worth of development work in 1967. A 70- by 12-foot earth-filled dam was constructed near the quarry. The quarry area has been cleaned off and all timber burned. Three feet of overburden was removed with a tractor and the bedrock washed with high-pressure water. The mill-site road was surveyed by a British Columbia land surveyor. A 250-tons-per-day rock crusher, belt conveyors, and a power plant were purchased. One hundred tons of limerock was blasted for research and testing. The property can be reached by driving up the British Columbia Telephone microwave road to Copper Mountain.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 267.]

**Quesnel Redi-Mix Cement Co. Ltd.** Urling (53° 120° N.W.) Company office,
By J. W. McCammon
P.O. Box 2139, Quesnel; quarry at Urling. This company produced 8,112 tons of limestone for the pulp-mills at Prince George.

**Sharan Quarry** Clinton (51° 121° S.W.) In April, 1966, B. R. Sharan, of
By J. W. McCammon
Ashcroft, applied for a limestone quarry lease on the southwest part of Lot 7635, just west of the Pacific Great Eastern Railway tracks and the Clinton–Kelly Lake road, 5½ miles southwest of Clinton. A rough road extends for 1,500 feet from the railway tracks to a 30-foot-wide quarry opened up across the base of a limestone bluff 100 feet north of Bowden Creek. The bluff is about 40 feet high by 300 feet long and forms the lowest bedrock exposure across the nose of a ridge that rises northwestward to the peak of Mount Soues at 7,200 feet elevation. Limestone in the quarry face is fine-grained blue-grey and white mottled rock that shows little evidence of bedding. Several large vertical faults with various strikes cut the exposure. The rock is shown on Geological Survey of Canada Map 3-1966 as part of the Upper Permian(?) Cache Creek Group. An analysis of a random chip sample collected from the quarry muck-pile had the following percentage composition: Insol.=0.30, $R_2O_3$=0.42, $Fe_2O_3$=0.08, MnO=0.04, MgO=0.16, CaO=55.24, $P_2O_5$=0.06, S=0.003, Ig. Loss=43.83, $H_2O$ (105° C)=0.11.

**Annis Industries Ltd.** (50° 119° S.W.) Company office, 280, 180 Seymour
By David Smith
Street, Kamloops. D. Spankes, president. This company holds a limestone lease 4 miles southwest of Westwold on the Douglas Lake road. Construction on site in 1967 included a storage bin, screening plant, conveyors, and crushing plant to handle 100 tons per day. Six men were employed under the supervision of W. Campbell.

**Fraser Valley Lime Supplies** Popkum (49° 121° S.W.) Head office, 7583
By A. R. C. James
Edmonds Street, Burnaby 3. W. T. Mairs, manager. The quarry and crushing plant are on the east side of the Trans-Canada Highway, adjoining the southernmost tip of Indian Reserve No. 1, three-quarters of a mile east of Popkum station on the Canadian National Railway. The crushing and screening plant was operated partly with stone from the quarry and partly with stone trucked in from other sources. Production from the quarry in 1967 was 6,360 tons and from other sources 1,308 tons, making a total of 7,668 tons, a slight increase on the 1966 production. The products were sold for agricultural use and as an industrial filler. An average crew of seven men was employed.

**Lafarge Cement of North America Ltd. (Beale Quarries Division)** Vananda (49° 124° N.W.) Head office, 1051 Main Street, Vancouver 4;
By W. C. Robinson
quarry office, Vananda. W. D. Webster, quarry superintendent. Open-pit bench-mining methods were used to quarry 715,000 tons of limerock, of which 576,000 tons was shipped. In 1967 work was started on construction of new stockpiling and shipping facilities, which will increase storage capacity by 40,000 tons. A crew of 25 men was employed.

**Ideal Cement Company** Vananda (49° 124° N.W.) British Columbia office,
By W. C. Robinson
610, 1200 West Pender Street, Vancouver 1; quarry office, Vananda. W. S. Beale, general manager, Rock Products Division; J. K. Johnson, superintendent. Limerock, quarried by open-pit benching on Lot 25, 2 miles south of Vananda, was trucked to the crushing, screening, and washing

plant at Marble Bay quarry. During 1967 extensive renovating, involving replacement of wooden structures with steel, was undertaken. In April shipments to the new cement plant in Seattle commenced. A crew of 33 men quarried 734,156 tons of limerock, of which 676,535 tons was shipped.

**Imperial Limestone Company Limited**
By W. C. Robinson

Vananda (49° 124° N.W.) Head office, 5427 Ohio Avenue South, Seattle, Wash. 98134; quarry office, Vananda. James H. Jack, president; A. Diewert, quarry superintendent. This company continued to operate a limestone quarry at the summit of a small hill 1 mile west of Spratt Bay on the northeast coast of Texada Island. Two crushing plants were operated—one at Vananda dock, where stucco dash and whiting were produced, and the other, a larger one, at Spratt Bay, where whiting and coarse limestone were produced.

Open-pit bench-mining methods were used to produce 163,037 tons of limerock, of which 162,240 tons was crushed and shipped to the Seattle plant. A crew of 23 men was employed.

**Domtar Chemicals Ltd. (Lime Division)**
By W. C. Robinson

Blubber Bay (49° 124° N.W.) British Columbia office, 470 Granville Street, Vancouver 1; quarry office, Blubber Bay. M. T. Pero, Blubber Bay plant manager. Open-pit bench mining was used to produce 951,259 tons of limerock, of which 688,561 tons was shipped. A crew of 43 men was employed.

**Koeye Limestone (1962) Ltd.**
By W. C. Robinson

Koeye River (51° 127° N.W.) Company office, Bella Bella. A. O. Widsten, president. White limestone is quarried by benching methods, on the north side of the mouth of Koeye River on Fitz Hugh Sound, 6 miles south of Namu. A crew of five men, employed for a period of seven weeks, produced 3,152 tons of limerock, which was shipped to the Columbia Cellulose Company Ltd. plant at Watson Island.

**Ocean Cement Limited (B.C. Cement Division)**
By J. W. McCammon

Cobble Hill (48° 123° N.W.) This company produced 570,111 tons of limestone for use in the cement plant at Bamberton.

## MAGNESITE

**Rok**
*New Jersey Zinc Exploration Company (Canada) Ltd.*
By J. W. McCammon

Cross River (50° 115° N.W.) Field office, 905 Seymour Street, Vancouver 2. This company owns 70 claims on a magnesite deposit located in the area around and between the junction of Assiniboine Creek and Mitchell River and the junction of Mitchell River and Cross River 20 miles northeast of Radium Junction. Access is by horse-trail for 10 to 12 miles from a road being built up the Cross River.

In 1967 the company did a small amount of mapping and surface sampling and had 200 feet of diamond drilling done in four X-ray diamond-drill holes.

[Reference: *Geol. Surv., Canada,* Paper 66–1, 1966, pp. 65–66.]

## MARL

**Cheam Marl Products Limited**
By A. R. C. James

Popkum (49° 121° S.W.) Head office, 13 Fletcher Street South, Chilliwack. P. C. Woodward, general manager. This property consists of a lake deposit of marl ranging up to 10 feet thick. The deposit is post-glacial and accumulated on the bed of

Cheam Lake, which was drained some years ago. The marl and topsoil are excavated by two small draglines and sold for agricultural purposes. The material is either trucked wet to the consumer or stockpiled on a drainage pad.

Production in 1967 was 22,898 tons of marl and 3,466 cubic yards of topsoil. A crew of three men was employed at the property.

## PHOSPHATE

### Phosphate Occurrences in British Columbia

By J. W. McCammon

Phosphorus is essential to all life and is, therefore, one of the main elements required to be supplied to plants in fertilizers. The sources of the phosphate for fertilizers are either primary deposits of the mineral apatite, $Ca_3(F.Cl)(PO_4)_3$, or phosphorite, a phosphate-bearing marine sedimentary rock containing secondary phosphatic material derived from the apatite of igneous rocks or from bones, marine life, or guano. Phosphorites provide the bulk of the source rock used in the world today.

A few occurrences of rocks containing appreciable apatite have been reported in British Columbia and phosphorites of considerable extent have been found. The phosphorites were investigated by L. Telfer (Ref. 1) for Cominco, and his description of them, which appeared in Volume 36 of the Transactions of the C.I.M.M. in 1933, is the only report of any length that has been published. The following notes have been taken almost completely from the report by Telfer.

Sedimentary phosphate-bearing rocks are found in southeastern British Columbia over a considerable area that extends from Fernie east to Alberta and from the United States border north to the headwaters of the Elk River. Although areally extensive, the phosphate zones are thin and low in grade, and to date none has proved commercial.

The phosphate is found at five different stratigraphic levels: in shales of the lower part of the Mississippian Banff-Exshaw sequence, in the upper part and top of the Pennsylvanian-Permian Rocky Mountain Formation, at the base of the Triassic Spray River Formation, at the base of the Jurassic Fernie Group, and in the Rock Creek Member of the Fernie Group.

In the Banff-Exshaw sequence the phosphate occurs as scattered dense black nodules and narrow fine-grained oolitic seams in the black shales of the lower part. Telfer describes a typical section 2 miles north of Crowsnest as follows: At the base is grey Devonian limestone overlain by 23 feet of black shale, followed by 0.6 foot of nodular phosphate (37.4 per cent $Ca_3P_2O_8$), then 1.7 feet of black shale (6.7 per cent $Ca_3P_2O_8$), and finally 0.6 foot of oolitic phosphate (50.8 per cent $Ca_3P_2O_8$). This, with minor variations, is stated to be representative of the phosphate zone for 20 miles north and south of Crowsnest. Near Fernie, however, only a few nodules and narrow stringers of phosphate are present in the same shales.

The Rocky Mountain Formation has been correlated with the Phosphoria beds, which are the commercially important rocks in the Western phosphate field of the United States. In Canada, unfortunately, the beds are much thinner and lower in grade than south of the border and so far have not proved of economic value. The lithology of the formation varies somewhat from place to place and the phosphate varies within the rocks. Telfer distinguished four types of occurrences:—

(1) Phosphatic sandstone, usually the upper few feet of the formation, is stained black by phosphate material that cements the sand grains. The rock contains 5 to 10 per cent $Ca_3P_2O_8$. This type of occurrence is widespread and is present in the Corbin-Crowsnest area.

(2) Nodular—throughout the area the top 100 to 200 feet of the formation commonly contains phosphate nodules that make up 10 to 25 per cent of sandstone beds, which may be as much as 20 feet thick. The nodules, one-quarter inch to 4 inches in diameter, are black, hard phosphate rock containing up to 70 per cent $Ca_3P_2O_8$. Occurrences of this sort have been noted north of Corbin, at Crowsnest, west of Fernie, and in the Flathead River area.

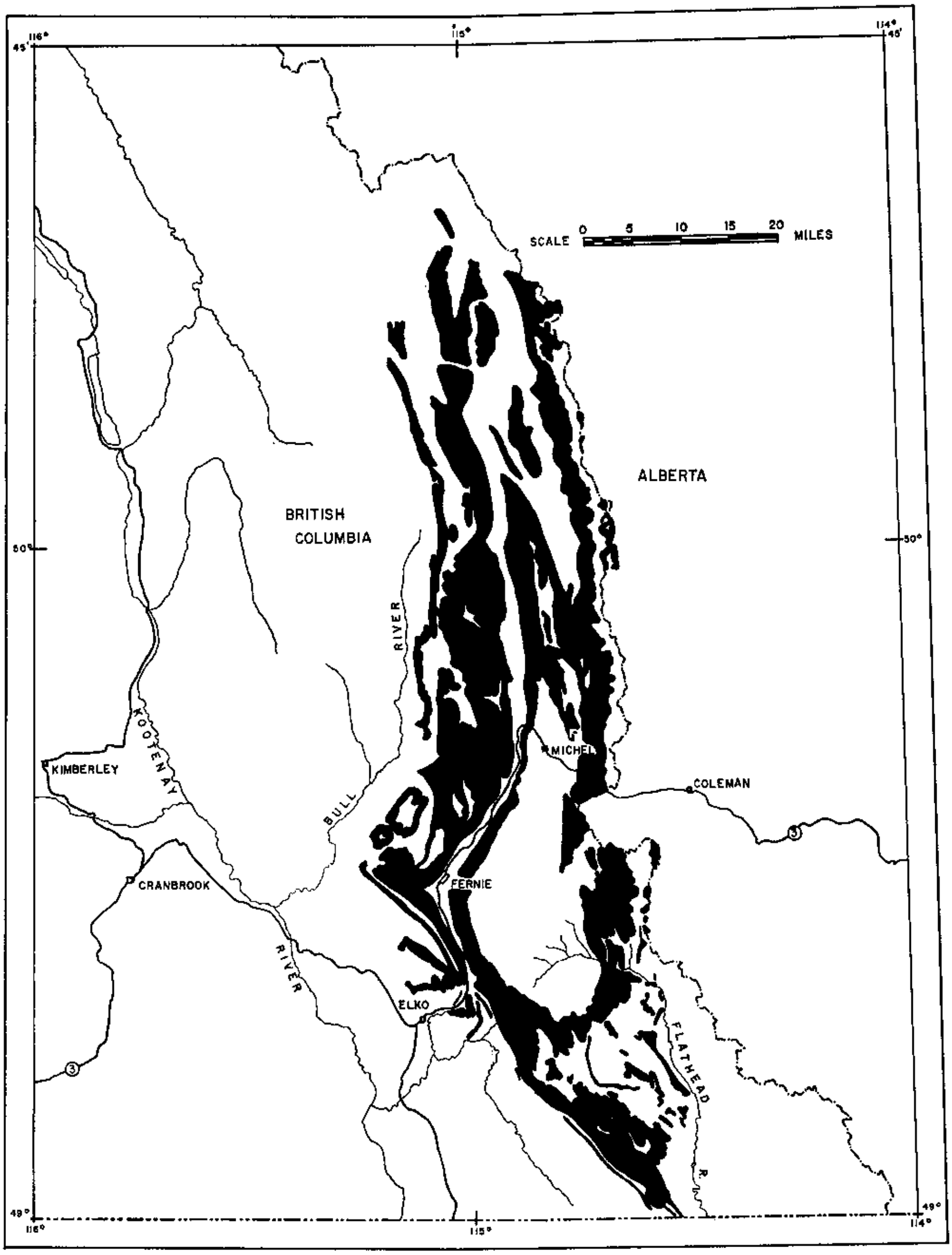


Figure 34. Phosphate-bearing rock formations of British Columbia.

(3) Massive—in some places, such as near Hosmer and west of the Elk River at Michel, dense, black, basaltic-looking phosphate forms a bed a few inches to 2 feet thick underlying a chert-quartzite bed, as much as 60 feet thick, which forms the top of the formation. This is often associated with and may grade into a nodular type deposit.

(4) Oolitic—fine-grained oolites, averaging 0.3 millimetre in diameter, mixed with angular quartz grains occur in a thin sandstone bed and stringers 75 to 120 feet below the top of the formation. West of Fernie a bed 1½ feet thick is interbedded with sandstone and shales under a 75-foot layer of chert and quartzite that forms the top of the formation. Near Hosmer the phosphate forms stringers in sandy shale for 150 feet below the chert.

Price (Ref. 2) noted a fifth mode of occurrence in the upper part of the Rocky Mountain Formation in parts of the MacDonald Range, where brecciated, dense light-grey dolomite is partly cemented by very fine-grained purple apatite.

According to Price, the base of the Spray River Formation in the Flathead and Fernie map-areas is marked in some places by a dark phosphatic sandstone bed up to 15 feet thick. This bed unconformably overlies sandstone and cherty dolomite of the upper part of the Rocky Mountain Formation.

The phosphate at the base of the Fernie Group is in an oolitic rock at Fernie, Crowsnest, and in the Flathead area, and in a chert conglomerate in other places. At Crowsnest a section 4.7 feet thick consisting of four layers averaged about 45 per cent $Ca_3P_2O_8$, and a similar six-layer section at Fernie, 12.7 feet thick, averaged 27 per cent $Ca_3P_2O_8$.

Part of the Rock Creek Member, 150 to 250 feet above the base of the Fernie Formation, is a 5- to 20-foot thick phosphatic sandstone that contains many belemnites. This bed assays 7 to 35 per cent $Ca_3P_2O_8$.

In the period 1925 to 1934, Cominco made an extensive study of the phosphate-bearing rocks. The company opened up three small exploratory underground mines and excavated numerous trenches. The mines were the Lizard, on Lizard Creek, 1,200 feet above and 5 miles west of Fernie; the Crow, on Alexander Creek, about 2 miles northwest of Crowsnest station; and the Marten, just east of the old railway, 5½ miles south of McGillivray station. Some rock was shipped to Trail for experimental work, but no commercial production was attempted. In 1964–65 the Crow mine was reopened to obtain rock for more tests but was again closed. In all, approximately 5,000 tons of phosphate rock was mined. During the initial exploratory period, Cominco gained Crown-granted rights to the phosphate mineralization underlying large areas through the *Phosphate Act* which was then in force but has since been repealed. The company, however, still retains these rights.

Since 1964 there has been a renewal of interest in the phosphate possibilities of the area and numerous claims have been located. Between 1964 and 1966 Western Co-operative Fertilizers Ltd. drilled and stripped a large area on the hilltop just north of Lodgepole Creek 4 miles above its junction with the Wigwam River. The same company prospected a large block of claims between Lodgepole Creek and the Flathead River. Crowsnest Industries and Crowsnest Pass Coal Company located and examined many claims in the Elk River valley north of Fernie and southeast of Lodgepole Creek. Cominco carried out further exploratory work in the Elk Valley. Other claims have been located south of Corbin.

The following maps and reports deal with and show the distribution of the phosphate-bearing rocks in southeastern British Columbia:—

(1) Phosphate in the Canadian Rockies, by L. Telfer, the Transactions of the Canadian Institute of Mining and Metallurgy, Vol. 36, 1933, pp. 566–605.
(2) Geological Survey of Canada, Paper 61-24, Fernie Map-area, East Half, by R. A. Price, 1962.
(3) Geological Survey of Canada, Map 14-1958 in Paper 58-5, Beehive Mountain, by D. K. Norris, 1958.
(4) Geological Survey of Canada, Map 1-1959, Flathead, by R. A. Price, 1959.
(5) Geological Survey of Canada, Map 11-1960, Fernie Map-area, West Half, by G. B. Leech, 1960.
(6) Geological Survey of Canada, Memoir 336, Flathead Map-area, by R. A. Price, 1965.
(7) British Columbia Department of Mines, Bulletin 33, Geology of the Crowsnest Coal Basin, by C. B. Newmarch, 1953.
(8) Minister of Mines, B.C., Annual Reports: 1929, pp. 298, 447; 1930, pp. 244, 377; 1931, p. 141.
(9) Bulletin of the American Association of Petroleum Geologists, Vol. 43, No. 3, 1959, pp. 644–645.

In addition to the phosphatic rock discussed above, four miscellaneous phosphate occurrences have been recorded in British Columbia, as follows:—

(1) *Francois Lake*.—A small irregular vein, 4 to 12 inches wide, containing botryoidal phosphate associated with asphaltum occurs in an andesite flow on a ranch 2 miles north of Francois Lake post office. [References: Minister of Mines, B.C., Ann. Rept., 1924, p. 116; Geol. Surv., Canada, Memoir 252, 1949, p. 197.]

(2) *Lempriere*.—A " carbonatite " rock occurring near Mile-post 109 on the Canadian National Railway line north of Blue River contains 2 to 5 per cent $P_2O_5$ in the form of apatite. [Reference: Minister of Mines, B.C., Ann. Rept., 1952, pp. 115–119.]

(3) *Stewart*.—On the Jackie property on Red Mountain, 10 miles due west of Stewart, apatite is a major constituent in lenses in impure quartzite. [Reference: Minister of Mines, B.C., Ann. Rept., 1965, p. 54.]

(4) *Granduc*.—Apatite in quartzite similar to that described at the Jackie property has been found near the portal at the Granduc mine.

**KRC, Inc.**
By W. G. Clarke

Lemoray (55° 122° N.W.) Company office, 1300 Elveden House, Calgary, Alta. A group of 40 claims owned by this company is on the Hart highway in Pine Pass. Three men spent one month under the supervision of W. B. Brady, consulting geologist, making geological reconnaissances and taking bulk samples.

**WW**
*Western Warner Oils Ltd.*
By P. E. Olson

(49° 114° S.W.) Company office, 215A Tenth Street Northwest, Calgary, Alta. The WW 1 to 110 recorded mineral claims are held by Western Warner Oils Ltd. under agreement with S. R. Dunn. The group is 14 miles east of Fernie. Showings are at an elevation of 5,000 to 6,000 feet. The company constructed 22 miles of access road and put in 16 bulldozer trenches totalling 2,220 feet to explore phosphate in the sedimentary rocks in the vicinity of Leach Creek.

## POZZOLAN

**Crownite Industrial Minerals Limited** By W. G. Clarke Quesnel (52° 122° N.W.) Company office 507, 1640—16th Avenue Northwest, Calgary, Alta.; plant on Lot 906 in West Quesnel. The company dried and pulverized " burnt " shale, quarried from Lot 222 south of Quesnel, to produce 4,000 tons of pozzolan. They also mined and treated 100 tons of diatomite from Lot 906, above the plant. A new dust-filter was installed in the plant. Six men worked throughout the year under the direction of D. Malin, superintendent.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 271.]

## SAND AND GRAVEL

Data on sand and gravel production are presented on the following pages. The abbreviations used in the table for the types of sand and gravel produced are as follows: AA=asphalt aggregate; SA=sized aggregate; WS=washed and sized aggregate; RP=run-of-pit material; AP=asphalt paving mix; RM=ready-mix concrete.

## *Sand and Gravel Pits*

| Location | Operator | Equipment and Plant | Men | Production |
|---|---|---|---|---|
| Kitkatla Gravel Pit—Porcher Island | Rupert Cement Products (1965) Ltd. | Tractor, conveyor, and barge | 3 | RP=17,300 yd. |
| Sandspit—Moresby Island | Department of Highways | Front-end loader | 2 | RP. |
| Miller Creek—Graham Island | Department of Highways | Front-end loader | 2 | RP. |
| Construction Pit—Graham Island | Department of Highways | Front-end loader, tractor, and crusher | 7 | SA=80,000 yd. |
| Terrace Highway District— | | | | |
| (1) Mile 1.0, Lakelse Lake Road No. 53 | Department of Highways | Front-end loader | 2 | RP. |
| (2) Mile 6.3, Kitimat Highway No. 25 | Department of Highways | Front-end loader | 2 | RP. |
| (3) Mile 2.6, Northern Trans-Provincial Highway No. 16 East | Department of Highways | Front-end loader | 2 | RP. |
| (4) Mile 7.3, Lakelse Lake Road No. 53 | Department of Highways | Front-end loader | 2 | RP. |
| (5) Mile 3.0, Old Airport Road No. 2 | Department of Highways | Front-end loader | 2 | RP. |
| (6) Mile 4.0, Kalum Lake Road No. 3 | Department of Highways | Front-end loader | 2 | RP. |
| (7) Mile 11.5, Kitimat Highway No. 25 | Department of Highways | Front-end loader | 2 | RP. |
| (8) Mile 10.0, Northern Trans-Provincial Highway No. 16 West | Department of Highways | Front-end loader | 2 | RP. |
| (9) Mile 29.0, Northern Trans-Provincial Highway No. 16 West | Department of Highways | Front-end loader | 2 | RP. |
| (10) Mile 2.3, Beam Station Road No. 90 | Department of Highways | Front-end loader | 2 | RP. |
| (11) Mile 1.9, Kitimat Village Road No. 200 | Department of Highways | Front-end loader | 2 | RP. |
| (12) Lot 24, Usk | Department of Highways | Front-end loader | 2 | RP. |
| (13) Mile 8.0, Northern Trans-Provincial Highway No. 16 East | Department of Highways | Front-end loader | 2 | RP. |
| (14) Mile 11.0, Northern Trans-Provincial way No. 16 East | Department of Highways | Front-end loader | 2 | RP. |
| (15) Mile 23.7, Northern Trans-Provincial Highway No. 16 East | Department of Highways | Front-end loader | 2 | RP. |
| (16) Mile 19.9, Kitimat Highway No. 25 | Department of Highways | Front-end loader | 2 | RP. |
| (17) North boundary of Kitimat Municipality | Department of Highways | Front-end loader | 2 | RP. |
| (18) Inside Kitimat Municipality | Department of Highways | Front-end loader | 2 | RP. |
| (19) C.N.R., Mile 42 West | Department of Highways | Front-end loader | 2 | RP. |
| (20) Mile 4.0, Lakelse Lake Road No. 53 | Department of Highways | Front-end loader | 2 | RP. |
| (21) Mile 1.0, Crescent Drive | Department of Highways | Front-end loader | 2 | RP. |
| (22) Mile 0.4, Crescent Drive | Department of Highways | Front-end loader | 2 | RP. |
| Sandhill—Kitimat | Scott's Ground Services Ltd. | Front-end loaders, screening, crusher, and paving plant | 5 | SA and AP=28,399 tons. |
| Sandhill—Kitimat | Kitimat Concrete Products (1961) Ltd. | Sauerman dragline, conveyors, washing, screening, ready-mix concrete, concrete bricks | 5 | RP, WS, RM. |
| Highway No. 16—Carnaby | Department of Highways | Front-end loader | 2 | RP. |
| Creston—Goat River | Louis Salvador & Sons | Front-end loader, crusher, screens | 3 | WS and RM. |
| Wynndel—Duck Creek | Louis Salvador & Sons | Front-end loader, crusher, screens | 2 | RP and RM. |
| Wynndel—Duck Lake | Frank Merriam & Sons | Front-end loader, screens | 3 | RP and AP. |

| | | | | |
|---|---|---|---|---|
| Nelson—Anderson Creek | Premier Sand & Gravel Co. Ltd. | Scraper, crusher, screens | 5 | RP, WS, and RM. |
| Trail—Casino Road | McGauley Ready-Mix Concrete Co. | Scraper, washing plant, screens | 5 | RP, WS, and RM. |
| Castlegar—Columbia River | McGauley Ready-Mix Concrete Co. | Front-end loader, screening plant | 4 | RP, WS, and RM. |
| Salmo—Erie Creek | Valley Concrete Products Ltd. | Front-end loader, screening | 2 | Concrete pipe. |
| Coquitlam Municipality— | | | | |
| (1) West end of Westwood Road | Corporation of the District of Coquitlam | Front-end loader, crushing and screening | — | RP and SA. |
| (2) Pipeline Road, 3½ miles north of Lougheed Highway | Jack Cewe Ltd., P.O. Box 300, New Westminster | Shovel, screening, crushing, paving plant | 10 | RP, SA, and AP=20,000 yd. |
| (3) Pipeline Road, 3 miles north of Lougheed Highway | S & S Sand and Gravel Limited, R.R. 1, Port Coquitlam | Front-end loader, crushing, screening, and washing | 8 | WS and RP. |
| (4) Pipeline Road, 1½ miles north of Lougheed Highway | Allard Concrete Construction Co., 1930 Pitt River Road, New Westminster | Front-end loader | 4 | RP. |
| (5) Pipeline Road, 1 mile north of Lougheed Highway | Deeks-McBride Ltd., 1051 Main St., Vancouver | Shovel, 600-tons-per-day washing and screening, ready-mix | 16 | SA, WS, and RM. |
| (6) Fraser River at Mary Hill, 2 miles south of Port Coquitlam | Ocean Cement Limited, north foot of Columbia St., Vancouver 4 | Shovels, etc., 500-tons-per-hour processing plant, barge-loading facilities | 51 | WS=1,160,707 yd. |
| Pitt Meadows District Municipality — Bonson Road (196th St.), 1 mile north of Fraser River | Lasser Trucking Co., P.O. Box 38, Pitt Meadows | Front-end loader | 3[1] | RP. |
| Maple Ridge Municipality— | | | | |
| (1) 33rd Road, 1 mile south of Silver Valley | S. Berto, Haney | Front-end loader | 1[1] | RP=500 yd. |
| (2) Grant Hill, 1 mile east of Albion and also adjoining Kirkpatrick pit | Corporation of the District of Maple Ridge | Dragline, crushing | — | RP and SA=40,000 yd. |
| (3) Grant Hill, ½ mile north of municipal pit | McIntosh Sand and Gravel Limited, 10412 Industrial Avenue, Whonock | Shovel, front-end loader, crushing, screening | 4[1] | RP and SA=35,000 yd. |
| (4) Grant Hill, north of McIntosh pit | Henry Van Boeyen, Albion | Shovel | 1[1] | RP. |
| (5) Lougheed Highway south of Grant Hill | Walske Ready Mix Limited, 22989 — 27th Road, Haney | Shovel, front-end loader, crushing, washing and screening, ready-mix | 3 | WS and RM=60,501 yd. |
| (6) 1 mile north of Websters Corners, ½ mile east | Kirkpatrick Sand and Gravel Ltd., Box 188, Haney | Shovel | 2[1] | RP. |
| (7) Lougheed Highway, 1 mile east of Whonock | Ralph E. George, Whonock | Front-end loader | 1[1] | RP=1,907 yd. |
| Mission Municipality—2.3 miles south of Steelhead, Dewdney Trunk Road | Cannon Contracting Ltd., P.O. Box 178, Mission | Shovel | 2[1] | RP=82 yd. |
| Kent Municipality— | | | | |
| (1) West end of Cemetery Road, south of Mount Agassiz | Corporation of the District of Kent | Shovel and front-end loader | — | RP=45,497 yd. |
| (2) McCallum Road, 1½ miles west of Harrison Hot Springs Road | Danielson Contractors Ltd., McCallum Road, Agassiz | Front end loader | 2[1] | RP. |
| Chilliwhack Municipality— | | | | |
| (1) Arnold Road—bank of Fraser River | P. Heppner & Son, 7113 Sumas Prairie Road, Sardis | Front end loader | 1[1] | RP. |
| (2) Fraser River bars, etc. | Chilliwhack Municipality | Front-end loader | — | RP=52,126 yd. |
| (3) Agassiz Road | George Beamin | Front-end loader | 1 | |
| Sumas Municipality—At foot and east of Taggart Peak | Various operators but owned by H. Quadling, R.R. 2, Yarrow | Front-end loader, screening | 3[1] | RP and SA=26,194 yd. |

[1] Part time.

## *Sand and Gravel Pits*—Continued

| Location | Operator | Equipment and Plant | Men | Production |
|---|---|---|---|---|
| Matsqui Municipality— | | | | |
| (1) 1 mile east of Abbotsford | Blackham's Construction Ltd., Abbotsford | Screening and crushing | 6 | RP and SA=66,952 yd. |
| (2) Tretheway Road, ¾ mile north of Clearbrook | Department of Highways | Front-end loader | — | RP=13,925 yd. |
| (3) Clearbrook Road, ½ mile north of border | Abbotsford Gravel Sales Ltd., P.O. Box 8, Abbotsford | Scraper, front-end loader, screening, washing, and ready-mix plant of Totem Trucking Limited | 3 | WS, RP, and RM=40,963 yd. |
| (4) 12th Avenue, ¼ mile west of Clearbrook Road | Valley Rite-Mix Ltd., P.O. Box 430, Clearbrook | Front-end loader, screening, washing and crushing, ready-mix plant | 6 | RP, SA, WS, and RM=17,280 yd. |
| (5) Corner of King (16th Ave.) and Foy Roads (316th St.) | Lepp Trucking, Abbotsford | Front-end loader | 2 | RP=6,000 yd. |
| (6) Corner Lefevre Road and Eighth Ave.—Caplette pit | E. Bird, Aldergrove | Front-end loader | 2[1] | RP. |
| Langley Municipality— | | | | |
| (1) Kinch Road at 36th Ave. | Corporation of the Township of Langley | Front-end loader, crushing | .... | RP=185,023 yd. |
| (2) North of the northeast corner of Jackman Road and Eighth Ave. | Aldergrove Cement Tile Products, S. Omelaniec, manager | Front-end loader | 1[1] | RP. |
| (3) ¼ mile north of corner of Jackman Road and Eighth Ave. | J. Craig, Trans-Canada Highway, Langley | Front-end loader | 1[1] | RP. |
| (4) Dogwood Ave., off Brown Road | Kitsul Bros. Gravel Sales Ltd., 24306 Fraser Highway, R.R. 3, Langley | Front-end loader | 1[1] | RP=18,000 yd. |
| (5) Glen Valley Road at 252nd St. | Fort Langley Aggregates, W. Sager, 25394 River Road, R.R. 6, Langley | Dragline, crushing, screening, and washing | 4 | RP and WS. |
| (6) 8802 Hudson Bay Road, Fort Langley | H. G. Clark, P.O. Box 145, Fort Langley | Front-end loader, screening, washing, and ready-mix | 4 | WS and RM. |
| (7) Bradshaw and Berry Roads (Gun Club pit) | B & B Trucking, P.O. Box 24, Cloverdale | Shovel | 1[1] | RP. |
| (8) 2962 Lambert Road (Highland pit) | Ocean Cement Limited, north foot of Columbia Street, Vancouver | Dragline, crushing, screening, and washing | 11 | RP and WS. |
| (9) 32nd Ave. at Kinch Road | Oscar W. Rees, 3003—208th St., R.R. 2, Langley | Shovel, front-end loader | 3[1] | RP=29,568 yd. |
| (10) Boundary Road at Surrey boundary | Border Sand & Gravel Ltd., Boundary Ave., R.R. 2, White Rock | Front-end loader, crushing, screening, and washing | 3 | RP and WS=27,504 yd. |
| Surrey Municipality— | | | | |
| (1) Campbell River Road at Langley boundary | White Rock Sand and Gravel, C. E. Schuler, 2546—176th St., R.R. 2, Cloverdale | Shovel, screening, and washing | 2[1] | RP, SA, and WS=12,464 yd. |
| (2) 58th Ave. and 148th Road, Surrey | A & B Gravel Sales Limited, Wm. Breaks, 2027—152nd St., White Rock | Front-end loader, screening, and washing | 4 | RP and WS. |
| Delta Municipality— | | | | |
| (1) ½ mile west of Scott Road at 68th St. | Western Paving Ltd., 6631—120th St., North Surrey | Shovels, front-end loader, crushing, screening | 2 | RP and SA=123,791 yd. |
| (2) Corner First Ave. and 56th St. | Century Manufacturing Co. Ltd., Ladner | Shovel | 1[1] | RP=12,000 yd. |
| (3) 10720—84th Ave. | M & W Sand and Gravel Ltd., North Delta | Front-end loader | 1[1] | RP. |

| | | | | |
|---|---|---|---|---|
| Howe Sound— | | | | |
| (1) Britannia Beach and Furry Creek | Construction Aggregates Ltd. | Dragline, scraper, bulldozer, front-end loader, crushing, screening, and washing | 35 | WS, RP, and SA=1,567,624 yd. |
| (2) Mamquam River | PaCo Cement Products, Limited | Front-end loader | 1 | RP=229 yd. |
| (3) Gower Point, Sechelt Highway | Ed Fiedler, Gibsons | Front-end loader | 1[1] | RP. |
| (4) Veterans Road, Gibsons (Pacific pit) | Gibsons Building Supply, Gibsons | Front-end loader, screening, and washing | 1 | RP and WS=4,000 yd. |
| (5) Cemetery Road, Gibsons | P & W Development Co. Ltd., P.O. Box 248, Gibsons | Front-end loader, crushing, screening, ready-mix | 1[1] | RP and RM. |
| (6) Porpoise Bay Road, Sechelt | L. & W. Swanson Limited, P.O. Box 172, Sechelt | Front-end loader, shovel, screening | 1[1] | SA and RP=2,140 yd. |
| Powell River—Off Allen Road, 3 miles northeast of Westview | P. Nassichuk | Screening | 1[1] | RP, Sand=9,352 yd. |
| Vancouver Island— | | | | |
| (1) Campbell River—south of Buttle Lake Road at Elk Falls Road | G & A Trucking Limited | Front-end loader, crushing | 20[1] | RP=18,000 yd. |
| (2) Painter's Spit, Campbell River | Island Readimix Limited | High-line scraper, front-end loader, crusher, washing, and screening | 3 | WS, SA, and RM=25,730 yd. |
| (3) Port McNeill | Island Readimix Limited | | 2 | SA and RM=16,521 yd. |
| (4) Comox | S. H. Marriott Sand and Gravel | Front-end loader | 2 | Fill gravel=62,681 yd.; sand=5,160 yd. |
| (5) Cumberland Road near Courtenay | Island Readimix Limited | Mobile loader, crushing, washing, and screening | 3 | SA and RM=27,200 yd. |
| (6) Parksville | Fouty Bros. | Front-end loader | 1 | |
| (7) Alberni | Dolan's Ltd. Sand & Gravel | Front-end loader, washing and screening plant | 3 | |
| (8) Nanaimo | Island Readimix Limited | | 3 | 19,100 yd. |
| (9) Cassidy No. 4 pit—Island Highway at Cassidy | Ocean Cement Limited | Front-end loader, washing, crushing, and screening | 4 | WS, RP, and SA=42,313 yd. |
| (10) Duncan–Cowichan Lake Road | Butler Bros. (Duncan) Limited, P.O. Box 214, Duncan | Front-end loader, washing, crushing, screening, ready-mix | 9 | WS, RP, and RM. |
| (11) Duncan–Koksilah | Doman Industries Limited, Duncan | Front-end loader, crushing, washing, screening, asphalt paving, ready-mix | 7 | RP, WS, SA, and RM=48,853 yd. |
| (12) Sooke—Sooke Road east of Milnes Landing | Wickheim Sand and Gravel Ltd. | Front-end loader | 3[1] | RP. |
| (13) Royal Bay | Ocean Cement Limited | Scraper, shovel, crushing, screening, and sizing | — | RP=123,246 yd; AA=77,482 yd.; WS=145,362 yd. |

[1] Part time.

## SILICA

**Red Cloud, Etc.**
*P.N.S. Industrial Minerals Limited*
By J. W. McCammon

Kootenay River (50° 115° S.W.) Company office, 506, 206 West Pender Street, Vancouver 3. This company owns four claims on a silica deposit at Gibraltar Rock, about 16 miles north of Canal Flats up the road on the west side of Kootenay River. The claims were located in 1961 by E. E. LaGrandeur, of Windermere, and sold to the company in January, 1962. The group consists of the Red Cloud, White Cloud, Eileen No. 1, and Eileen No. 2 claims. A small quarry on the Red Cloud claim is 1,800 feet up a road that branches north off the main river road about 200 feet north of the first creek south of Gibraltar Rock.

The quarry is located across the base of a bluff that is the lowest exposure of a band of quartzite. This rock has been mapped as part of the Ordovician Wonah Quartzite Formation (*see* Bull. 35, *B.C. Dept. of Mines,* 1954). The band continues up the mountain and to the north for several miles, but this is the only readily accessible part. At the quarry the band is 60 to 70 feet wide. It consists of hard white rock with grey streaks and occasional yellowish sandy patches. The band strikes northeasterly and dips 40 to 50 degrees west. In the quarry, fractures at 3-inch or greater intervals are numerous.

The quarry has been opened up for 100 feet across the base of the bluff. The fresh broken face is 10 to 15 feet high. A small tonnage of rock was removed for trial purposes, but apparently no further production has ensued and the property is now idle.

A grab sample of pieces picked at random from loose muck in the quarry had the following percentage composition: $SiO_2$=98.56; $Al_2O_3$=0.65; Fe (total)=0.12; CaO=0.05.

**Val 1 and 2**
*Far East Minerals Ltd.*
By J. W. McCammon

Boundary Falls (49° 118° S.W.) Office, 401, 543 Granville Street, Vancouver 2. This company holds an option on two located claims, Val 1 and Val 2, on a silica prospect near the centre of the north boundary of Lot 3284, 2 miles due east of the Boundary Falls sawmill. The prospect is at 4,500 feet elevation on the west shoulder of Mount Attwood, about 2¼ miles west and a little south of the peak. The claims were located in October, 1962, by John P. Gouthro, of Grand Forks. Access is via the McCarren Creek road, which branches east from Highway No. 3 at Boundary Falls, 2¾ miles south of Greenwood. The road is followed 5¼ miles to where it makes a right-angled bend to the east just after passing over McCarren Creek and the gas pipe-line right-of-way. At this bend a disused logging-road branches to the northwest. The showings are half a mile up this branch road.

The material of interest on the property consists of quartzite. It occurs as a bed or lens lying between layers of argillite. Map 6-1957, Kettle River (East Half) of the Geological Survey of Canada shows these rocks as part of the Permian(?) Anarchist Group. The quartzite is exposed intermittently for 900 feet in an easterly direction and is 300 feet wide at the widest point. On the west it pinches and appears to be cut off by a fault. Although fair rock exposures occur to the west, no obvious continuation of this band could be found in the area examined, although two or three very thin bands are present. Since these other bands pinch and swell along strike, it is probable that the large one does also, and so one or other of the narrow bands seen may be the offset continuation of the larger one. To the east and southeast the quartzite is covered by drift, and no rock exposures were found within a range of several hundred yards in those directions.

Outcrops of dark-grey argillite occur around the north side and southwest corner of the quartzite. This rock is very fine grained, and in places is finely banded with a somewhat gneissic appearance. It has a high magnetite content in some parts. The banding, assumed to represent bedding, strikes about northwest and dips 25 degrees northeast. The direction of bed tops was not identified. The quartzite is fine grained and appears very pure in hand specimens. Thin-sections examined contained a few scattered shreds of sericite and nothing else but quartz grains. The grains range from 0.04 to 0.78 millimetre and average about 0.35 millimetre in diameter. They are strained and have highly sutured contacts. Near the centre of the showing a 10-foot-wide andesite dyke cuts diagonally across the quartzite.

Two samples were collected for analyses. These were obtained from fresh rock opened up by blasting done during exploration work. Sample No. 1 consisted of chips collected at random across 80 feet along the side of the rock cut near the centre of the showing. Sample No. 2 consisted of chips gathered across 25 feet in the trench along the north edge of the most easterly exposure. The analyses gave the following percentage compositions:—

No. 1: $SiO_2$=97.14; $Al_2O_3$=0.42; Fe (total)=0.46; CaO=0.98
No. 2: $SiO_2$=98.40; $Al_2O_3$=0.13; Fe (total)=0.31; CaO=0.20

Exploration work done on the showing consists of the trenches as shown on Figure 35. Evidence of some diamond drilling was seen, but nothing is known of how much nor what the results were.

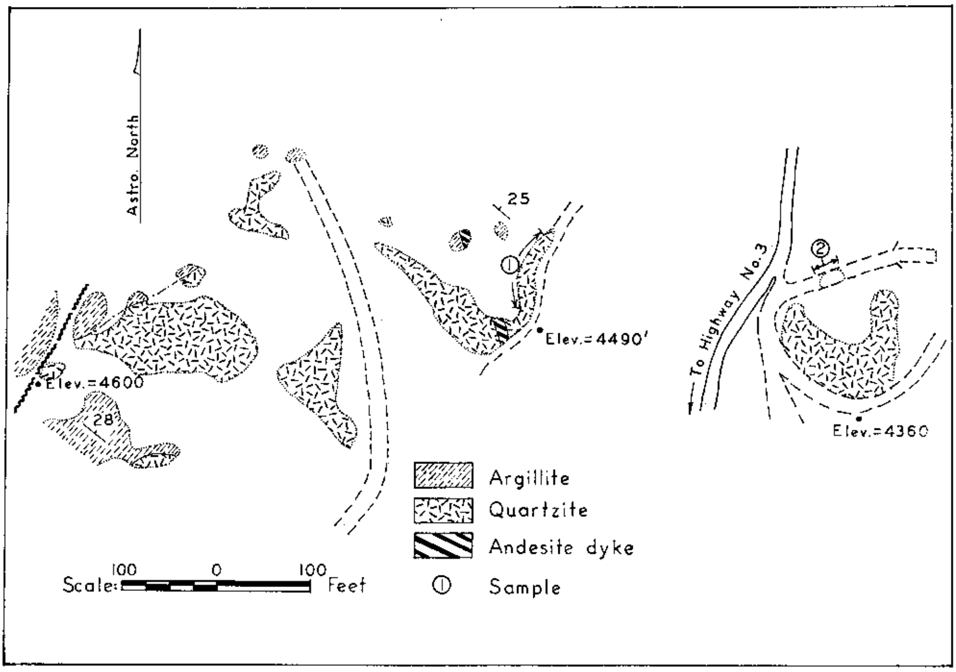


Figure 35. Far East Minerals Ltd. Surface workings on the Val silica prospect.

**Oliver Silica Quarry** (49° 119° S.W.) Pacific Silica Limited. Registered
By David Smith office, 717 West Pender Street, Vancouver 1; quarry office, P.O. Box 39, Oliver. I. A. Hunter, manager; H. Carlson, superintendent. The Oliver silica quarry is on the Gypo mineral claim (Lot 30985), owned by Cominco

Ltd., and operated under lease by Pacific Silica Limited. The claim is less than one-quarter of a mile west of Highway No. 97, 1 mile north of Oliver. Production for 1967 was 40,500 tons, and shipments made were 8,000 tons sacked and 32,500 tons in bulk. In addition, 80 tons of fluorite was bagged and shipped. In preparation for additional mining of ore, 22,000 tons of waste rock has been removed. Twenty-five persons were employed.

# Petroleum and Natural Gas

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## LIST OF ILLUSTRATIONS

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## PETROLEUM AND NATURAL GAS TITLES

Petroleum and Natural Gas Titles, under the direction of the Chief Commissioner, is responsible for the administration of the *Petroleum and Natural Gas Act,* which includes all matters related to and affecting title to Crown petroleum and natural-gas rights. The regulations governing geophysical operations are also administered by the Chief Commissioner.

As at December 31, 1967, 34,822,715 acres, or approximately 54,410 square miles, of Crown petroleum and natural-gas rights, issued under the *Petroleum and Natural Gas Act,* were held in good standing by operators ranging from small independent companies to major international ones. The form of title held, total number issued, and acreage in each case were as follows:—

| Form of Title | Number | Acreage |
|---|---|---|
| Permits | 346 | 23,214,363 |
| Natural-gas licences | -------- | -------- |
| Drilling reservations | 38 | 462,138 |
| Leases (all types) | 4,056 | 11,146,214 |
| Total | | 34,822,715 |

*Petroleum and Natural-gas Revenue, 1967*

| | | |
|---|---|---|
| Rentals and fees— | | |
| Permits | $1,369,232.18 | |
| Drilling reservations | 86,303.30 | |
| Natural-gas licences | ---------- | |
| Petroleum, natural-gas, and petroleum and natural-gas leases | 8,901,195.69 | |
| Total rentals and fees | | $10,356,731.17 |
| Disposal of Crown reserves— | | |
| Permits | 8,428,408.91 | |
| Drilling reservations | 3,013,978.50 | |
| Leases | 2,855,428.23 | |
| Total Crown reserve disposal | | 14,297,815.64 |
| Royalties— | | |
| Gas | 2,870,655.93 | |
| Oil | 6,678,244.53 | |
| Processed products | 58,536.56 | |
| Total royalties | | 9,607,437.02 |
| Miscellaneous fees | | 17,916.73 |
| Total petroleum and natural-gas revenues | | $34,279,900.56 |

Administration of the *Petroleum and Natural Gas Act* in the Department is divided between Petroleum and Natural Gas Titles and the Petroleum and Natural Gas Branch.

## PETROLEUM AND NATURAL GAS BRANCH

The Petroleum and Natural Gas Branch, under the direction of the Chief of the Branch, is responsible for administration of the "Regulations Governing the Drilling of Wells and the Production and Conservation of Oil and Natural Gas." The regulations specify the conditions which must be employed for efficiency and safe practice in the drilling, completion, and abandonment of wells; for well spacing; prevention of waste; conservation; and all related matters.

### GENERAL REVIEW

In 1967 the activity in the petroleum industry of British Columbia maintained about the same pace as 1966. Production of oil and natural gas continued their steady gains while drilling fell off slightly from the previous year.

Exploration operations were substantially greater as seismograph studies were being extended into the Province from the prolific petroleum pools recently discovered in the Rainbow area of northwestern Alberta.

Production of natural gas gained 24 per cent over 1966 to 246,875,958 M s.c.f. Clarke Lake, the largest producing field in British Columbia, and Laprise Creek accounted for the major part of the increase. Oil production increased 18 per cent, compared to 1966, to 19,697,369 barrels. Substantial gains were reported from fields on secondary recovery schemes, notably the Peejay, Boundary Lake, and Milligan fields. The most active area for oil development was in and around the Inga field.

Well authorizations issued by the Branch decreased from 220 in 1966 to 201 for 1967. Well completions recorded a 10-per-cent slide to 198 from 220, but the trend to deeper drilling was reflected in a virtually unchanged total footage of more than 1 million feet.

Abandonments, gas completions, and oil completions during 1967 were 94, 43, and 46 respectively. The number of completed oil wells gained slightly, while the abandonments and gas completions declined. A significant entry into the drilling phase commenced with the offshore operations west of Vancouver Island.

The major development in the marketing of petroleum products was the installation and completion of an oil refinery at Prince George. The seven refineries located in British Columbia received about 103,300 barrels per day at the end of the year. Approximately one-half of this crude is produced from wells in the Province.

Extension of the gas-gathering system to the Yoyo, Kotcho, and Sierra pools was near completion at the close of the year. With the expected approval of increased gas export to the United States, these fields will provide the large reserves required to meet the demand.

## FIELD OFFICE

The district office of the Petroleum and Natural Gas Branch is at Charlie Lake, near Mile 52 on the Alaska highway. A sub-office, for use by the field staff particularly during the winter, is retained in the Provincial Government Building at Fort Nelson.

The principal responsibility of the field office staff is the enforcement, at the field level, of the "Regulations Governing the Drilling of Wells and the Production and Conservation of Oil and Natural Gas." Other important functions are to maintain liaison with the operating companies and to collect information and data for use by the Branch in drilling or production studies.

Petroleum and natural-gas production continued to increase during 1967, resulting in a greater number of inspections required on producing wells. Complete inspections were made on 442 gas meters, with each operational meter inspected at least once during the year. Eighty-three absolute open-flow tests were witnessed by Branch technicians on producible gas wells. To ensure that correct gas measurements are being made, 41 orifice and meter-run inspections were done. Twenty water and 10 oil and gas samples were taken from specified wells and forwarded to Victoria for chemical analyses. A total of seven bottom-hole pressure runs was made using the Departmental bottom-hole truck to check reports submitted by companies. Bottom-hole pressure and temperature equipment used by the operating companies was calibrated to a Government standard in the laboratory at the field office. During the year, 296 calibrations of temperature and pressure bombs were made as a service to the industry.

Inspections were carried out at 224 drilling and 970 producing or abandoned locations. Seven Branch vehicles were driven 123,943 miles to complete the inspections and surveys done in 1967. In order that less accessible locations could be reached, two Honda motor-cycles were purchased. These vehicles enabled inspectors to reach 26 locations that were otherwise inaccessible.

On July 15, 1967, the construction of a new office and the enlargement and renovation of the core and sample facilities commenced. During the construction period it was necessary to suspend core and sample examination privileges.

## GEOLOGICAL SECTION

During 1967, Branch geologists concentrated on the geology of oil- and gas-producing strata of northeastern British Columbia. New geologic data were incorporated into the subsurface maps for determination of reserves, land evaluation, permit and lease work evaluation, and special projects. The main sources of information for the geologic studies were permit and lease reports, submitted drilling and production data, well logs, samples, and core.

The geological data were interpreted in relation to the fields of the Province and to a limited extent to the regional geology. Fields receiving the greatest attention were Clarke Lake, Inga, and Stoddart. Regional geology was studied on some aspects of the Cretaceous and the Devonian of northeastern British Columbia. Special projects were undertaken to deal with numerous industry submissions and well classifications. All approved well locations continued to be classified by the Geological Section according to the Lahee system. This system has been adopted to standardize well statistics as defined by the American Association of Petroleum Geologists. Six classifications are used that are based upon the geological interpretation, which are described as follows: (1) New field wildcat—drilled in a geological environment where hydrocarbons have not yet been discovered; (2) new-pool wildcat—drilled in a geological horizon where other pools have been found but the geological conditions are such that searching for a new pool is very hazardous; (3) outpost—drilled with the intent of extending an already partly developed pool by a considerable distance; (4) and (5) deeper-pool and shallow-pool tests—drilled within the known limits of a pool with the intent of searching for hydrocarbons below or above, respectively, the pool or producible horizon; and (6) development—drilled with the intent of further exploiting the pay horizon or pool within the area which has already been essentially proved for production. The results of 1967 drilling for wells classified by the Lahee system are shown in Table 14.

TABLE 14.—SUMMARY OF EXPLORATORY AND DEVELOPMENT WELLS COMPLETED, JANUARY TO DECEMBER, 1967

| | Oil | | Gas | | Total Producers | | Abandonments | | Service Wells | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Footage | No. | Footage | No. | Footage | No. | Footage | No. | Footage | No. | Footage |
| New field wildcats— | | | | | | | | | | | | |
| Northeast | 1 | 5,092 | 6 | 41,128 | 7 | 46,220 | 16 | 110,206 | — | ——— | 23 | 156,426 |
| Offshore | — | ——— | — | ——— | — | ——— | 2 | 19,887 | — | ——— | 2 | 19,887 |
| New-pool wildcats | 3 | 17,052 | 5 | 28,355 | 8 | 45,407 | 30 | 143,850 | — | ——— | 38 | 189,257 |
| Deeper-pool tests | — | ——— | — | ——— | — | ——— | — | ——— | — | ——— | — | ——— |
| Shallower-pool tests | — | ——— | 1 | 1,639 | 1 | 1,639 | 2 | 2,249 | — | ——— | 3 | 3,888 |
| Outposts | 10 | 50,668 | 13 | 67,930 | 23 | 118,598 | 25 | 138,088 | — | ——— | 48 | 256,686 |
| Total exploratory wells | 14 | 72,812 | 25 | 139,052 | 39 | 211,864 | 75 | 414,280 | — | ——— | 114 | 626,144 |
| Stratigraphic wells | — | ——— | — | ——— | — | ——— | — | ——— | — | ——— | — | ——— |
| Development wells | 36 | 176,269 | 18 | 113,564 | 54 | 289,833 | 20 | 94,859 | 3 | 11,743 | 77 | 396,435 |
| Development service wells | — | ——— | — | ——— | — | ——— | — | ——— | 1 | 3,950 | 1 | 3,950 |
| Totals | 50 | 249,081 | 43 | 252,616 | 93 | 501,697 | 95[1] | 509,139 | 4 | 15,693 | 192 | 1,026,529 |

[1] Total includes two wells (2,099 feet) junked and abandoned.

## Geological Laboratories

### *Core and Well Samples*

All cores from British Columbia wells must be preserved in labelled boxes having an inside length not greater than 30 inches and must be delivered to the geological laboratory for permanent storage. During 1967, 1,293 boxes of core from 106 wells were received at the laboratory. At the end of 1967, 25,706 boxes from 1,484 wells were stored.

Unless otherwise directed, any operator who drills a well for petroleum or natural gas is required to take a sample of drilled rock (bit cuttings) at least every 10 feet of depth. Each sample, consisting of several ounces of rock fragments, is placed in a small bag at the well, labelled, and submitted to the geological laboratory, where it is washed and bottled.

Each 10-foot sample is divided, resulting in three complete sets of samples for each well. One set is retained at the Charlie Lake sample library, one is sent to headquarters at Victoria, and the other to the Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, in Calgary. The remainder of the 10-foot sample from the original sample-bag is retained at the laboratory for a period not exceeding one year should further samples be required. The main sample-examination facilities are at Charlie Lake; limited facilities are available at Victoria.

The Charlie Lake sample library and the Geological Survey of Canada sample library in Calgary each has a set of samples from wells drilled in British Columbia since 1948; the Victoria sample library has samples from wells drilled since September, 1957. At the end of 1967 the Charlie Lake sample library contained 529,320 samples, while 527,681 samples were retained in the Victoria library.

During 1967, samples were received at the laboratory from 189 wells. A total of 30,441 10-foot samples was washed and bottled in 1967.

### *Core and Sample Examination*

A nominal fee is charged for the use of the core- and sample-examination facilities provided by the Department.

In 1967, 6,000 boxes of core from 354 wells were studied by oil company personnel and other interested individuals. Cores from 22 wells were temporarily removed from the laboratory by the operators for further studies. Samples from 47 wells were studied, using the laboratory facilities at Charlie Lake.

Since the core- and sample-examination laboratory at Charlie Lake was made available to the public in February, 1961, 54,556 boxes of core have been removed from the racks for examination.

## Exploration

In 1967, 18 oil and gas companies employed seismic crews in northeastern British Columbia. During March, the most active month, 24 crews were working. An annual total of 389 seismic crew-weeks were completed, which included 5.5 crew-weeks in the waters off the west coast of the Province. Some surface geological work was done in northeastern British Columbia and the Fernie area. These exploration activities are listed in Tables 15 and 16.

Moderate development drilling was carried out in five of the Devonian gas accumulations in the Province. Three wells were completed in both the Clarke Lake and Yoyo fields. Gas wells were also completed in the Kotcho and Cabin pools, and the prolific Beaver River pool, located in the extreme northwestern part of the area, was extended by the drilling of Pan Am Beaver c-45-K some 2 miles to the southwest of the previously existing Beaver River well capable of production. All of the pools named, with the exception of Clarke Lake, await the extension of pipe-line facilities before commercial production can commence.

A number of new Devonian pools were discovered during 1967. The wells, Tenn FPC Tooga d-18-K and Pacific Sinclair Shekilie b-46-A, tapped commercial quantities of gas in dolomitized rocks of the Slave Point Formation. An isolated carbonate mass, bearing gas in the Pine Point Formation, was discovered by the well Socony Mobil S Sierra a-98-K. The well Chevron N Helmet a-54-B uncovered significant quantities of natural gas in the lower part of the Pine Point Formation, a zone which has not previously been productive in northeastern British Columbia.

Continued interest was shown for Mesozoic rocks in northeastern British Columbia. It appears that the industry recognized the potential for hydrocarbon accumulations in the Charlie Lake stray sands. A significant portion of the annual drilling was done in the Inga area. This trend, which is productive from a thin, clean sand, was extended 10 miles to the south by the discovery of the South Inga and Coplin pools.

Other significant Charlie Lake discoveries were Champlin Two Rivers 10-5-83-16, CanDel et al Farrell a-41-I, and West Nat et al Halfway 14-11-87-25. The latter well was completed during 1966 but not evaluated until 1967. Compared to previous years, drilling activity declined in the non-continuous Halfway trend. In this area most of the drilling was directed around proven pools, with continued interest encouraged by the discovery of a new pool east of the Peejay trend after the completion of Union et al Crush d-28-F. Three Halfway and one Baldonnel gas discoveries were made in this Halfway trend during 1967.

An area of keen geological interest was opened up during 1967 with the commencement of a drilling programme off the west coast of Vancouver Island.

*Gas Discoveries, 1967*

| Well Authorization No. | Well Name | Total Depth (Ft.) | Status |
|---|---|---|---|
| | *Mesozoic* | | |
| 2056 | CDR Sun Evergreen b-43-J | 4,615 | Halfway gas well. |
| 2060 | Union ARCo Firebird d-43-D | 4,000 | Baldonnel gas well. |
| 2089 | CanDel et al Kobes a-41-I | 6,135 | Charlie Lake-Halfway gas well. |
| 2101 | Pacific SR CanDel Beaverdam d-71-I | 3,722 | Halfway gas well. |
| 2115 | KCL et al Woodrush d-83-H | 3,701 | Halfway gas well. |
| 2119 | Ashland CK Tb Wargen d-19-B | 4,210 | Charlie Lake gas well. |
| 2138 | Pacific et al Ft St John 11-34-83-19 | 4,998 | Halfway gas well. |
| 2139 | Champlin et al Two Rivers 6-9-83-16 | 6,400 | Baldonnel-Halfway gas well. |
| | *Palæozoic* | | |
| 1814 | Socony Mobil S Sierra a-98-K | 1,958 | Pine Point gas well. |
| 2038 | Pacific Sinclair Shekilie b-46-A | 6,690 | Slave Point gas well. |
| 2066 | Tenn FPC Tooga d-18-K | 6,541 | Slave Point gas well. |
| 2108 | Chevron N Helmet a-54-B | 7,195 | Pine Point gas well. |
| 2110 | ROCK Pan Am Shekilie d-73-K | 6,618 | Mississippian gas well. |

*Oil Discoveries, 1967*

| Well Authorization No. | Well Name | Total Depth (Ft.) | Status |
|---|---|---|---|
| | *Mesozoic* | | |
| 2064 | Champlin Two Rivers 10-5-83-16 | 5,358 | Charlie Lake oil well. |
| 2122 | Tenn S Inga 16-7-87-23 | 6,024 | Charlie Lake oil well. |
| 2188 | Pan Am Coplin 6-19-86-23 | 5,670 | Charlie Lake oil well. |

## RESERVOIR SECTION

### Maximum Permissible Rates

In 1967 the Reservoir Section established 49 individual well maximum permissible rates, of which 6 were revisions of existing rates and 18 were interim approvals granted pending further evaluation of reservoir data. One application is on hand pending receipt of supporting data. One application has been received for a revised M.P.R. in response to the memorandum sent to all operators on November 21st. One application for exemption from the off-target factor was pending at December 31st.

A memorandum to all operators was sent on November 21st outlining the procedures to be followed for establishing uniformity in the calculation of M.P.R.s for both individual wells and for units and projects. Also included were instructions relating to the effective date of unit and project M.P.R.s, and in particular where pressure maintenance was to be a factor in calculating an M.P.R.

One application for joint M.P.R. pending at December 31, 1966, was approved in 1967.

One application for revision of a joint M.P.R. pending at December 31, 1966, was approved in 1967. Seven applications for joint M.P.R.s were received and five were approved.

Three applications received for amendment of existing M.P.R.s were approved.

Pacific Petroleums Limited applied for two separate joint M.P.R.s for Pacific Peejay Unit No. 3. The first was for a joint M.P.R. of 5,404 barrels per day for wells producing from the Halfway pool of the Peejay field. The application was published in the Gazette on March 2nd and 9th. Approval was granted on March 31st to become effective on the first day of the month in which injection of water commenced. The effective date was April 1st. The second, for a joint M.P.R. of 2,627 barrels per day, was also approved on March 31st to become effective on April 1st and remain in effect until superseded by the joint water-flood M.P.R.

Pacific Petroleums Limited, on behalf of itself and Sinclair Canada Oil Company, applied for two separate joint M.P.R.s for Pacific-Sinclair Peejay Project. The first was for a joint M.P.R. of 3,046 barrels per day for wells producing from the Halfway pool of the Peejay field. The application was published in the Gazette on March 2nd and 9th. Approval was granted on March 31st to become effective on the first of the month in which water injection commenced. The effective date was April 1st. The second, for a joint M.P.R. of 1,178 barrels per day, was also approved on March 31st to become effective April 1st and remain in effect until superseded by the joint water-flood M.P.R.

Pacific Petroleums Limited applied for a joint M.P.R. of 781 barrels per day for wells in Pacific Currant Unit No. 1 producing from the Halfway pool in the Currant field. The application was published in the Gazette on August 3rd and

10th. The application was then amended by Pacific Petroleums Limited to a lesser joint M.P.R. of 627 barrels per day. This amended application was approved on September 27th to become effective on the first of the month in which water injection commenced. The joint M.P.R. was not in effect at December 31st. An interim joint M.P.R. was approved for 439 barrels per day, being the sum of the primary M.P.R.s of the unit wells, to become effective September 1st and remain in effect until superseded by the joint water-flood M.P.R.

Tenneco Oil and Minerals Limited applied for a joint M.P.R. of 1,806 barrels per day for Tenneco Peejay Project for wells producing from the Halfway pool in the Peejay field. Notice of the application was published in the Gazette on March 2nd and 9th. The application was approved on March 31st to become effective on the first day of the month in which water injection commenced. The effective date was April 1st.

Tenneco Oil and Minerals Limited applied for a joint M.P.R. of 1,535 barrels per day for Tenneco Primary Producing Block for wells producing from the Charlie Lake pool in the Inga field. The application was published in the Gazette on September 28th and October 5th. The application had not been approved at December 31st.

Texaco Exploration Company applied for two separate increases in the joint M.P.R. of the wells in Texaco Boundary Lake Unit No. 2 producing from the Boundary Lake Zone in the Boundary Lake field. The first was to increase the joint M.P.R., on the basis of improved oil recovery from infill drilling and increased water-flood, from 9,892 barrels per day to 25,818 barrels per day. The application was published in the Gazette on July 6th and 13th. The application was approved on August 3rd to become effective on the first day of the month following completion of the infill drilling and increased water injection. The M.P.R. was not in effect at December 31st. The second application was for an increase to the joint M.P.R. granted on August 3rd from 25,818 barrels per day to 27,147 barrels per day to include the M.P.R.s of wells taken into the Unit on September 1st. The application was approved on September 15th to become effective under the same terms as the previous approval. This revision was not in effect at December 31st. Approval was granted effective September 1st for a joint M.P.R. of 11,221 barrels per day, being the sum of the M.P.R.s of wells within the Unit at September 1st, to remain in effect until superseded under the terms of the approvals granted August 3rd and September 15th.

Union Oil Company of Canada Limited applied in 1966 for a joint M.P.R. of 389 barrels per day for wells in the Halfway pool of the Bulrush field. Approval was granted on January 12, 1967, effective January 1st.

Union Oil Company of Canada Limited applied in 1966 for an increase in the joint M.P.R. for Union Peejay Unit No. 2 from 4,014 barrels per day to 7,631 barrels per day. Notice of the application was published in the Gazette on December 15 and 22, 1966. The application was approved February 3, 1967, to become effective on the first day of the month in which water injection commenced. The effective date was April 1st.

Union Oil Company of Canada Limited applied for an increase in the joint M.P.R. of wells in the Halfway pool of Union Peejay Unit No. 2 from 7,631 to 8,229 barrels per day based on enlargement of the Unit. The application was approved April 20th, effective April 1st.

### Absolute Open-flow Potential Tests and Production Rate Limits

Reports of 276 absolute open-flow potential tests of gas wells were processed, and corresponding production rate limits were established during 1967.

The absolute open-flow potentials and production rate limits for all gas wells as at December 31, 1967, except for those in the confidential category, are shown in Table 22. Group production rate limits for units and projects are shown in Table 21.

Texaco Exploration Company applied for a joint production rate limit for wells produced from the Baldonnel Formation in Nig Creek field. Notice of application was published in the Gazette on January 26th and February 2nd and approval was granted on February 17th, effective March 1st. The company subequently applied for an increase of the joint production rate limit. On October 5th the increased rate limit was approved on an interim basis, effective October 1st.

Pacific Petroleums Limited made application for exemption from normal gas-well restrictions for certain wells producing from the Baldonnel Formation in the Bubbles field. Notice of the application was published in the Gazette on October 5th and 13th and was approved on November 2nd, effective November 1st.

Dome Petroleums Ltd., as operator for Laprise Creek Baldonnel Unit No. 1, applied for a revised joint production rate limit for wells in the Unit. Notice of the application was published in the Gazette on November 23rd and 30th and was approved on December 29th, to become effective January 1, 1968.

### Pressure Maintenance

Pacific Petroleums Limited applied for approval of a scheme of pressure maintenance by water injection into a portion of the Halfway pool of the Currant field. Notice of the application was published in the Gazette on August 3rd and 10th. The application was approved on September 27th.

Pacific Petroleums Limited made application for approval of a scheme of pressure maintenance by water injection into a portion of the Halfway pool of the Peejay field known as Pacific Peejay Unit No. 3. Notice of the application was published in the Gazette on March 2nd and 9th. Approval was granted on March 31st.

Pacific Petroleums Limited, on behalf of itself and Sinclair Canada Oil Company, applied for approval of a scheme of pressure maintenance by water injection into a portion of the Halfway pool of the Peejay field known as Pacific-Sinclair Peejay Project. Notice of the application was published in the Gazette on March 2nd and 9th. Approval was granted on March 31st.

Tenneco Oil and Minerals Limited applied for approval of a scheme of pressure maintenance by water injection into a portion of the Halfway pool of the Peejay field known as Tenneco Peejay Project. Notice of the application was published in the Gazette on March 2nd and 9th. The scheme was approved on March 31st.

### Reserves

The calculation of proved reserves of crude oil and established reserves of natural gas and natural-gas products was not complete at the time of printing. The reserves at December 31, 1966, are given in Table 19.

Oilfield and gasfield reservoir data as compiled at the end of 1967 are given in Tables 17 and 18.

## DEVELOPMENT SECTION

### Drilling

No significant changes were recorded in the 1967 drilling operations compared to the work completed during 1966. Total footage drilled decreased 2 per cent, and the number of well completions dropped 10 per cent. For the third consecutive year the annual footage exceeded 1 million feet. This milestone has now been surpassed five times in the past seven years.

To examine changes in footage drilled by well classifications, the following Branch definitions are given. A development well is located within a spacing area that is contiguous to a spacing area containing a well capable of production. Exploratory wells are divided into two types—wildcat and outpost. A wildcat well is located more than 4½ miles from any capable well, and an outpost well is located in the areas between development and wildcat wells. Development wells may be further classified as deep-pool or shallow-pool tests when undeveloped pools below or above the known pool are being explored.

During 1967, development footage increased 5 per cent to 465,914 feet, mainly due to the oil play in the Inga field. Exploratory footage was down 7 per cent, with wildcat footage gaining 14 per cent and outpost footage decreasing 21 per cent. The annual footage for wildcat wells was 288,618 feet, and for outpost wells it was 309,968 feet.

Except for the offshore activity west of Vancouver Island, which consisted of two abandonments and one drilling well at year-end, all the drilling took place in the northeastern corner of the Province.

Minimal movement of drilling rigs in and out of British Columbia was evident during 1967. The issuance or renewal of rig licences and the number of individual rigs employed each varied by only one compared to 1966. The number of operating companies increased by five, with the new entrants primarily smaller oil companies that were successful in obtaining oil and gas rights near areas of active development.

Well completions decreased in 1967 by 22 to 198. Abandonments decreased nearly 20 per cent, with a lesser drop in gas completions and a moderate gain in oil completions. The individual totals for 1967 were 46 oil wells, 43 gas wells, 94 abandonments, 6 service wells, and 9 finished drilling wells, compared to 42 oil wells, 49 gas wells, 116 abandonments, 3 service wells, and 10 finished drilling wells in 1966. The finished drilling wells include locations where the drilling rig has been released but the final status of the well is undetermined.

At the close of 1967, 29 locations were being actively drilled with one suspended pending further drilling at a later date.

In the foregoing compilations, each zone of a multiple completion is counted as a completed well. There were 194 wells actually drilled and completed in 1967, of which four were multiple gas wells.

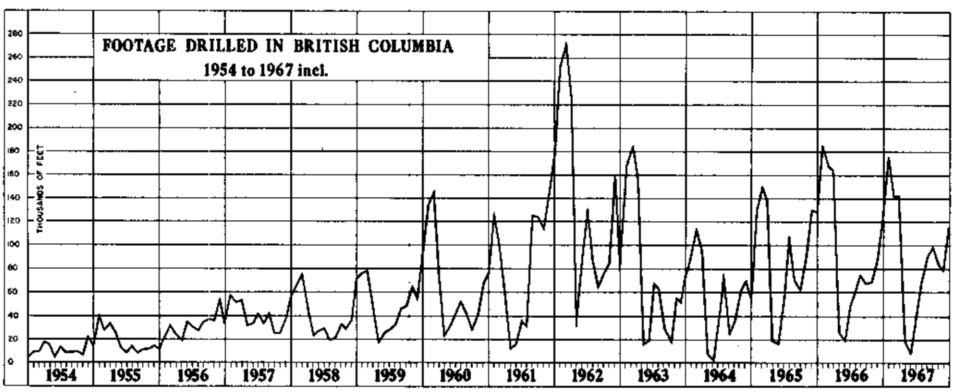


Figure 36. Footage drilled in British Columbia, 1945–67.

Wells drilled and drilling during 1967 are listed in Table 24. Monthly footages drilled since 1954 are given graphically in Figure 36, which reflects the seasonal fluctuations during the years caused by accessibility difficulties.

The number of work-overs reported in 1967 approximated the same volume as during 1966. Work-overs are any operation performed on a well after the release of the drilling rig that changes the producing interval or alters, or intends to alter, the producing characteristics of the well. The producing interval may be changed by perforating, cementing perforations, or by running casing or plugs. The producing characteristics of a well may be changed by any operation performed to increase the production of oil or gas. Changes may include perforating, acidizing, fracturing, installing a pump, or changing a choke, but not the replacement of equipment.

Four new fields were designated by the Branch in 1967, and 10 amendments were made to others. Release of information obtained during the drilling of a well is withheld on the basis or whether or not the well is included in a field. Provided one year has elapsed since the rig-release date of the discovery well, a new field may be designated when one or more wells are on continuous production or three or more capable wells exist in contiguous spacing areas. When an area meets these requirements and a field is outlined by the Branch, well information of field wells may be released 30 days after the rig-release date; otherwise the data are held confidential for one year or until the requirements for field designation are met.

During 1967 new fields were designated at Buick Creek North, Bulrush East, Inga, and Wolf, while field boundaries were altered in Clarke Lake, Kotcho Lake, Peejay, Rigel, Stoddart, Weasel, and Yoyo. Initially, newly designated fields are based upon a geological interpretation. Extensions are made by whole spacing areas as the fields are developed by the drilling of successful wells. The 53 oil and gas fields of British Columbia are listed in Table 25 and their locations are shown in Figure 37.

Approval of all submissions made pertaining to drilling operations is a responsibility of the Development Section. Such approvals must be obtained prior to the commencement of drilling a well, changing a well name, and abandoning a location or any alteration proposed to change the physical characteristics of the well. When a submission is made to the Development Section, a review is done concerning the proposed programme, the title under which the petroleum and natural-gas rights are held, and any other relevant requirements of the regulations. With each application for a well authorization, a surveyed position of the well-site must be given, and this position must conform with the regulations.

Any application that is submitted to alter the equipment in a well or the proposed programme for a well is handled in a similar manner. Details of the alteration are examined and given approval by the various sections of the Branch. Prior to the abandonment of wells, the operators must submit an abandonment programme to the field engineer for his approval, but all other types of alterations are studied at Victoria, where official records are retained.

There were 201 well authorizations issued in 1967, representing a decrease of 9 per cent from 1966. Seven well authorizations were cancelled due to changes in drilling programmes.

Various maps are prepared for distribution to the petroleum industry and other interested persons. Designated fields, well locations, plus plant and pipe-line facilities are given. These maps are mailed to regular subscribers, or they may be obtained by writing to the Department of Mines and Petroleum Resources, Victoria.

Two fires of a minor nature involving production equipment were reported during 1967.

FIELDS & POOLS - DEC. 31, 1967

| NO. | FIELD | PRODUCING HORIZON OIL | GAS |
|---|---|---|---|
| 1 | AITKEN CR. | GETHING | |
| 2 | BEATTON R. | HALFWAY | |
| 3 | BEATTON R. WEST | BLUESKY-GETHING | |
| 4 | BEAVERDAM | HALFWAY | |
| 5 | BEG | | BALDONNEL<br>HALFWAY |
| 6 | BEG WEST | | BALDONNEL |
| 7 | BERNADET | | BLUESKY-GETHING |
| 8 | BLUEBERRY | MISSISSIPPIAN | DUNLEVY<br>BALDONNEL<br>CHARLIE LAKE |
| 9 | BLUEBERRY EAST | | BALDONNEL<br>HALFWAY<br>MISSISSIPPIAN |
| 10 | BLUEBERRY WEST | | DUNLEVY<br>BALDONNEL |
| 11 | BOUNDARY LAKE | BOUNDARY LAKE<br>HALFWAY | BLUESKY-GETHING<br>GETHING<br>DUNLEVY<br>BALDONNEL |
| 12 | BOUNDARY L.N. | | HALFWAY |
| 13 | BUBBLES | | BALDONNEL |
| 14 | BUICK CREEK | | DUNLEVY<br>CHARLIE LAKE |
| 15 | BUICK CR. EAST | | BLUESKY-GETHING<br>DUNLEVY |
| 16 | BUICK CR. WEST | DUNLEVY | BALDONNEL<br>HALFWAY |
| 17 | BUICK NORTH | | DUNLEVY |
| 18 | BULRUSH | HALFWAY | |
| 19 | BULRUSH EAST | HALFWAY | |
| 20 | CHARLIE LAKE | GETHING | |
| 21 | CLARKE LAKE | | SLAVE POINT |
| 22 | CURRANT | HALFWAY | HALFWAY |
| 23 | DAWSON CREEK | | CADOTTE |
| 24 | FORT ST. JOHN | CHARLIE LAKE | CADOMIN<br>BALDONNEL<br>HALFWAY<br>BELLOY |
| 25 | FORT ST. JOHN S.E. | | CADOMIN<br>BALDONNEL<br>HALFWAY<br>BELLOY |
| 26 | GUNDY CREEK | | BALDONNEL<br>CHARLIE LAKE |
| 27 | HALFWAY | | BALDONNEL<br>HALFWAY |
| 28 | HIGHWAY | | DUNLEVY<br>BALDONNEL<br>MISSISSIPPIAN |
| 29 | INGA | CHARLIE LAKE | |
| 30 | JEDNEY | | GETHING<br>BALDONNEL<br>HALFWAY |
| 31 | JEDNEY WEST | | BALDONNEL<br>HALFWAY |
| 32 | KOBES-TOWNSEND | | DUNLEVY<br>CHARLIE LAKE<br>HALFWAY<br>MISSISSIPPIAN |
| 33 | KOTCHO LAKE | | SLAVE POINT |
| 34 | LAPRISE CREEK | | BALDONNEL |
| 35 | LAPRISE CR. WEST | | BALDONNEL |
| 36 | MILLIGAN | HALFWAY | |
| 37 | MONTNEY | | BLUESKY-GETHING<br>CHARLIE LAKE<br>HALFWAY |
| 38 | NETTLE | BLUESKY-GETHING | HALFWAY |
| 39 | NIG CREEK | | BALDONNEL |
| 40 | OSPREY | HALFWAY | |
| 41 | PARKLAND | | WABAMUN |
| 42 | PEEJAY | HALFWAY | |
| 43 | PEEJAY WEST | HALFWAY | |
| 44 | PETITOT RIVER | | SLAVE POINT |
| 45 | RED CREEK | | CHARLIE LAKE<br>HALFWAY |
| 46 | RIGEL | | DUNLEVY |
| 47 | STODDART | | BELLOY |
| 48 | STODDART WEST | | BELLOY |
| 49 | WEASEL | HALFWAY | |
| 50 | WILDMINT | HALFWAY | |
| 51 | WILLOW | BLUESKY-GETHING | HALFWAY |
| 52 | WOLF | HALFWAY | |
| 53 | YOYO | | SLAVE PT.-PINE PT. |

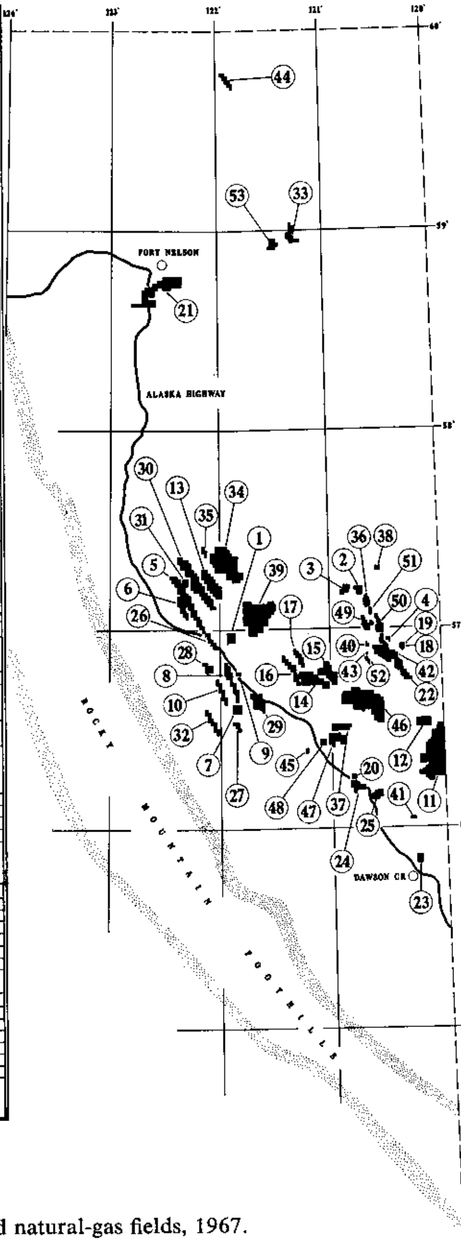


Figure 37. Petroleum and natural-gas fields, 1967.

The disposal of salt water produced with petroleum and natural gas was accomplished by evaporation in surface pits or by injection into one of the four water-disposal wells situated in producing areas. During 1967 there were 468,700 barrels injected into subsurface formations and 484,925 barrels delivered to flare pits for disposal by evaporation.

Water-flood operations to enhance the production of oil continued to expand in 1967. A total of 33,154,054 barrels was injected into six producing pools in the Province. The source of this water is principally fresh water obtained from or near the surface with a minor amount of salt water recovered during producing operations.

## Production

Production of crude oil and natural gas in British Columbia was greatly increased during 1967 compared to the 1966 totals. Natural-gas production was up 24 per cent, while oil production gained a substantial 18 per cent.

The Boundary Lake field continued its role of the largest oil-producing field, and significant increases were made by the established Peejay and Bulrush fields with an important contribution obtained from the newly developed Inga field. Production from Boundary Lake was 6,702,945 barrels, with Peejay and Milligan Creek supplying 5,144,821 and 3,558,644 barrels respectively. These three fields, all under enhanced production by water-flood programmes, accounted for nearly 80 per cent of the Provincial supply. The Weasel, Blueberry, and Inga fields each produced in excess of 800,000 barrels during 1967. Some fields, particularly Aitken Creek, Beatton River, Currant, and Blueberry, reported decreases in production, indicative that the peak production periods have been surpassed.

The greatest producing field for natural gas was Clarke Lake with 67,053,152 M s.c.f., about one-third of British Columbia's total. Other major producers, in order of volume, were Laprise Creek, 27,223,352 M s.c.f.; Jedney, 20,599,214 M s.c.f.; Nig Creek, 18,771,219 M s.c.f.; Rigel, 15,557,825 M s.c.f.; and Beg, 10,741,001 M s.c.f.

Monthly crude-oil and natural-gas production for 1967 by fields and pools is given in Tables 27 and 28.

Graphs of monthly production for the period 1954 to 1967 are shown in Figures 38 and 39.

Production of butane and propane increased 21 and 13 per cent respectively compared to 1966 production, while sulphur decreased 4 per cent to 48,625 long tons.

General statistics showing well operation and production data are given in Table 29. The monthly dispositions of the various petroleum products are shown in Tables 30, 31, and 32. Monthly values to the producers are given in Table 33.

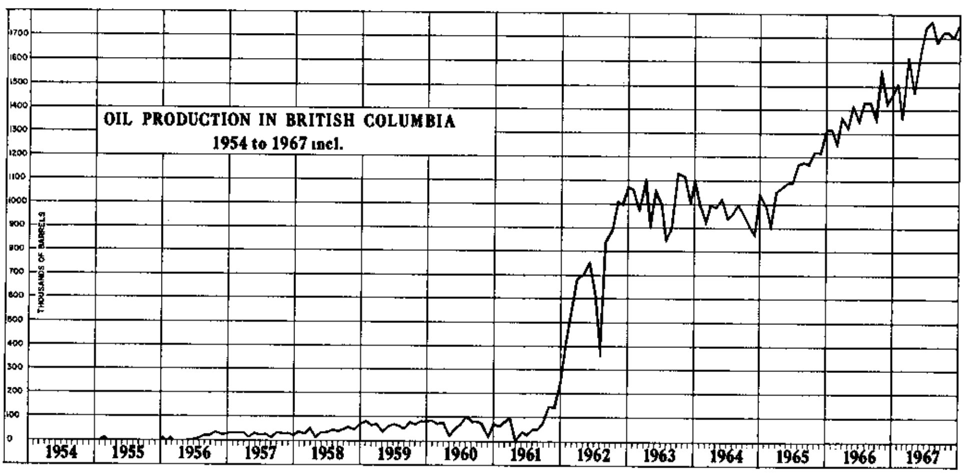


Figure 38. Oil production in British Columbia, 1954–67.

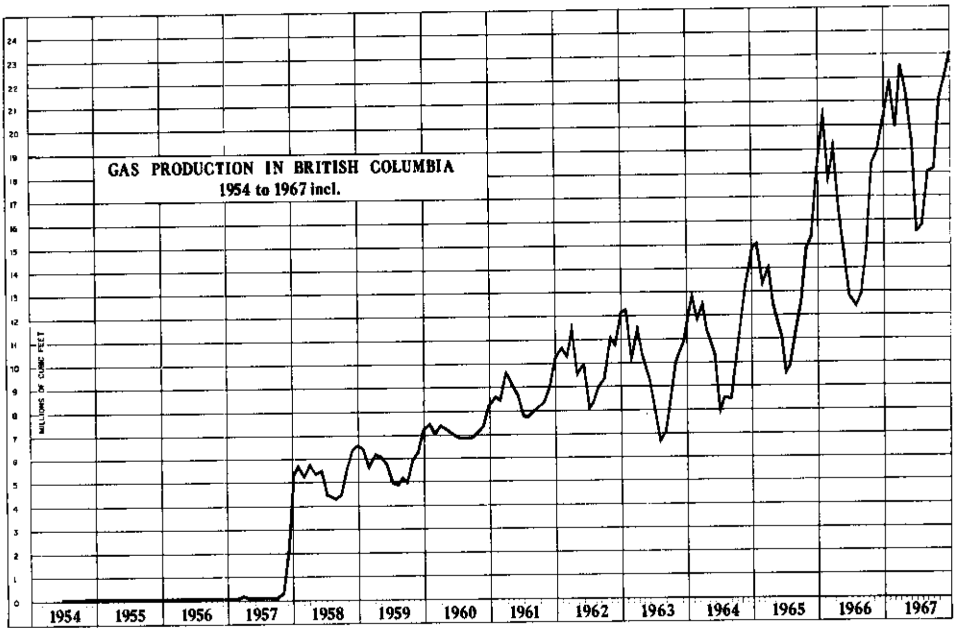


Figure 39. Gas production in British Columbia, 1954–67.

## Pipe-lines

### *Oil-gathering System*

The throughput of the pipe-line from the Boundary Lake-Beatton River oil-producing area to the refinery at Taylor was increased to 53,368 barrels per day. An addition to the British Columbia Oil Transmission Co. Ltd. pipe-line to gather crude oil from the Inga field was put into operation during 1967. It was constructed with a capacity of 4,000 barrels per day.

### *Oil-transmission System*

Western Pacific Products and Crude Oil Pipelines Ltd. increased the capacity of its pipe-line to 48,672 barrels per day by the installation of six additional pumping-stations.

### *Gas-gathering System*

No changes were reported in the gas-gathering system in the Province in 1967.

### *Gas-transmission System*

Inland Natural Gas Co. Ltd. and Northland Utilities (B.C.) Ltd. made additions to their systems of 9.8 and 3.4 miles respectively.

### *Gas-distribution System*

Minor expansions were completed to four gas-distribution systems during 1967. A total of 149 miles of pipe-line was constructed and put into operation.

## Oil Refineries

Construction of the Prince George refinery, with a capacity of 7,500 barrels per day, was completed by Union Oil Company of Canada Ltd. during 1967. Pacific Petroleums Limited added equipment to raise the capacity of the Taylor refinery by 2,000 barrels per day. These two additions increased the Provincial capacity to 109,900 barrels per day. Oil-storage capacity at the refineries was increased to 831,700 barrels.

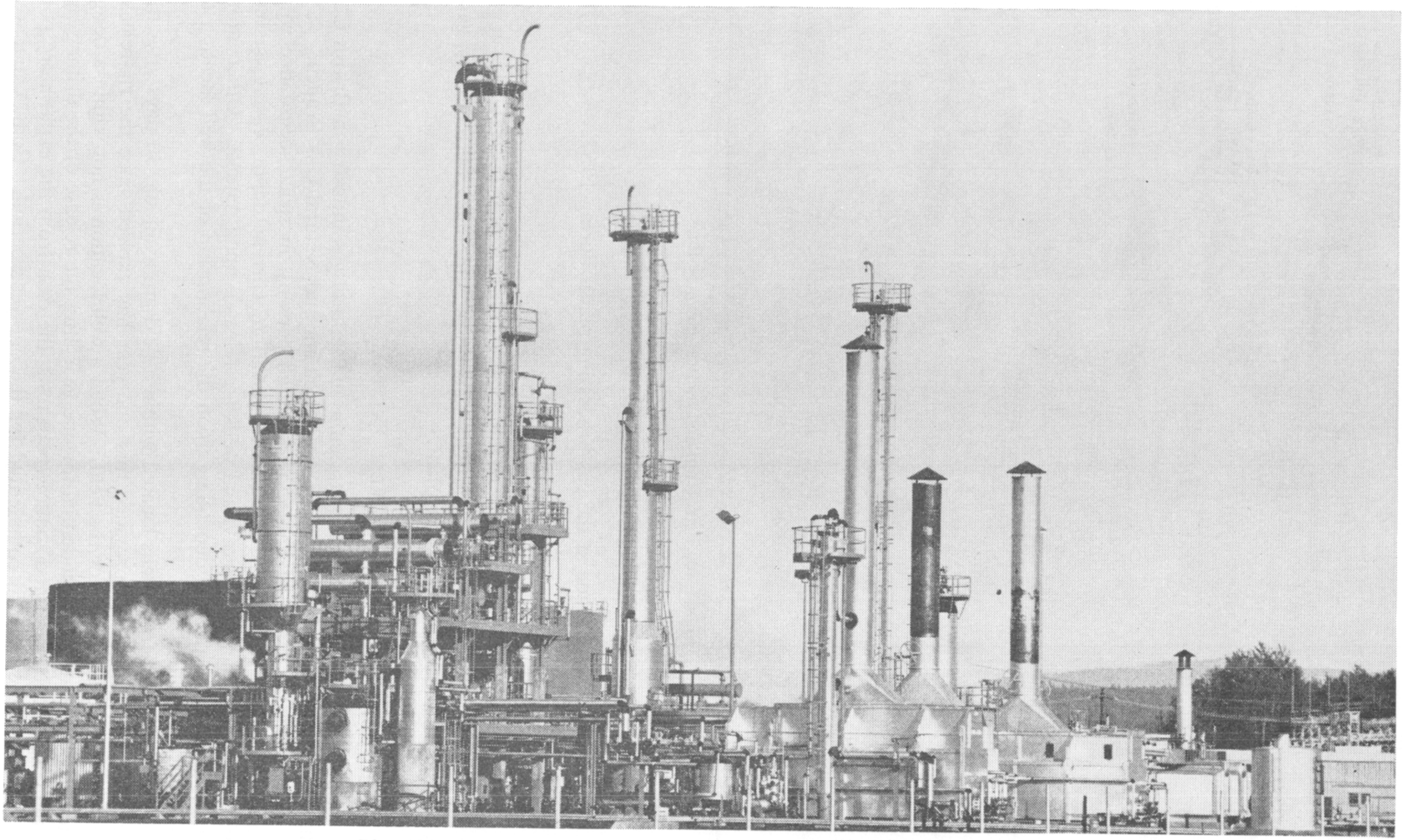

Plate IX. Union Oil Company of Canada Limited, Prince George refinery.

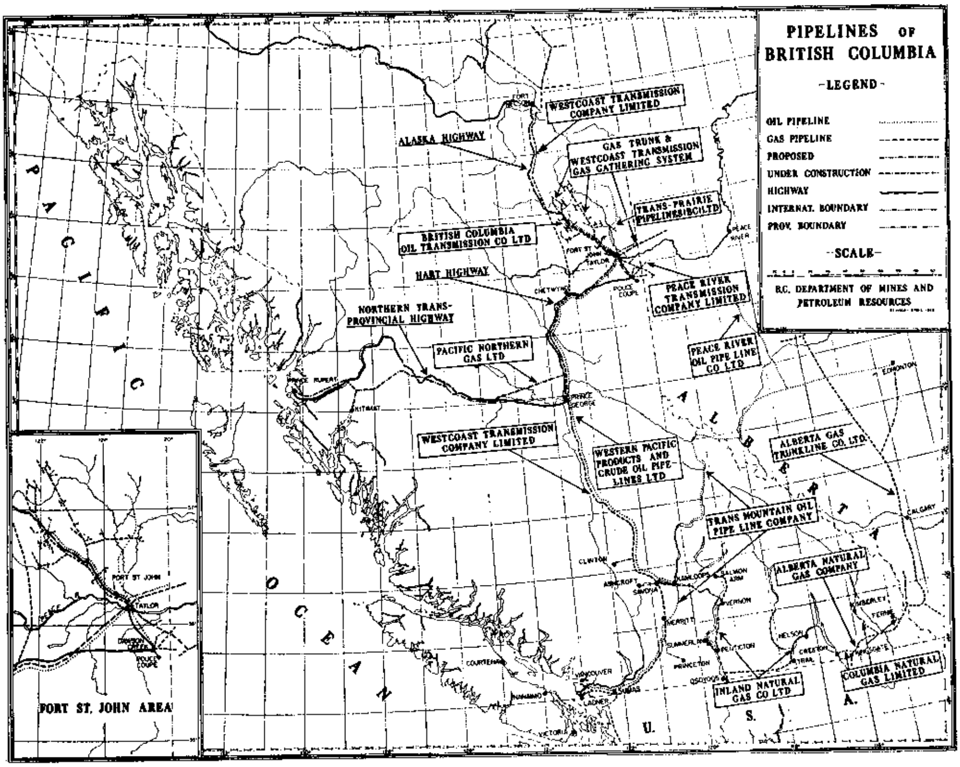


Figure 40. Petroleum and natural-gas pipe-lines.

## Gas-processing Plants

No changes were made at the gas-processing plants during 1967.

## Sulphur Plants

No changes were made at the sulphur plant located at Taylor.

Tables 34, 35, 36, 37, and 38 provide data on the pipe-lines, oil refineries, gas-processing plants, and the sulphur plant.

## Well Records

Information concerning the petroleum and natural-gas industry in British Columbia is collected and compiled by the Petroleum and Natural Gas Branch.

The data are made available to interested persons, in strict accordance with section 51 of the regulations. Location, elevation, current depth, casing, status, and monthly production of individual wells are released upon request. Other information is held confidential, depending upon the relationship of the well location to the designated fields.

Data obtained from wells located within a field are available 30 days after the release of the drilling rig, provided that one year has expired since the rig-release date of the discovery well for the field. When a well location is not within a designated field, all data are confidential for one year after the release of the drilling rig. In the case of deep-pool and shallow-pool tests, the data from the exploratory portions of the wells are held confidential for the one-year period. Confidential well information may be released to an interested person, if a letter is received by the Branch from the operator of the well authorizing its release.

Information is released by publication, examination of Branch records, or reproduction of data. Cost-defraying charges are made by the Branch for these services.

The records maintained by the Branch are in constant use by the Reservoir, Development, and Geological Sections; therefore, they must be kept up to date and in a manner suitable for many purposes. As the published reports are expanded to meet the requirements of the industry and of other government bodies, the systems of keeping records must be altered.

The Branch has representation on the Statistical Sub-committee which was established at the request of the Mines Ministers' Conference in 1955. This committee is composed of representatives from each Province actively engaged in the petroleum industry and personnel employed by oil companies. The objectives of the group are as follows:—

(1) Standardization of forms designed for the same purpose but which are required individually by both the Provincial and Federal Governments under different formats.

(2) Standardization of forms to accommodate machine accounting procedures for reporting production statistics to the Provincial Governments.

(3) Amendment of existing model report forms to conform with present requirements.

(4) Investigation of ways and means to obtain the co-operation of both Provincial and Federal Government agencies and provide earlier availability of information on all phases of the oil and gas industry.

One meeting of the Statistical Sub-committee was held in 1967, when revisions in the model forms were approved and discussions were held concerning the procedures and reports employed by the Provincial authorities. The Petroleum and Natural Gas Branch has adopted many features of these model forms and uses the following applications and reports:—

| Form. No. | Form Name |
|---|---|
| 1. | Well Register. |
| 2. | Application for a Well Authorization. |
| 3. | Application to Amend a Well Authorization. |
| 4. | Application to Change a Well Name. |
| 5. | Application to Abandon a Well. |
| 6. | Application to Alter a Well. |
| 7. | New Oil Well Report. |
| 8. | New Gas Well Report. |
| 9. | Application for M.P.R. |
| 10. | Report of Wells Connected to a Battery. |
| BC S1. | Monthly Production Report. |
| BC S2. | Monthly Disposition and Crown Royalty Statement. |
| 15. | Monthly Gas-gathering Operations Report. |
| 16. | Monthly Natural Gas Plant Statement. |
| 17. | Monthly Natural Gas Processing Statement. |
| 18. | Monthly Sulphur Plant Operations Report. |
| 19. | Monthly Refinery Operations Report. |
| 20. | Monthly Crude Oil and Condensate/Pentanes Plus Purchaser's Statement. |
| 21. | Monthly Liquefied Petroleum Gas Purchaser's Statement. |
| 22. | Well Completion Report. |
| 23. | Supplement to Well Completion Report. |

| Form. No. | Form Name |
|---|---|
| 24. | Work-over Report No. |
| *25. | Work-over Card. |
| *26. | Monthly Operations Report. |
| 27. | Application for a Rig Licence. |
| 28. | Monthly Water Flood Operations Report. |
| 29. | Monthly Water Receipts and Disposal Report. |
| 30. | Statement of Nomination and Estimated Requirements for British Columbia Crude Oil, Condensate/Pentanes Plus. |
| 31. | New Service Well Report. |
| 32. | Well Allowable Report. |
| *33. | Drilling Report. |
| *7C. | Meter Inspection Report. |
| *7D. | Battery Inspection Report. |
| | †Monthly Natural Gas Distributor's Statement. |
| | †Monthly Report on Oil Pipeline Gathering Operations. |

* For Departmental use only.
† Used in conjunction with the Dominion Bureau of Statistics.

The Branch has representation on the Provincial-Federal Committee on Oil and Gas Statistics, which held one meeting during 1967. The purpose of this committee is to establish and revise, as required, statistical forms on the production, transportation, and distribution of oil and gas and to foster the joint collection of these statistics, eliminating as much duplication by the Provincial and Federal agencies as possible.

## REPORTS

### *Schedule of Wells*

In 1967 a composite volume was compiled giving all non-confidential well information to 8 a.m., January 1, 1967. The data contained in previously published volumes were consolidated and expanded to include the releasable information for the 1966 wells.

The data are arranged by location and provide the following information where applicable: Well authorization number, well name, location, classification, co-ordinates, K.B. elevation, total depth, status, interval(s) open to production, casing size and depth, spud date, rig-release date, logs taken, cored intervals, sampled interval, drill-stem test data, and geological formation depths determined by the petroleum geologists.

The information was condensed from reports submitted to the Branch by the various operators.

### *Weekly Report*

A weekly report is published for Departmental use from data collected by the field office staff at Charlie Lake. The week reported is from 8 a.m. on Friday to the succeeding Friday. The following information is included:—

(1) Spudded wells.
(2) Cancelled locations.
(3) Changes of well names.
(4) Changes of well classification.
(5) Changes of well status.
(6) Suspended wells.
(7) Finished drilling wells.
(8) Abandoned wells.

(9) Oil wells.
(10) Gas wells.
(11) Work-overs.
(12) Operating wells.
(13) Approved wells not spudded.
(14) Summary of well count giving the following totals:—
 (*a*) Finished drilling wells.
 (*b*) Abandoned wells.
 (*c*) Oil wells.
 (*d*) Gas wells.
 (*e*) Water-injection wells.
 (*f*) Gas-injection wells.
 (*g*) Water-source wells.
 (*h*) Observation wells.
 (*i*) Disposal wells.
 (*j*) Completed wells.
 (*k*) Locations drilled.
 (*l*) Multiple completions.
 (*m*) Drilling wells.
 (*n*) Suspended wells.
 (*o*) Approved but not spudded wells.
 (*p*) Locations in good standing.
 (*q*) Locations approved.
 (*r*) Locations cancelled.

The number of completed wells is calculated by two methods to provide verification. The number of wells of different status, counting each zone of a multiple completion as a well, is compared to the number of locations drilled less the multiple completions.

The number of locations in good standing is calculated also by two methods. The total number of locations drilled, drilling, suspended, and approved but not spudded is compared to the total number of locations approved less the number of locations cancelled.

*Oil and Gas Production Report*

The Oil and Gas Production Report is prepared monthly from returns made by the operators of the producing wells, pipe-lines, gas plants, refineries, and distribution facilities. The contents of the report are as follows:—

(1) Graphical presentations of the daily average oil production, the daily average marketable gas production, and the monthly footage drilled with comparative graphs of the totals for the preceding year.
(2) Monthly summary of the drilling and completion activity with cumulatives for the year and comparative figures for the same month of the preceding year.
(3) New oil- and gas-well reports received.
(4) The number of producing and producible oil and gas wells by field and pool and comparative figures for the same month of the preceding year.
(5) Production of crude oil, natural gas, condensate, and water by field and pool with comparative volumes produced in the same month of the preceding year. These quantities are given for the current month, the current year, and the all-time cumulative.
(6) Estimated oil production for the succeeding month.
(7) Crude oil and equivalent disposition.

(8) Value of crude-oil sales to British Columbia producers.
(9) Disposition of produced water.
(10) Tabulation of nominations and estimated requirement for British Columbia crude oil and condensate/pentanes plus.
(11) Approved maximum permissible rates.
(12) Withdrawn maximum permissible rates.
(13) Approved absolute open-flow potential tests.
(14) Natural-gas disposition.
(15) Value of natural gas to British Columbia producers and distributors.
(16) Production and disposition of condensate/pentanes plus, butane, propane, and sulphur.
(17) Value of sales of natural-gas liquids and sulphur to British Columbia producers.
(18) Water-flood operations showing the number of injection wells and the current monthly, current yearly, and all-time cumulative figures for each formation in each pool and field.

This report is compiled and mailed to subscribers approximately two weeks after receipt of the returns from the operators.

*Drilling and Land Report*

The Drilling and Land Report is published and distributed monthly concurrently with the Oil and Gas Production Report.

The Drilling Section is compiled from information forwarded by the Branch field office and contains the following:—

(1) Monthly summary of drilling and completion activity with cumulatives for the year, and comparative figures for the same month of the preceding year.
(2) Summary of the well count giving the following totals:—
  (*a*) Locations drilled.
  (*b*) Finished drilling wells.
  (*c*) Abandoned wells.
  (*d*) Oil wells.
  (*e*) Gas wells.
  (*f*) Water-injection wells.
  (*g*) Gas-injection wells.
  (*h*) Water-source wells.
  (*i*) Observation wells.
  (*j*) Disposal wells.
(3) Well authorizations approved.
(4) Locations cancelled.
(5) Locations outstanding.
(6) Changes of well status.
(7) Changes of well classification.
(8) Changes of well names.
(9) Suspended wells.
(10) Drilling and completed wells.
(11) Rig licences issued.
(12) Rig licences renewed.
(13) Rig licences cancelled.
(14) Well data released from confidential status.
(15) Descriptions of designated fields.

The Land Section is prepared by the Petroleum and Natural Gas Titles Section and contains the following:—

(1) Acreage synopses.

(2) Summary of changes in acreage held under the following titles:—
  (a) Permits.
  (b) Leases.
  (c) Natural-gas licences.
  (d) Drilling reservations.

(3) Geophysical licences issued and renewed.

(4) Notices regarding sales of Crown petroleum and natural-gas rights.

(5) Summary of disposition of permits, leases, natural-gas licences, and drilling reservations.

## Publications

Various publications, maps, and services concerning petroleum and natural-gas operations in British Columbia are available. A catalogue containing descriptions and prices is available from the Chief Petroleum and Natural Gas Commissioner, Administration Branch, or the Chief, Petroleum and Natural Gas Branch, Department of Mines and Petroleum Resources, Parliament Buildings, Victoria, B.C.

## Table 15.—Geophysical Exploration, 1967

*Seismic Surveys*

Note.—Unless otherwise shown, the exploration method used is the reflection seismic survey. For indicating location, the National Topographic Series grid system is used, except in the Peace River Block, where the township system is used.

| Company | Location of Exploration | Number of Seismic Crews | Number of Crew-weeks |
|---|---|---|---|
| *January* | | | |
| Atlantic Richfield | 94-P-7 | 1 | 3 |
| | 94-I-6 | 1 | 2 |
| Canadian Delhi Oil | 94-H-16 | 1 | 2 |
| Canadian Superior | 94-I-7, -8 | 1 | 1.3 |
| Chevron Standard | 94-I, 94-P | 2 | 6.5 |
| Dome Petroleum | 94-P-7, -10, -11 | 1 | 4 |
| French Petroleum Company of Canada | 94-G-16; 94-H-13; 94-I-4, -5; 94-J-1, -2, -7, -8 | 1 | 4.5 |
| Marathon Oil | 94-P-7, -8 | 1 | 2 |
| Pacific Petroleums | 94-I-11, -14, -15; 94-J-6, -10, -11 | 3 | 9 |
| Pan American | 94-I-2, -6, -7, -9; 94-P-8, -9, -16 | 4 | 43.3 |
| Texaco Exploration | 94-H-14, -15, -16; 94-I-1, -2, -3 | 1 | 3 |
| | 94-P-9, -10, -15, -16 | 1 | 3 |
| Union Oil Company of Canada | 94-H-16 | 1 | 1.9 |
| *February* | | | |
| Amerada Petroleums | 94-I-3 | 1 | 4 |
| Atlantic Richfield | 94-I-4 | 1 | 4 |
| Canadian Delhi Oil | 94-H-16 | 1 | 4 |
| Canadian Superior | 94-I-7, -8 | 1 | 4 |
| | 94-H-14 | 1 | 1.9 |
| Chevron Standard | 94-I, 94-P | 2 | 8 |
| French Petroleum Company of Canada | 94-G-16; 94-H-13; 94-I-4, -5; 94-J-1, -2, -7, -8 | 1 | 2 |
| | 94-I-15; 94-P-2 | 1 | 2 |
| Hudson's Bay Oil & Gas | 94-P-14 | 1 | 1 |
| Pacific Petroleums | 94-J-9, -10; 94-P-3, -4, -5 | 2 | 7 |
| Pan American | 94-I-1, -2, -3, -4, -5, -6, -7; 94-P-8, -9 | 4 | 35.5 |
| Texaco Exploration | 94-I-1, -2, -3, -6, -7, -10, -11; 94-H-14, -15, -16 | 1 | 4 |
| | 94-P-9, -10, -15, -16 | 1 | 4 |
| Union Oil Company of Canada | 94-H-16 | 1 | 6.8 |

TABLE 15.—GEOPHYSICAL EXPLORATION, 1967—*Continued*

| Company | Location of Exploration | Number of Seismic Crews | Number of Crew-weeks |
|---|---|---|---|
| *March* | | | |
| Amerada Petroleums | 94-I-3 | 1 | 4 |
| Atlantic Richfield | 94-I-8 | 1 | 2 |
| Canadian Delhi Oil | 94-H-16; 94-I-1 | 1 | 4 |
| Canadian Superior | 94-I-7, -8 | 1 | 4.4 |
| | 94-H-14 | 1 | 1 |
| Chevron Standard | 94-I; 94-P | 2 | 3.5 |
| Dome Petroleum | 94-H-10, -11 | 1 | 4 |
| French Petroleum Company of Canada | 94-I-15; 94-P-2 | 1 | 4 |
| Hudson's Bay Oil & Gas | 94-P-14 | 2 | 8 |
| Imperial Oil Enterprises | 94-I-6 | 1 | 1 |
| Pacific Petroleums | 94-H-5, -7, -8, -9, -10; 94-I-9, -14, -16; 94-G-8 | 3 | 7 |
| Pan American | 94-I-2, -3; 94-O-1; 94-P-7, -8, -9, -11, -16 | 5 | 46.8 |
| Texaco Exploration | 94-I-6, -7, -10, -11 | 1 | 4 |
| | 94-O-8; 94-P-3, -4, -5, -6, -9, -10, 12, 15, 16 | 1 | 4 |
| Texas Gulf Sulphur | 93-O-9 | 1 | 1[1] |
| Union Oil Company of Canada | 94-H-16 | 1 | 0.9 |
| *April* | | | |
| Canadian Superior | 94-I-7, -8 | 1 | 0.3 |
| Pan American | 94-P-7 | 1 | 4.6 |
| *May* | | | |
| Texaco Exploration | 94-I-8, -9 | 1 | 2 |
| *June* | | | |
| Texaco Exploration | 94-I-8, -9 | 1 | 4 |
| *July* | | | |
| French Petroleum Company of Canada | 93-P-9 | 1 | 4 |
| Texaco Exploration | 94-H-14 | 1 | 4 |
| | 94-I-8, -9 | 1 | 3 |
| *August* | | | |
| French Petroleum Company of Canada | 93-P-9 | 1 | 3 |
| Pacific Petroleums | 94-J-7 | 1 | 2 |
| Texaco Exploration | 94-H-14 | 1 | 1 |
| | 94-P-1, -2 | 1 | 4 |
| | 94-H-11 | 1 | 1 |
| Texas Gulf Sulphur | 93-O-9 | 1 | 2.5 |
| *September* | | | |
| Canadian Delhi | 94-A-5; 94-B-8 | 1 | 2 |
| Pacific Petroleums | 94-G-15, -16; 94-H-12, -13; Tps. 85, 86, R. 17, W. of 6th M.; Tp. 85, R. 20, 21, 22, W. of 6th M. | 3 | 6 |
| Pan American | 94-I-7, -8 | 2 | 2.7 |
| | 94-N-10, -12, -15, -16 | 2 | 3.4 |
| Shell Canada[2] | 92-C-12, -13; 92-D-9, -16; 92-E-1; 92-F-4 | 1 | 1.5 |
| Texaco Exploration | 94-P-1, -2 | 1 | 2 |
| | 94-H-6, -7, -10 | 1 | 4 |
| Texas Gulf Sulphur | 93-O-9 | 1 | 3 |
| | 93-P-5 | 1 | 1 |
| *October* | | | |
| Marathon Oil | 94-H-13; 94-I-4 | 1 | 4 |
| Pacific Petroleums | Tp. 86, R. 18, 19, W. of 6th M.; Tp. 86, R. 22, 23, W. of 6th M.; 94-J-7, -10 | 3 | 5 |
| Pan American | 94-I-7, -8 | 1 | 2.1 |
| | 94-I-2 | 1 | 1.9 |
| Shell Canada[2] | 92-E-2, -6, -7 | 1 | 1.5 |
| Texaco Exploration | 94-H-6 | 1 | 1 |
| Texas Gulf Sulphur | 93-O-9 | 1 | 2 |
| | 93-P-5 | 1 | 2 |

[1] Reflection and refraction.
[2] Marine geophysical survey.

TABLE 15.—GEOPHYSICAL EXPLORATION, 1967—*Continued*

| Company | Location of Exploration | Number of Seismic Crews | Number of Crew-weeks |
|---|---|---|---|
| *November* | | | |
| French Petroleum Company of Canada | 94-A-4 | 1 | 2 |
| | 94-B-9 | 1 | 1 |
| Pacific Petroleums | 94-J-7, -10 | 2 | 3 |
| Pan American | 94-I-7 | 1 | 5 |
| | 94-I-6 | 1 | 1.1 |
| Shell Canada[2] | 92-C-12, -13; 92-D-9, -16 | 1 | 1 |
| | 92-C-5; 92-E-2, -3, -6, -7 | 1 | 1.5 |
| Texas Gulf Sulphur | 93-P-5 | 1 | 0.5 |
| *December* | | | |
| Atlantic Richfield | 94-P-1, -2 | 1 | 1 |
| Central-Del Rio | 94-H-6 | 1 | 1 |
| French Petroleum Company of Canada | 94-B-9 | 1 | 2 |
| Mobil Oil Canada | 94-I-12 | 1 | 0.5 |
| Pacific Petroleums | 94-J-7, -10; 94-G-10; 94-I-14; 94-P-5,-6 | 2 | 8 |
| Pan American | 94-I-6 | 2 | 3 |
| | 94-I-5 | 2 | 2 |
| | Tp. 77, R. 15, 16, 17, 18, W. of 6th M.; Tp. 78, R. 15, 16, 17, W. of 6th M.; 93-P-10 | 2 | 4.1 |

[2] Marine geophysical survey.

TABLE 16.—SURFACE GEOLOGICAL EXPLORATION, 1967

| Company | Location of Exploration | Number of Geologists | Two-man Party-weeks |
|---|---|---|---|
| *July* | | | |
| Pan American | 94-G-2 | 4 | 6 |
| *August* | | | |
| Shell Canada | 82-J-2, -7 | 3 | 1.5 |
| *September* | | | |
| French Petroleum Company of Canada | 94-A, B | 2 | 2 |
| Pan American | 82-J-7 | 3 | 3 |
| Shell Canada | 82-J-2, -7 | 3 | 3 |

## TABLE 17.—OILFIELD RESERVOIR DATA, DECEMBER 31, 1967

| Field | Pool | Rock Type | Age | Trap | Drive Mechanism | Average Porosity (per Cent) | Average Reservoir Thickness (Net Ft.) | Average Permeability (Md.) | Average Water Saturation (per Cent) | Shrinkage Factor (Stock Tank Barrel per Reservoir Barrel) | Gravity Degrees (A.P.I.) | Original Pressure (Psig.) | Average M.P.R. (Bbl./Day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aitken Creek | Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | Depletion and gas cap | 12 | 17 | 3,340 | 18 | 0.77 | 39.2 | 1,548 | 175 |
| Beatton River | Halfway | Sandstone | Triassic | Structural-stratigraphic | Depletion | 20 | 10 | 288 | 24 | 0.86 | 40.4 | 1,172 | 205 |
| Beatton River West | Bluesky-Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | Depletion and gas cap | 14 | 8 | 65 | 31 | 0.80 | 42.1 | 1,031 | 79 |
| Beaverdam | Halfway | Sandstone | Triassic | Stratigraphic | Depletion | 12 | 20 | 16 | 14 | 0.83 | 38.8 | 1,300 | 580 |
| Blueberry | Mississippian | Carbonate | Mississippian | Structural-stratigraphic | Gas cap and partial water | 11 | 28 | 31[1] | 17 | 0.75 | 42.4 | 2,715 | 256[2]<br>97[3] |
| Boundary Lake | Cadomin | Sandstone | Lower Cretaceous | Structural | Water | 18 | 11 | 75 | 40 | 0.75 | 29.3 | 1,474 | 79 |
| | Boundary Lake | Carbonate | Triassic | Structural-stratigraphic | Depletion | 18 | 12 | 45 | 11 | 0.80 | 33.7 | 1,814 | 146[2]<br>63[3] |
| | Halfway | Sandstone | Triassic | Structural | Water and partial gas cap | 13 | 11 | 14 | 26 | 0.82 | 42.6 | 1,699 | 68 |
| Bulrush | Halfway | Sandstone | Triassic | Stratigraphic | Depletion and gas cap | 15 | 6 | 212 | 18 | 0.83 | 41.1 | 1,350 | 97 |
| Charlie Lake | Gething | Sandstone | Lower Cretaceous | Stratigraphic | Depletion | 19 | 13 | (4) | 25 | 0.83 | 34.4 | 1,111 | — |
| Currant | Halfway | Sandstone | Triassic | Stratigraphic | Depletion and gas cap | 16 | 7 | 81 | 15 | 0.83 | 38.8 | 1,412 | 73 |
| Fort St. John | Charlie Lake | Sandstone | Triassic | Stratigraphic | Gas cap | 14 | 3 | 570 | 25 | 0.77 | 39.6 | 1,953 | 37 |
| | Belloy | Carbonate | Permian | Structural-stratigraphic | Depletion | 10 | 21 | 23 | 25 | 0.75 | 43.0 | 2,784 | — |
| Inga | Charlie Lake | Sandstone | Triassic | Structural-stratigraphic | Depletion and gas cap | 13 | 7 | 200 | 21 | 0.75 | 40.4 | 2,294 | 87 |
| Milligan Creek | Halfway | Sandstone | Triassic | Structural-stratigraphic | Depletion | 25 | 16 | 23 | 14 | 0.88 | 40.4 | 1,184 | 476[2]<br>157[3] |
| Nettle | Bluesky-Gething | Sandstone | Lower Cretaceous | Stratigraphic | Depletion | 15 | 5 | 127 | 44 | 0.80 | 42.9 | 974 | 74 |
| Osprey | Halfway | Sandstone | Triassic | Stratigraphic | Depletion | 11 | 5 | 67 | 35 | 0.85 | 38.6 | 1,432 | 49 |
| Peejay | Halfway | Sandstone | Triassic | Stratigraphic | Depletion | 16 | 10 | 106 | 21 | 0.83 | 39.0 | 1,382 | 273[2]<br>33[3] |
| Peejay West | Halfway | Sandstone | Triassic | Stratigraphic | Depletion | 22 | 20 | 82 | 31 | 0.83 | 39.0 | 1,440 | — |
| Rigel | Dunlevy | Sandstone | Lower Cretaceous | Stratigraphic | Depletion | 13 | 6 | 330 | 42 | 0.87 | 38.6 | 1,288 | 132 |
| Stoddart | Belloy | Carbonate | Permian | Structural-stratigraphic | Depletion | 11 | 9 | 8 | 24 | 0.85 | 38.6 | 2,466 | 82 |
| Weasel | Halfway | Sandstone | Triassic | Stratigraphic | Depletion | 20 | 12 | 400 | 24 | 0.88 | 40.0 | 1,284 | 149 |
| Wildmint | Halfway | Sandstone | Triassic | Structural-stratigraphic | Depletion | 20 | 13 | 202 | 23 | 0.87 | 40.0 | 1,226 | 262[2]<br>148[3] |
| Willow | Bluesky-Gething | Sandstone | Lower Cretaceous | Stratigraphic | Depletion | 29 | 9 | 150 | 13 | 0.89 | 44.2 | 987 | 122 |
| Wolf | Halfway | Sandstone | Triassic | Structural-stratigraphic | Depletion | 19 | 7 | 218 | (4) | 0.83 | 39.8 | 1,960 | 125 |

[1] Plus fractures.
[2] Daily average M.P.R. obtained by dividing unit M.P.R. by the number of producible wells in the unit.
[3] Daily average M.P.R. of wells not included in a unit or pool M.P.R.
[4] Not available.

TABLE 18.—GASFIELD RESERVOIR DATA, DECEMBER 31, 1967

| Field | Pool | Rock Type | Age | Trap | Av'ge Porosity (per Cent) | Av'ge Reservoir Thickness (Net Ft.) | Av'ge Permeability (Md.) | Av'ge Water Saturation (per Cent) | Compressibility Factor | Specific Gravity (Air=1.0) | Original Pressure (Psig.) | Av'ge Well A.O.F.P. (M s.c.f./Day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Beg | Baldonnel | Carbonate | Triassic | Structural | 8 | 32 | 65 | 21 | 0.840 | 0.652 | 1,630 | 3,267 |
| Beg | Halfway | Sandstone | Triassic | Structural | 10 | 36 | 10 | 35 | 0.839 | 0.673 | 1,820 | 4,620 |
| Beg West | Baldonnel | Carbonate | Triassic | Structural | 8 | 86 | 23 | 23 | 0.848 | 0.653 | 1,674 | 1,537 |
| Bernadet | Bluesky-Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | 8 | 13 | (1) | 15 | 0.838 | 0.644 | 1,193 | 410 |
| Blueberry | Dunlevy | Sandstone | Lower Cretaceous | Structural | 11 | 33 | 10 | 33 | 0.840 | 0.659 | 1,363 | 1,403 |
| Blueberry | Baldonnel | Carbonate | Triassic | Structural | 10 | 17 | 38 | 37 | 0.837 | 0.673 | 1,611 | 2,304 |
| Blueberry | Charlie Lake | Sandstone | Triassic | Structural-stratigraphic | 9 | 26 | (1) | 27 | 0.706 | 0.939 | 2,073 | (2) |
| Blueberry East | Baldonnel | Carbonate | Triassic | Structural | 10 | 30 | 48 | 25 | 0.832 | 0.675 | 1,715 | 1,740 |
| Blueberry East | Mississippian | Carbonate | Mississippian | Structural | 12 | 17 | 32 | 30 | 0.871 | 0.615 | 2,680 | 3,256 |
| Blueberry West | Dunlevy | Sandstone | Lower Cretaceous | Structural | 10 | 9 | 62 | 25 | 0.850 | 0.658 | 1,410 | 319 |
| Blueberry West | Baldonnel | Carbonate | Triassic | Structural | 9 | 16 | 84 | 23 | 0.824 | 0.648 | 1,715 | 1,425 |
| Boundary Lake | Bluesky-Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | 18 | 9 | (1) | 28 | 0.858 | 0.634 | 1,276 | 830 |
| Boundary Lake | Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | 17 | 57 | (1) | 16 | 0.843 | 0.648 | 1,371 | 8,379 |
| Boundary Lake | Dunlevy | Sandstone | Lower Cretaceous | Structural | 24 | 46 | (1) | 38 | 0.845 | 0.629 | 1,453 | 11,200 |
| Boundary Lake | Baldonnel | Carbonate | Triassic | Structural | 14 | 20 | (1) | 34 | 0.799 | 0.677 | 1,447 | 4,425 |
| Boundary Lake | Boundary Lake Zone | Carbonate | Triassic | Structural | 20 | 5 | 133 | 6 | 0.805 | 0.681 | 1,701 | 1,816 |
| Boundary Lake | Halfway | Sandstone | Triassic | Structural | 10 | 25 | (1) | 11 | 0.841 | 0.632 | 1,556 | 360 |
| Boundary Lake North | Halfway | Sandstone | Triassic | Stratigraphic | 15 | 28 | 57 | 25 | 0.845 | 0.657 | 1,566 | 13,650 |
| Bubbles | Baldonnel | Carbonate | Triassic | Structural | 10 | 51 | 33 | 17 | 0.900 | 0.665 | 1,598 | 6,676 |
| Buick Creek | Dunlevy | Sandstone | Lower Cretaceous | Structural-stratigraphic | 13 | 25 | 140 | 28 | 0.836 | 0.659 | 1,293 | 5,060 |
| Buick Creek | Charlie Lake | Sandstone | Triassic | Structural-stratigraphic | 13 | 6 | (1) | 33 | 0.859 | 0.613 | 1,554 | 1,500 |
| Buick Creek East | Bluesky-Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | 10 | 10 | (1) | 47 | 0.865 | 0.639 | 1,096 | 750 |
| Buick Creek East | Dunlevy | Sandstone | Lower Cretaceous | Structural-stratigraphic | 11 | 20 | 125 | 29 | 0.853 | 0.648 | 1,289 | 4,744 |
| Buick Creek North | Bluesky-Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | 12 | 9 | (1) | 36 | 0.925 | 0.685 | 1,304 | 6,888 |
| Buick Creek North | Dunlevy | Sandstone | Lower Cretaceous | Structural-stratigraphic | 10 | 17 | (1) | 31 | 0.920 | 0.670 | 1,248 | 6,149 |
| Buick Creek West | Dunlevy | Sandstone | Lower Cretaceous | Structural-stratigraphic | 11 | 28 | 165 | 52 | 0.850 | 0.657 | 1,305 | 5,197 |
| Buick Creek West | Baldonnel | Carbonate | Triassic | Structural-stratigraphic | 11 | 18 | 45 | 27 | 0.817 | 0.698 | 1,467 | 1,514 |
| Buick Creek West | Halfway | Sandstone | Triassic | Structural | 11 | 39 | 21 | 31 | 0.782 | 0.748 | 1,721 | 2,450 |
| Clarke Lake | Slave Point | Carbonate | Devonian | Stratigraphic | 7 | 119 | (1) | 22 | 0.930 | 0.671 | 2,895 | 79,820 |
| Dawson Creek | Cadotte | Sandstone | Lower Cretaceous | Structural-stratigraphic | 16 | 49 | 33 | 25 | 0.921 | 0.580 | 686 | 805 |
| Fort St. John | Cadomin | Sandstone | Lower Cretaceous | Structural | 12 | 8 | 421 | 40 | 0.869 | 0.581 | 1,324 | 29,000 |
| Fort St. John | Baldonnel | Carbonate | Triassic | Structural | 14 | 33 | 1,212 | 25 | 0.822 | 0.661 | 1,604 | 3,355 |
| Fort St. John | Charlie Lake | Sandstone | Triassic | Stratigraphic | 15 | 6 | (1) | 10 | 0.825 | 0.648 | 1,906 | (2) |
| Fort St. John | Halfway | Sandstone | Triassic | Structural | 11 | 28 | 23 | 25 | 0.799 | 0.679 | 2,006 | 2,524 |
| Fort St. John | Belloy | Carbonate | Permian | Structural-stratigraphic | 12 | 11 | 59 | 25 | 0.828 | 0.655 | 2,756 | 1,991 |
| Fort St. John Southeast | Cadomin | Sandstone | Lower Cretaceous | Structural | 16 | 32 | 64 | 40 | 0.876 | 0.581 | 1,389 | 897 |
| Fort St. John Southeast | Baldonnel | Carbonate | Triassic | Structural | 18 | 12 | 30 | 28 | 0.778 | 0.702 | 1,634 | 2,994 |

TABLE 18.—GASFIELD RESERVOIR DATA, DECEMBER 31, 1967—*Continued*

| Field | Pool | Rock Type | Age | Trap | Av'ge Porosity (per Cent) | Av'ge Reservoir Thickness (Net Ft.) | Av'ge Permeability (Md.) | Av'ge Water Saturation (per Cent) | Compressibility Factor | Specific Gravity (Air=1.0) | Original Pressure (Psig.) | Av'ge Well A.O.F.P. (M s.c.f./Day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fort St. John Southeast | Halfway | Sandstone | Triassic | Structural | 10 | 16 | 14 | 25 | 0.821 | 0.693 | 2,072 | 4,370 |
| Fort St. John Southeast | Belloy | Carbonate | Permian | Structural-stratigraphic | 9 | 16 | 62 | 25 | 0.842 | 0.640 | 2,814 | 5,656 |
| Gundy Creek | Baldonnel | Carbonate | Triassic | Structural | 9 | 9 | 69 | 20 | 0.850 | 0.636 | 1,731 | 5,000 |
| Gundy Creek | Charlie Lake | Sandstone | Triassic | Structural-stratigraphic | 7 | 10 | (1) | 25 | 0.810 | 0.653 | 2,339 | (2) |
| Halfway | Baldonnel | Carbonate | Triassic | Structural | 8 | 31 | 6 | 35 | 0.818 | 0.639 | 1,642 | 5,010 |
| Halfway | Halfway | Sandstone | Triassic | Structural | 16 | 7 | 49 | 25 | 0.800 | 0.650 | 2,212 | 720 |
| Highway | Dunlevy | Sandstone | Lower Cretaceous | Structural | 9 | 14 | 85 | 25 | 0.857 | 0.669 | 1,346 | 766 |
| Highway | Baldonnel | Carbonate | Triassic | Structural | 10 | 5 | 124 | 25 | 0.805 | 0.675 | 1,666 | 3,567 |
| Highway | Mississippian | Carbonate | Mississippian | Structural | 10 | 13 | 105 | 25 | 0.903 | 0.609 | 3,122 | 6,885 |
| Jedney | Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | 11 | 10 | (1) | 24 | 0.870 | 0.663 | 1,126 | 13,600 |
| Jedney | Baldonnel | Carbonate | Triassic | Structural | 10 | 57 | 34 | 13 | 0.852 | 0.693 | 1,602 | 5,284 |
| Jedney | Halfway | Sandstone | Triassic | Structural | 10 | 51 | 16 | 22 | 0.842 | 0.673 | 1,688 | 6,453 |
| Jedney West | Baldonnel | Carbonate | Triassic | Structural | 9 | 11 | (1) | 64 | 0.850 | 0.693 | 1,622 | 1,362 |
| Jedney West | Halfway | Sandstone | Triassic | Structural | 8 | 32 | (1) | 45 | 0.839 | 0.673 | 1,768 | 1,010 |
| Kobes-Townsend | Dunlevy | Sandstone | Lower Cretaceous | Structural | 12 | 26 | 18 | 20 | 0.782 | 0.651 | 1,486 | 1,400 |
| Kobes-Townsend | Charlie Lake | Sandstone | Triassic | Structural-stratigraphic | 11 | 12 | (1) | 29 | 0.820 | 0.629 | 2,470 | 2,178 |
| Kobes-Townsend | Halfway | Sandstone | Triassic | Structural-stratigraphic | 8 | 24 | 5 | 28 | 0.823 | 0.638 | 2,636 | 10,603 |
| Kobes-Townsend | Mississippian | Carbonate | Mississippian | Structural-stratigraphic | 5 | 21 | 10 | 16 | 0.841 | 0.647 | 3,025 | 5,519 |
| Kotcho Lake | Slave Point | Carbonate | Devonian | Stratigraphic | 10 | 19 | 46 | 8 | 0.920 | 0.670 | 2,550 | 268,000 |
| Laprise Creek | Baldonnel | Carbonate | Triassic | Structural-stratigraphic | 10 | 60 | 130 | 19 | 0.844 | 0.676 | 1,528 | 8,434 |
| Laprise Creek West | Baldonnel | Carbonate | Triassic | Structural-stratigraphic | 10 | 44 | 48 | 23 | 0.845 | 0.694 | 1,326 | 2,695 |
| Montney | Bluesky-Gething | Sandstone | Lower Cretaceous | Structural-stratigraphic | 17 | 6 | (1) | 45 | 0.843 | 0.670 | 1,250 | 814 |
| Montney | Charlie Lake | Sandstone | Triassic | Structural-stratigraphic | 20 | 5 | (1) | 30 | 0.830 | 0.664 | 1,746 | 2,200 |
| Montney | Halfway | Sandstone | Triassic | Structural | 15 | 15 | 67 | 33 | 0.805 | 0.702 | 1,846 | 2,597 |
| Nig Creek | Baldonnel | Carbonate | Triassic | Structural-stratigraphic | 11 | 38 | 61 | 24 | 0.840 | 0.677 | 1,641 | 9,360 |
| Parkland | Wabamun | Carbonate | Devonian | Structural-stratigraphic | 13 | 53 | (1) | 16 | 1.022 | 0.623 | 4,900 | 18,350 |
| Petitot River | Slave Point | Carbonate | Devonian | Structural-stratigraphic | 7 | 80 | (1) | 18 | 0.936 | 0.674 | 2,775 | 185,000 |
| Red Creek | Charlie Lake | Sandstone | Triassic | Structural-stratigraphic | 18 | 6 | (1) | 32 | 0.838 | 0.614 | 1,866 | 3,308 |
| Red Creek | Halfway | Sandstone | Triassic | Structural | 11 | 19 | 18 | 20 | 0.719 | 0.779 | 2,021 | 2,484 |
| Rigel | Dunlevy | Sandstone | Lower Cretaceous | Structural-stratigraphic | — | — | — | — | — | — | — | 11,294 |
| Stoddart | Belloy | Carbonate | Permian | Stratigraphic | — | — | — | — | — | — | — | 10,430 |
| Stoddart West | Belloy | Carbonate | Permian | Stratigraphic | 14 | 15 | 24 | 14 | 0.805 | 0.695 | 2,411 | 4,954 |
| Yoyo | Pine Point | Carbonate | Devonian | Stratigraphic-structural | 8 | 95 | (1) | 15 | 0.810 | 0.704 | 2,899 | 128,400 |

1 Not available.

2 The average A.O.F.P. per well does not include wells which have been withdrawn from production. In some fields, all wells in a particular pool may have been withdrawn from production.

TABLE 19.—PROVED RESERVES OF CRUDE OIL AND ESTABLISHED RESERVES OF NATURAL GAS AND NATURAL-GAS PRODUCTS, DECEMBER 31, 1966

| | Crude Oil[1] (Thousands of Barrels) | Established Disposable Gas (B S.C.F.[2] at 14.65 Psia. at 60° F.) | Disposable Gas (1,000 B.T.U./C.F. Basis B S.C.F.) | Producible Natural-gas Liquids (Thousands of Barrels) | Producible Sulphur (Thousands of Short Tons) |
|---|---|---|---|---|---|
| Reserves remaining at December 31, 1965 | 266,613 | 6,770.7 | 7,044.0 | 115,886 | 3,077 |
| Revisions and extensions[3] | +18,855 | +455.8 | +468.5 | +3,456 | +232 |
| Production, 1966 | 16,638 | 169.2 | 181.8 | 4,935 | 79 |
| Reserves remaining at December 31, 1966 | 268,830 | 7,057.3 | 7,330.7 | 114,407 | 3,230 |

[1] Barrels of 34.97 imperial gallons. Includes only proved drilled reserves. There are an additional 16,800,000 barrels of probable reserves which are in effect proved undrilled reserves.

[2] B S.C.F.—Billion standard cubic feet. Associated gas is included only for pools wherein gas conservation schemes are operational.

[3] Includes discovery from new drilling and revisions arising from new information.

NOTE.—The production of residual gas, gas liquids, and sulphur are the quantities calculated from gas analyses to have been produced with the raw gas and are not the quantities actually extracted. The quantity of gas delivered to the transmission-line and distributed in 1966 was 161.3 B s.c.f., and the amounts of natural-gas liquids and sulphur actually extracted were 1,849,432 barrels and 56,594 short tons respectively.

## Table 20.—Pool, Project, and Unit M.P.R. Summary, December 31, 1967

| Field and Pool | Pool, Project, or Unit Name | Current Pool, Project, or Unit M.P.R. (Barrels per Day) and Effective Date[1] | Past Revisions to Pool, Project, or Unit M.P.R. and Date Approved | Pool, Project, or Unit Area (Acres) | Number of Producible Oil Wells | Number of Gas-injection Wells | Number of Water-injection Wells | Daily Average Gas Injected[2] (M S.C.F.) | Daily Average Water Injected[2] (Barrels) |
|---|---|---|---|---|---|---|---|---|---|
| Aitken Creek—Gething | (Union) Aitken Creek Gething Pool | 874 (1-5-65) | 582 (1-1-64) | 1,212[3] | 5 | 1 | — | 2,361 | ... |
| Beatton River—Halfway | (Triad) Beatton River Halfway Pool | 2,054 (1-7-65) | 1,940 (5-10-63)<br>1,960 (1-9-64) | 1,156[3] | 10 | ... | 4 | ... | 3,464 |
| Blueberry—Mississippian | (Pacific) Blueberry Mississippian Pool | 4,600 (29-4-63) | ... | 3,798[4] | 18 | 1 | — | 562 | ... |
| Boundary Lake— | | | | | | | | | |
| Boundary Lake | (Dome) Boundary Lake Water-flood Project No. 1 | 2,429 (1-10-65) | 2,225 (22-7-64)<br>2,343 (1-10-64) | 3,520[4] | 25 | ... | 7 | ... | 3,744 |
| Boundary Lake | (Dome) Boundary Lake Water-flood Project No. 2 | 733 (1-4-65) | ... | 640[4] | 6 | — | 2 | ... | 1,228 |
| Boundary Lake | (Imperial) Boundary Lake Unit No. 1 | 19,090 (1-9-65) | 18,488 (1-6-64)<br>18,818 (1-2-65)<br>18,887 (1-4-65) | 25,280[4] | 130 | — | 29 | ... | 16,948 |
| Boundary Lake | (Texaco) Boundary Lake Unit No. 2 | 11,221 (1-9-67) | 9,754 (1-5-65)<br>9,892 (1-10-65)<br>25,818 (3-7-67)<br>27,147 (15-9-67) | 14,560[4] | 68 | ... | 19 | ... | 18,156 |
| Bulrush—Halfway | (Union) Bulrush Halfway Pool | 389 (1-1-67) | ... | 1,106[3] | 4 | 2 | ... | 982 | ... |
| Currant—Halfway | (Pacific) Currant Unit No. 1 | 439 (1-9-67) | ... | 702[3] | 6 | — | ... | ... | ... |
| Milligan Creek—Halfway | (Union) Milligan Creek Halfway Sand Unit No. 1 | 10,000 (1-1-64) | 4,000 (20-9-62)<br>5,000 (28-6-63) | 2,308[3] | 21 | 1 | 8 | 2,068 | 14,812 |
| Peejay— | | | | | | | | | |
| Halfway | (Pacific) Peejay Unit No. 1 | 4,430 (16-4-64) | 2,018 (3-12-63) | 4,106[3] | 20 | — | 9 | ... | 6,195 |
| Halfway | (Pacific) Peejay Unit No. 3 | 5,404 (1-4-67) | 2,627 (1-4-67) | 4,389[3] | 21 | ... | 8 | ... | 6,079 |
| Halfway | (Pacific-Sinclair) Peejay Project | 3,046 (1-4-67) | 1,178 (1-4-67) | 1,504[3] | 7 | — | 2 | ... | 2,137 |
| Halfway | (Tenneco) Peejay Project | 1,806 (1-4-67) | ... | 1,048[4] | 5 | — | 1 | ... | 1,167 |
| Halfway | (Union) Peejay Unit No. 2 | 8,229 (1-4-67) | 4,014 (1-10-64)<br>7,631 (1-4-67) | 5,982[3] | 31 | ... | 10 | ... | 10,934 |
| Wildmint—Halfway | (Union) Wildmint Upper Halfway Pool | 3,665 (1-9-66) | 1,100 (1-12-63)<br>1,191 (1-10-64)<br>1,566 (16-12-65) | 1,708[3] | 14 | 2 | 3 | 7,325 | 10,108 |
| Totals | ... | 78,409 | ... | 73,019 | 391 | 7 | 102 | 13,298 | 94,972 |

[1] Depends on the terms of the M.P.R. approval such as commencement of injection, infill drilling, or conversion of wells to or from injection.
[2] Total injection for the year divided by the total days in the months of injection.
[3] Calculated area based on the area enclosed by the zero contour of the net oil pay isopachous map.
[4] Sum of the N.T.S. unit or section areas enclosed by the surface unit boundaries.

TABLE 21.—GROUP PRODUCTION RATE LIMITS, DECEMBER 31, 1967

| Field | Pool | Operator | Initial Approval Date | Type of Approval Granted | Present Authorized P.R.L. M C.F./D. | Number of Producible Wells |
|---|---|---|---|---|---|---|
| Bubbles | Baldonnel | Pacific Petroleums Ltd. | Nov. 1, 1967 | Pool allowable with lease-line wells restricted to individual P.R.L. | 24,920 | 8 |
| Kobes-Townsend | Halfway | Pacific Petroleums Ltd. | Apr. 1, 1966 | Production by good engineering practices | ——— | 2 |
| Laprise Creek | Baldonnel | Dome Petroleum | Apr. 1, 1966 | Pool allowable with lease-line wells restricted to individual P.R.L. | 39,296 | 16 |
| Laprise Creek | Baldonnel | Pacific Petroleums Ltd. | Dec. 22, 1966 | Pool allowable with lease-line wells restricted to individual P.R.L. | 44,350 | 16 |
| Nig Creek | Baldonnel | Texaco Exploration Co. | Mar. 1, 1967 | Pool allowable with lease-line wells restricted to individual P.R.L. | 80,300 | 20 |
| Parkland | Wabamun | Pacific Petroleums Ltd. | Dec. 15, 1965 | Pool allowable | 20,000 | 2 |

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER, 31, 1967

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. Well | A.O.F.P. in M C.F./D. Pool Total[1] | P.R.L. in M C.F./D.[2] Well | P.R.L. in M C.F./D.[2] Pool Total[3] |
|---|---|---|---|---|---|---|---|---|
| Aitken Creek | 1338 | Union Aitken d-25-L | Gething | — | — | — | — | — |
| | 400 | Union Aitken Creek (3) a-53-L | Gething | — | — | — | — | — |
| | 1310 | Union Aitken Creek d-45-L | Gething | — | — | — | — | — |
| Beatton River | 1020 | Triad Beatton d-60-J | Halfway | — | — | — | — | — |
| Beaverdam | 1802 | Tenn Beaverdam d-39-L | Halfway | — | — | — | — | — |
| | 1746 | Tenn Sun Beaverdam d-37-L | Halfway | — | — | — | — | — |
| Beg | 539 | Pacific et al Beg b-17-K | Baldonnel | 14-6-67 | 5,286 | | 2,000 | |
| | 541 | Pacific et al Beg d-10-G | Baldonnel | 5-7-67 | 1,159 | | 2,000 | |
| | 711 | Pacific et al Beg a-21-F | Baldonnel | 23-7-65 | 658 | | (4) | |
| | 733 | Pacific et al Beg d-64-F | Baldonnel | 12-6-67 | 3,392 | | 2,000 | |
| | 740 | Pacific et al Beg b-6-K | Baldonnel | 13-6-67 | 2,127 | | 2,000 | |
| | 741 | Pacific et al Beg b-84-F | Baldonnel | 16-6-67 | 2,357 | | 2,000 | |
| | 747 | Pacific et al Beg b-95-F | Baldonnel | 13-6-67 | 2,548 | | 2,000 | |
| | 748 | Pacific et al Beg b-42-F | Baldonnel | 31-12-66 | 1,535 | | 2,000 | |
| | 749 | Pacific et al Beg a-28-K | Baldonnel | 14-6-67 | 3,609 | 52,281 | 2,000 | 26,831 |
| | 786 | Pacific et al Beg b-59-K | Baldonnel | — | — | | — | |
| | 1132 | Pacific et al Beg b-82-L | Baldonnel | 11-7-67 | 1,159 | | 2,000 | |
| | 1154 | Pacific Imperial Beg d-35-B | Baldonnel | 16-6-67 | 2,193 | | 2,000 | |
| | 1359 | Pacific Imperial Beg c-24-B | Baldonnel | 20-5-65 | 1,400 | | (4) | |
| | 806 | Pacific Imperial Beg d-46-B | Baldonnel | 26-6-67 | 1,978 | | 2,000 | |
| | 1095 | Pacific Imperial Beg d-57-B | Baldonnel | 18-5-65 | 2,680 | | (4) | |
| | 766 | Pacific Pan Am Dome Beg a-4-D | Baldonnel | 11-7-67 | 16,600 | | 4,831 | |
| | 855 | Pacific Pan Am Dome Beg d-15-D | Baldonnel | 12-6-63 | 3,600 | | (4) | |
| | 541 | Pacific et al Beg d-10-G | Halfway | 16-6-67 | 6,390 | | 2,000 | |
| | 711 | Pacific et al Beg a-21-F | Halfway | 15-6-67 | 2,150 | | (4) | |
| | 733 | Pacific et al Beg d-64-F | Halfway | 15-6-67 | 3,469 | | 2,000 | |
| | 739 | Pacific et al Beg b-A99-B | Halfway | 16-6-67 | 3,832 | | 2,000 | |
| | 740 | Pacific et al Beg b-6-K | Halfway | 16-6-67 | 3,578 | | 2,000 | |
| | 741 | Pacific et al Beg b-84-F | Halfway | 15-6-67 | 1,844 | | 2,000 | |
| | 747 | Pacific et al Beg b-95-F | Halfway | 16-6-67 | 2,035 | | 2,000 | |
| | 748 | Pacific et al Beg b-42-F | Halfway | 29/30-8-61 | 2,100 | 69,293 | (4) | 30,005 |
| | 786 | Pacific et al Beg b-59-K | Halfway | 23-1-62 | — | | 2,000[5] | |
| | 1350 | Pacific et al Beg b-88-B | Halfway | 15-6-67 | 5,030 | | 2,000 | |
| | 1359 | Pacific Imperial Beg c-24-B | Halfway | 22-6-67 | 4,299 | | 2,000 | |
| | 806 | Pacific Imperial Beg.d-46-B | Halfway | 23-6-67 | 9,200 | | 2,719 | |
| | 1095 | Pacific Imperial Beg d-57-B | Halfway | 23-6-67 | 11,700 | | 3,063 | |
| | 1154 | Pacific Imperial Beg d-35-B | Halfway | 22-6-67 | 5,536 | | 2,000 | |
| | 1233 | Richfield Sohio Beg d-77-B | Halfway | 27-11-63 | 2,030 | | 2,000[5] | |
| | 1268 | Richfield Sohio Beg d-13-B | Halfway | 18-7-67 | 6,100 | | 2,223 | |
| Beg West | 620 | Pacific et al W Beg a-79-F | Baldonnel | 26-6-67 | 1,696 | | 2,000 | |
| | 622 | Pacific et al W Beg c-84-C | Baldonnel | 13-6-67 | 1,377 | 3,073 | 2,000 | 4,000 |
| | 722 | Pacific et al W Beg c-58-F | Baldonnel | — | — | | — | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bernadet | 1106 | West Nat et al Bernadet 8-1-88-25 | Bluesky-Gething | 21–6–67 | 410 | 410 | 2,000 | 2,000 |
| Blueberry | 70 | West Nat et al Blueberry c-32-D | Dunlevy | | | | | |
| | 94 | West Nat et al Blueberry d-A87-D | Dunlevy | 19–6–67 | 1,129 | | 2,000 | |
| | 279 | West Nat et al Blueberry 16-24-88-25 | Dunlevy | 20–6–67 | 1,911 | | 2,000 | |
| | 330 | West Nat et al Blueberry a-29-K | Dunlevy | 2–7–63 | 500 | 7,015 | (4) | 6,000 |
| | 357 | West Nat et al Blueberry d-A50-K | Dunlevy | 27–8–63 | 640 | | (4) | |
| | 581 | West Nat et al Blueberry d-97-D | Dunlevy | 21–6–67 | 2,835 | | 2,000 | |
| | 2146 | West Nat et al Blueberry d-38-K | Dunlevy | | | | | |
| | 64 | West Nat et al Blueberry d-87-D | Baldonnel | 20–6–67 | 486 | | 2,000 | |
| | 71 | West Nat et al Blueberry c-65-D | Baldonnel | 7–7–65 | 825 | 6,911 | (4) | 2,000 |
| | 581 | West Nat et al Blueberry d-97-D | Baldonnel | 12/13–9–60 | 5,600 | | (4) | |
| | 525 | West Nat et al Blueberry a-61-L | Charlie Lake | | | | | |
| | 601 | West Nat et al Blueberry b-13-D | Charlie Lake | | | | | |
| | 1946 | West Nat et al Blueberry b-22-D | Halfway | | | | | |
| Blueberry East | 103 | West Nat et al E Blueberry b-38-C | Baldonnel | 22–6–67 | 1,740 | 1,740 | 2,000 | 2,000 |
| | 331 | West Nat et al E Blueberry b-36-C | Mississippian | 28–10–58 | 3,256 | 3,256 | (4) | (4) |
| Blueberry West | 165 | West Nat et al W Blueberry d-82-I | Dunlevy | 21–6–67 | 333 | 638 | 2,000 | 4,000 |
| | 278 | West Nat el al W Blueberry 2-20-88-25 | Dunlevy | 14–7–67 | 305 | | 2,000 | |
| | 241 | West Nat et al W Blueberry d-19-L | Baldonnel | 18–9–62 | 1,425 | 1,425 | (4) | (4) |
| Boundary Lake | 270 | Pacific Boundary 8-15-85-14 | Bluesky-Gething | 27–9–62 | 830 | 830 | (4) | (4) |
| | 1125 | Texaco NFA Boundary 8-23-86-14 | Bluesky-Gething | | | | | |
| | 352 | Pacific Boundary 12-10-85-14 | Gething | 24–5–67 | 12,094 | 16,794 | 4,049 | 4,049 |
| | 655 | Pacific Boundary Lake A16-4-85-14 | Gething | 12/13–6–61 | 4,700 | | (4) | |
| | 799 | Amerada Boundary 8-5-85-14 | Dunlevy | 27–10–61 | 11,200 | 11,200 | 2,800 | 2,800 |
| | 1454 | Amerada Boundary A6-24-85-14 | Baldonnel | | | | | |
| | 667 | Pacific Boundary Lake 11-14-85-14 | Baldonnel | 29–5–63 | 1,650 | | (4) | |
| | 270 | Pacific Boundary 8-15-85-14 | Baldonnel | 25–5–66 | 3,352 | 22,127 | (4) | 6,625 |
| | 652 | Sun Boundary Lake 8-23-85-14 | Baldonnel | 3–6–67 | 9,300 | | 2,625 | |
| | 687 | Texaco NFA Boundary Lake 6-25-85-14 | Baldonnel | 18–5–67 | 5,000 | | 2,000 | |
| | 1137 | Texaco NFA Boundary Lake 6-30-85-13 | Baldonnel | 19–5–67 | 2,825 | | 2,000 | |
| | 1964 | Imp Pac Boundary 14-4-85-14 | Boundary Lake | 24–5–67 | 1,816 | 1,816 | 2,000 | 2,000 |
| | 1501 | Huber et al Boundary 6-4-87-13 | Halfway | 12–11–64 | 360 | 360 | 2,000[5] | 2,000 |
| | 836 | Texaco NFA Boundary 16-31-86-13 | Halfway | | | | | |
| Boundary Lake North | 1395 | Texaco NFA N Boundary 7-3-87-14 | Halfway | | | | | |
| | 1451 | Texaco NFA N Boundary 10-9-87-14 | Halfway | 10–12–64 | 35,000 | 27,300 | 6,250[5] | 8,250 |
| | 1529 | Texaco NFA N Boundary 6-8-87-14 | Halfway | | | | (5) | |
| | 1881 | Texaco NFA N Boundary 7-15-87-14 | Halfway | 11–3–66 | 2,300 | | 2,000[5] | |
| Bubbles | 451 | Pacific Imperial Bubbles b-33-I | Baldonnel | 13–7–67 | 6,939 | | | |
| | 462 | Pacific Imperial Bubbles d-88-I | Baldonnel | 12–7–67 | 32,000 | | | |
| | 466 | Pacific Imperial Bubbles b-44-I | Baldonnel | 13–7–67 | 10,498 | | | |

1 Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.

2 A minimum production rate limit of 2,000 M c.f. per day is allowed for a well in which the calculated P.R.L. would be less than 2,000 M c.f. per day.

3 Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.

4 Well withdrawn from production. There is no P.R.L. The present potential of the well or all wells in the pool will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

5 Potential gas well which has not gone on production. The present potential of the well will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER 31, 1967—*Cont'd*

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. Well | A.O.F.P. in M C.F./D. Pool Total[1] | P.R.L. in M C.F./D.[2] Well | P.R.L. in M C.F./D.[2] Pool Total[3] |
|---|---|---|---|---|---|---|---|---|
| Bubbles | 467 | Pacific Sunray Imp Bubbles b-22-I | Baldonnel | | | | 24,920[6] | |
| | 478 | Pacific Imperial Bubbles d-77-I | Baldonnel | 13–7–67 | 3,016 | | | |
| | 479 | Pacific Sunray Imp Bubbles d-55-I | Baldonnel | | | | | |
| | 480 | Pacific Imperial Bubbles b-66-I | Baldonnel | 13–7–67 | 2,500 | 66,762 | | 32,920 |
| | 615 | Pacific Dome et al Bubbles d-99-I | Baldonnel | 12–7–67 | 1,803 | | | |
| | 464 | Dome Basco Bubbles b-19-A | Baldonnel | 19–6–67 | 3,304 | | 2,000 | |
| | 506 | Dome Basco Bubbles b-50-A | Baldonnel | | | | | |
| | 526 | Dome Provo Bubbles c-20-A | Baldonnel | 19–6–67 | 580 | | 2,000 | |
| | 674 | McCoy Dome Bubbles b-A62-B | Baldonnel | 20–6–67 | 4,270 | | 2,000 | |
| | 791 | McCoy Dome Bubbles d-42-B | Baldonnel | 20–6–67 | 1,852 | | 2,000 | |
| Buick Creek | 1492 | Altair W Mineral Buick b-22-C | Dunlevy | 22–2–65 | 1,020 | | 2,000[5] | |
| | 1344 | Decalta et al Buick d-73-I | Dunlevy | | | | | |
| | 1323 | Pacific Buick a-85-I | Dunlevy | 7–6–67 | 8,578 | | 2,527 | |
| | 457 | Pacific Buick Creek b-4-B | Dunlevy | 5–6–67 | 2,086 | | 2,000 | |
| | 469 | Pacific Buick Creek c-14-B | Dunlevy | 5–6–67 | 2,181 | | 2,000 | |
| | 744 | Sun Buick c-16-B | Dunlevy | 7–6–67 | 2,300 | | 2,000 | |
| | 756 | Sun Buick d-19-B | Dunlevy | 7–6–67 | 2,300 | | 2,000 | |
| | 818 | Sun Buick d-11-C | Dunlevy | 6–6–67 | 7,800 | | 2,540 | |
| | 1360 | Sun et al Buick c-32-C | Dunlevy | 11–6–67 | 8,400 | 80,950 | 3,890 | 42,081 |
| | 728 | Texaco NFA Buick d-93-J | Dunlevy | 30–5–67 | 6,700 | | 3,574 | |
| | 787 | Texaco NFA Buick d-96-I | Dunlevy | 25–5–67 | 17,750 | | 5,041 | |
| | 1179 | Texaco NFA Buick b-10-B | Dunlevy | 30–5–67 | 1,810 | | 2,000 | |
| | 1213 | Texaco NFA Buick c-40-B | Dunlevy | 2–6–67 | 585 | | 2,000 | |
| | 1348 | Texaco NFA Buick a-63-I | Dunlevy | | | | | |
| | 45 | Texaco NFA Buick Creek (1) d-98-I | Dunlevy | 24–5–67 | 4,950 | | 2,000 | |
| | 65 | Texaco NFA Buick Creek (2) c-10-A | Dunlevy | 29–5–67 | 190 | | 2,000 | |
| | 96 | Texaco NFA Buick Creek (4) d-83-J | Dunlevy | 29–6–67 | 11,400 | | 4,509 | |
| | 110 | Texaco NFA Buick Creek (6) c-79-J | Dunlevy | 24–5–67 | 2,900 | | 2,000 | |
| | 96 | Texaco NFA Buick Creek (4) d-83-J | Charlie Lake | 6–6–66 | 1,500 | 1,500 | 2,000 | 2,000 |
| Buick Creek East | 1087 | Texaco NFA E Buick c-80-D | Bluesky-Gething | 20–7–66 | 750 | 750 | 2,000 | 2,000 |
| | 1088 | Texaco NFA E Buick c-98-L | Bluesky-Gething | | | | | |
| | 1286 | Mic Mac et al E Buick d-17-D | Dunlevy | 29–7–66 | 4,850 | | 2,000 | |
| | 295 | Texaco NFA E Buick a-31-A | Dunlevy | 26–7–67 | 16,000 | | 4,216 | |
| | 1087 | Texaco NFA E Buick c-80-D | Dunlevy | 25–7–67 | 4,700 | | 2,000 | |
| | 1088 | Texaco NFA E Buick c-98-L | Dunlevy | 28–7–67 | 1,370 | | 2,000 | |
| | 1185 | Texaco NFA E Buick c-18-D | Dunlevy | 31–7–67 | 4,500 | 37,950 | 2,000 | 18,216 |
| | 1346 | Texaco NFA E Buick d-93-A | Dunlevy | | | | | |
| | 1500 | Texaco NFA E Buick c-32-A | Dunlevy | | | | | |
| | 1508 | Texaco NFA E Buick d-A46-A | Dunlevy | 27–7–67 | 400 | | 2,000 | |
| | 1303 | Whitehall E Buick b-62-A | Dunlevy | 30–7–66 | 4,220 | | 2,000 | |
| | 1336 | Whitehall E Buick c-34-A | Dunlevy | 31–7–66 | 1,910 | | 2,000 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Buick Creek North | 1753 | Pacific West Prod N Buick c-22-F | Bluesky-Gething | 9-6-67 | 6,888 | 6,888 | 2,000 | 2,000 |
| | 1799 | Pacific West Prod N Buick b-44-F | Bluesky-Gething | | | | | |
| | 1753 | Pacific West Prod N Buick c-22-F | Dunlevy | 8-6-67 | 5,353 | | 2,000 | |
| | 1799 | Pacific West Prod N Buick b-44-F | Dunlevy | | | | | |
| | 1830 | Pacific West Prod N Buick b-86-F | Dunlevy | 1-6-66 | 1,340 | 30,743 | 2,000[5] | 11,150 |
| | 2026 | Pacific West Prod N Buick b-2-F | Dunlevy | 4-2-67 | 3,650 | | 2,000[5] | |
| | 2069 | Pacific West Prod N Buick a-81-C | Dunlevy | 13-2-67 | 7,800 | | 2,000[5] | |
| | 2174 | Texaco NFA N Buick d-91-C | Dunlevy | 15-10-67 | 12,600 | | 3,150 | |
| Buick Creek West | 239 | Pacific West Buick Creek (6) c-2-E | Gething | | | | | |
| | 89 | Pacific West Buick Creek (2) b-78-C | Dunlevy | 6-6-67 | 3,815 | | 2,000 | |
| | 95 | Pacific West Buick Creek (3) c-14-C | Dunlevy | 19-7-62 | 5,100 | | (4) | |
| | 99 | Pacific West Buick Creek (4) d-95-K | Dunlevy | 5-6-67 | 3,933 | | 2,000 | |
| | 239 | Pacific West Buick Creek (6) c-2-E | Dunlevy | 6-6-67 | 4,474 | | 2,000 | |
| | 255 | Pacific West Buick Creek (9) b-91-D | Dunlevy | 6-6-67 | 2,628 | 41,575 | 2,000 | 17,943 |
| | 261 | Pacific West Buick Creek (10) c-80-C | Dunlevy | | | | | |
| | 264 | Pacific West Buick Creek (11) c-5-C | Dunlevy | 5-6-67 | 3,681 | | 2,215 | |
| | 268 | Pacific West Buick Creek (12) d-89-C | Dunlevy | 6-6-67 | 2,216 | | 2,000 | |
| | 384 | Pacific West Buick Creek (17) d-17-C | Dunlevy | 7-6-66 | 15,728 | | 5,728 | |
| | 249 | Pacific West Buick Creek (8) d-58-C | Baldonnel | | | 1,514 | | 2,000 |
| | 644 | Pacific West Buick Creek a-78-C | Baldonnel | 8-6-67 | 1,514 | | 2,000 | |
| | 86 | Pacific West Buick Creek (1) b-23-E | Halfway | 19-7-62 | 2,450 | 2,450 | (4) | (4) |
| Clarke Lake | 2176 | Cankee Cdn-Sup Clarke d-72-G | Slave Point | 9-10-67 | 120,000 | | 30,000 | |
| | 1528 | Marathon Clarke a-65-G | Slave Point | 25-8-67 | 15,800 | | 3,950 | |
| | 1071 | Pacific Apache Clarke b-76-G | Slave Point | 21-8-67 | 12,750 | | 3,216 | |
| | 1578 | Pacific Apache Clarke a-61-F | Slave Point | 22-8-67 | 141,000 | | 35,440 | |
| | 1796 | Pacific et al Clarke b-22-F | Slave Point | | | | | |
| | 1833 | Pacific Imp Clarke c-56-L | Slave Point | 27-11-67 | 172,000 | | 43,060 | |
| | 1554 | Pacific Imperial Clarke c-92-I | Slave Point | 22-8-67 | 215,000 | | 53,750 | |
| | 1866 | Pacific et al Clarke d-69-H | Slave Point | 21-3-66 | 40,500 | | 10,125 | |
| | 1932 | Pacific et al Clarke c-54-F | Slave Point | | | | | |
| | 1933 | Pacific et al Clarke c-38-I | Slave Point | | | | | |
| | 1966 | Pacific et al Clarke a-55-J | Slave Point | 21-9-66 | | 1,197,350 | 37,500 | 346,973 |
| | 2107 | Pacific et al Clarke c-20-I | Slave Point | 27-9-67 | 30,000 | | 7,500 | |
| | 2162 | Pacific et al Clarke b-46-J | Slave Point | 27-9-67 | | | 5,000 | |
| | 505 | West Nat et al Clarke c-78-I | Slave Point | 20-8-67 | 116,000 | | 29,000 | |
| | 688 | West Nat et al Clarke b-70-I | Slave Point | 19-7-67 | 47,900 | | 12,837 | |
| | 856 | West Nat et al Clarke a-52-J | Slave Point | 18-8-67 | 18,400 | | 4,600 | |
| | 211 | West Nat et al Clarke c-47-J | Slave Point | | | | | |
| | 585 | West Nat Imp Clarke Lake d-91-L | Slave Point | 11/12-1-63 | 12,000 | | 3,000[5] | |
| | 344 | West Nat Imp Clarke Lake d-88-L | Slave Point | 17-8-67 | 143,000 | | 36,572 | |
| | 397 | West Nat Imp Clarke Lake c-94-L | Slave Point | 16-8-67 | 60,000 | | 15,120 | |
| | 503 | West Nat Imp Clarke Lake c-8-D | Slave Point | 17-8-67 | 53,000 | | 13,303 | |

[1] Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.
[2] A minimum production rate limit of 2,000 M c.f. per day is allowed for a well in which the calculated P.R.L. would be less than 2,000 M c.f. per day.
[3] Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.
[4] Well withdrawn from production. There is no P.R.L. The present potential of the well or all wells in the pool will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.
[5] Potential gas well which has not gone on production. The present potential of the well will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.
[6] Pool or project P.R.L.

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER 31, 1967—*Cont'd*

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. | | P.R.L. in M C.F./D.[2] | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Well | Pool Total[1] | Well | Pool Total[3] |
| Currant | 1607 | Texaco NFA Currant a-3-C | Halfway | — | — | — | — | — |
| | 1269 | Union HB Sinc Pac Currant d-37-C | Halfway | — | — | — | — | — |
| | 1320 | Union HB Sinc Pac Currant d-39-C | Halfway | — | — | — | — | — |
| Dawson Creek | 2216 | Horizon Dawson B3-22-79-15 | Dunvegan | — | — | — | — | — |
| | 302 | Pacific Sc Dawson Ck (2) 3-22-79-15 | Cadotte | 2-6-67 | 805 | 805 | 2,000 | 2,000 |
| Fort St. John | 75 | Pacific Ft St John (31) A3-29-83-18 | Cadomin | 19-7-53 | 29,000 | 29,000 | (4) | (4) |
| | 190 | Pacific Ft St John (58) A9-19-83-18 | Cadomin | — | — | | | |
| | 32 | Pacific Ft St John (7) 14-5-83-18 | Baldonnel | 11-10-66 | 3,171 | | 2,000 | |
| | 67 | Pacific Ft St John (26) 4-32-83-18 | Baldonnel | 29-5-67 | 715 | | 2,000 | |
| | 76 | Pacific Ft St John (32) 14-22-83-18 | Baldonnel | 25-5-67 | 5,815 | | 2,200 | |
| | 82 | Pacific Ft St John (34) 13-23-83-18 | Baldonnel | 26-5-67 | 5,461 | | 2,000 | |
| | 170 | Pacific Ft St John (43) 8-20-83-18 | Baldonnel | 30-5-67 | 3,398 | | 2,000 | |
| | 186 | Pacific Ft St John (56) C3-29-83-18 | Baldonnel | 30-5-67 | 2,678 | 36,901 | 2,000 | 22,534 |
| | 193 | Pacific Ft St John (62) B14-21-83-18 | Baldonnel | 1-6-67 | 3,297 | | 2,000 | |
| | 194 | Pacific Ft St John (54) 13-14-83-18 | Baldonnel | 12-10-66 | 2,238 | | 2,000 | |
| | 204 | Pacific Ft St John (71) 9-14-83-18 | Baldonnel | — | — | | — | |
| | 210 | Pacific Ft St John (72) 6-17-83-18 | Baldonnel | 31-5-67 | 4,914 | | 2,334 | |
| | 212 | Pacific Ft St John (73) A6-16-83-18 | Baldonnel | 31-5-67 | 2,657 | | 2,000 | |
| | 233 | Pacific Ft St John (83) 16-8-83-18 | Baldonnel | 31-5-67 | 2,557 | | 2,000 | |
| | 179 | Pacific Ft St John (52) B3-29-83-18 | Charlie Lake | — | — | — | — | — |
| | 74 | Pacific Ft St John (30) 1-20-83-18 | Halfway | 30-5-67 | 2,886 | | 2,000 | |
| | 172 | Pacific Ft St John (46) 2-21-83-18 | Halfway | 31-5-67 | 3,897 | | 2,139 | |
| | 178 | Pacific Ft St John (51) A14-21-83-18 | Halfway | 29-5-67 | 3,771 | 15,144 | 2,731 | 10,870 |
| | 179 | Pacific Ft St John (52) B3-29-83-18 | Halfway | 30-5-67 | 2,641 | | 2,000 | |
| | 181 | Pacific Ft St John (53) 10-30-83-18 | Halfway | 29-5-66 | 1,824 | | 2,000 | |
| | 192 | Pacific Ft St John (61) A14-22-83-18 | Halfway | 30-5-66 | 125 | | (4) | |
| | 29 | Pacific Ft St John (4) 14-21-83-18 | Belloy | 26-8-66 | 1,246 | 3,983 | 2,000 | 4,000 |
| | 58 | Pacific Ft St John (23) 3-29-83-18 | Belloy | 28-5-67 | 2,737 | | 2,000 | |
| Fort St. John Southeast | 220 | Pac Ft St John SE (80) 10-31-82-17 | Cadomin | 26-5-66 | 897 | 897 | (4) | (4) |
| | 184 | Pac Ft St John SE (55) A4-10-83-17 | Baldonnel | 11-5-64 | 3,125 | 5,988 | (4) | 2,000 |
| | 213 | Pac Ft St John SE (74) 13-2-83-17 | Baldonnel | 19-5-67 | 2,863 | | 2,000 | |
| | 60 | Pac Ft St John SE (22) 10-33-82-17 | Halfway | 25-10-56 | 9,000 | | (4) | |
| | 174 | Pacific Ft St John SE (49) 7-3-83-17 | Halfway | 5/14-8-58 | 3,814 | | (4) | |
| | 191 | Pac Ft St John SE (60) A10-4-83-17 | Halfway | 19-5-67 | 2,237 | 26,223 | 2,000 | 4,975 |
| | 197 | Pac Ft St John SE (66) 16-3-83-17 | Halfway | 19-5-67 | 6,447 | | 2,975 | |
| | 202 | Pac Ft St John SE (69) 7-5-83-17 | Halfway | 18-6-57 | 2,050 | | (4) | |
| | 320 | Pac Ft St John SE (98) A10-10-83-17 | Halfway | 11-5-64 | 2,675 | | (4) | |
| | 42 | Pac Ft St John SE (12) 4-10-83-17 | Belloy | 21-7-61 | 5,700 | | (4) | |
| | 52 | Pacific Ft St John SE (20) 8-5-83-17 | Belloy | 1-10-53 | 4,980 | | (4) | |
| | 166 | Pacific Ft St John SE (44) 4-9-83-17 | Belloy | 23-5-67 | 6,000 | 33,938 | 4,124 | 13,235 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 173 | Pac Ft St John SE (47) 10-4-83-17 | Belloy | 23–5–67 | 9,200 | | 4,344 | |
| | 201 | Pac Ft St John SE (68) 11-32-82-17 | Belloy | 19–5–67 | 5,675 | | 2,767 | |
| | 219 | Pac Ft St John SE (79) 10-10-83-17 | Belloy | 22–5–67 | 2,383 | | 2,000 | |
| Gundy Creek | 291 | West Nat East Gundy Creek a-76-A | Baldonnel | | | | | |
| | 367 | West Nat Gundy Creek d-2-G | Baldonnel | 22/23–8–62 | 2,250 | 5,000 | (4) | (4) |
| | 83 | West Nat Gundy Creek c-80-A | Baldonnel | | | | | |
| | 253 | West Nat Gundy Creek b-69-A | Baldonnel | 2–7–58 | 5,000 | | (4) | |
| | 253 | West Nat Gundy Creek b-69-A | Charlie Lake | | | | | |
| Halfway | 107 | West Nat et al Halfway 5-1-87-25 | Baldonnel | 19–6–67 | 1,821 | 10,021 | 2,000 | 2,000 |
| | 351 | West Nat et al Halfway 11-35-86-25 | Baldonnel | 29–10–58 | 8,200 | | (4) | |
| | 182 | West Nat et al Halfway 8-11-87-25 | Halfway | 20–8–63 | 720 | 720 | (4) | (4) |
| Highway | 168 | West Nat et al Highway b-3-I | Dunlevy | 23–7–67 | 766 | 766 | 2,000 | 2,000 |
| | 112 | Pacific Highway (1) b-25-I | Baldonnel | 27–8–58 | 6,600 | | (4) | |
| | 180 | Pacific Highway (2) a-47-I | Baldonnel | 26/27–11–57 | 3,600 | 14,270 | (4) | (4) |
| | 229 | Pacific Highway (4) a-90-I | Baldonnel | 23–11–64 | 920 | | (4) | |
| | 274 | Pacific Highway (3) a-69-I | Baldonnel | 28–11–57 | 3,150 | | (4) | |
| | 229 | Pacific Highway (4) a-90-I | Mississippian | 13–7–66 | 6,885 | 6,885 | (4) | (4) |
| Jedney | 1366 | Pacific Imperial Jedney a-95-C | Gething | 17–10–63 | 13,600 | | (4) | |
| | 1907 | Pacific et al Jedney b-50-F | Gething | | | | | |
| | 498 | Pacific et al Jedney b-68-J | Gething | 10–6–66 | 584 | | 2,000 | |
| | 651 | Pacific et al Jedney d-97-C | Gething | 5–7–67 | 12,500 | 13,600 | 3,269 | (4) |
| | 778 | Pacific et al Jedney c-86-C | Gething | 5–7–67 | 3,126 | | 2,000 | |
| | 427 | Pacific et al Jedney b-88-J | Gething | 10–7–67 | 18,800 | | 6,336 | |
| | 2171 | Pacific Imp Jedney d-19-B | Gething | | | | | |
| | 382 | Pacific Imp Jedney d-99-J | Baldonnel | 6–7–67 | 2,207 | | 2,000 | |
| | 1178 | Pacific Imperial Jedney d-31-C | Baldonnel | 13–7–67 | 2,860 | | 2,000 | |
| | 820 | Pacific Imperial Jedney d-53-C | Baldonnel | 13–7–67 | 2,088 | | 2,000 | |
| | 868 | Pacific Imperial Jedney b-73-C | Baldonnel | 5–7–67 | 2,641 | | 2,000 | |
| | 1054 | Pacific Imperial Jedney b-99-H | Baldonnel | 4–7–67 | 3,128 | | 2,000 | |
| | 1082 | Pacific Imperial Jedney c-100-H | Baldonnel | 4–7–67 | 1,929 | | 2,000 | |
| | 1129 | Pacific Imperial Jedney c-78-H | Baldonnel | 13–11–63 | 1,450 | | 2,000 | |
| | 460 | Pacific Imperial Jedney b-30-B | Baldonnel | 6–7–67 | 3,818 | 100,389 | 2,000 | 47,112 |
| | 473 | Pacific Imperial Jedney b-10-B | Baldonnel | 6–7–67 | 23,400 | | 7,507 | |
| | 475 | Pacific Imperial Jedney b-66-J | Baldonnel | 14–7–67 | 6,179 | | 2,000 | |
| | 484 | Pacific Imperial Jedney d-77-J | Baldonnel | 7–7–67 | 2,543 | | 2,000 | |
| | 1375 | Pacific Imperial Jedney d-44-C | Baldonnel | 6–7–67 | 5,233 | | 2,000 | |
| | 944 | Pacific Pan Am Dome Jedney b-28-F | Baldonnel | 15–7–67 | 2,400 | | 2,000 | |
| | 1152 | Pacific Pan Am Dome Jedney c-8-F | Baldonnel | 4–7–67 | 1,253 | | (4) | |
| | 492 | Pacific Sunray Imp Jedney b-44-J | Baldonnel | | | | | |
| | 1334 | Skelly Jedney a-39-F | Baldonnel | 5–11–66 | 4,250 | | 2,000 | |
| | 778 | Pacific et al Jedney c-86-C | Halfway | 28–6–67 | 3,347 | | 2,000 | |
| | 779 | Pacific et al Jedney a-17-F | Halfway | 27–6–67 | 5,977 | | 2,000 | |
| | 1907 | Pacific et al Jedney b-50-F | Halfway | | | | | |

1 Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.
2 A minimum production rate limit of 2,000 M c.f. per day is allowed for a well in which the calculated P.R.L. would be less than 2,000 M c.f. per day.
3 Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.
4 Well withdrawn from production. There is no P.R.L. The present potential of the well or all wells in the pool will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER 31, 1967—*Cont'd*

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. | | P.R.L. in M C.F./D.[2] | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Well | Pool Total[1] | Well | Pool Total[3] |
| Jedney | 651 | Pacific et al Jedney d-97-C | Halfway | 27-6-67 | 4,523 | | 2,000 | |
| | 2171 | Pacific Imp Jedney d-19-B | Halfway | | | | | |
| | 382 | Pacific Imp Jedney d-99-J | Halfway | 10-7-67 | 4,571 | | 2,000 | |
| | 453 | Pacific Imperial Jedney d-42-C | Halfway | 12-7-67 | 8,493 | | 2,491 | |
| | 820 | Pacific Imperial Jedney d-53-C | Halfway | 11-7-67 | 5,668 | | 2,000 | |
| | 868 | Pacific Imperial Jedney b-73-C | Halfway | 28-6-67 | 4,403 | | 2,000 | |
| | 1054 | Pacific Imperial Jedney b-99-H | Halfway | 7-7-67 | 14,400 | | 4,222 | |
| | 1082 | Pacific Imperial Jedney c-100-H | Halfway | 7-7-67 | 6,262 | | 2,000 | |
| | 1129 | Pacific Imperial Jedney c-78-H | Halfway | 29-6-67 | 10,721 | 129,050 | 3,393 | 50,519 |
| | 1178 | Pacific Imperial Jedney d-31-C | Halfway | 11-7-67 | 4,973 | | 2,000 | |
| | 1183 | Pacific Imperial Jedney c-57-H | Halfway | 29-6-67 | 2,264 | | 2,000 | |
| | 1256 | Pacific Imperial Jedney d-68-H | Halfway | 29-6-67 | 3,359 | | 2,000 | |
| | 1366 | Pacific Imperial Jedney a-95-C | Halfway | 2-8-67 | 2,099 | | 2,000 | |
| | 1375 | Pacific Imperial Jedney d-44-C | Halfway | | | | | |
| | 461 | Pacific Imperial Jedney a-65-J | Halfway | 7-7-67 | 4,492 | | 2,000 | |
| | 475 | Pacific Imperial Jedney b-66-J | Halfway | 8-8-67 | 12,315 | | 3,464 | |
| | 484 | Pacific Imperial Jedney d-77-J | Halfway | 10-7-67 | 21,700 | | 6,949 | |
| | 691 | Pacific Imperial Jedney b-84-C | Halfway | 28-6-67 | 3,425 | | 2,000 | |
| | 944 | Pacific Pan Am Dome Jedney b-28-F | Halfway | 27-6-67 | 4,288 | | 2,000 | |
| | 1334 | Skelly Jedney a-39-F | Halfway | 4-11-66 | 1,680 | | 2,000 | |
| Jedney West | 1081 | Pacific et al W Jedney b-84-K | Baldonnel | 26-7-67 | 1,362 | 1,362 | (4) | (4) |
| | 1081 | Pacific et al W Jedney b-84-K | Halfway | 14-7-67 | 1,377 | 2,021 | (4) | (4) |
| | 1276 | Pacific et al W Jedney b-6-C | Halfway | 18-6-65 | 644 | | (4) | |
| Kobes-Townsend | 372 | Pacific Kobes (4) a-3-A | Dunlevy | 1-8-67 | 2,185 | | 2,000 | |
| | 489 | Pacific Kobes b-24-A | Dunlevy | 31-7-67 | 855 | 4,199 | 2,000 | 6,000 |
| | 496 | Pacific Kobes b-82-I | Dunlevy | 1-8-67 | 1,159 | | 2,000 | |
| | 141 | Pacific Kobes (1) d-94-I | Charlie Lake | 2-8-67 | 5,699 | | 2,000 | |
| | 177 | Pacific Kobes (A-1) b-35-A | Charlie Lake | 28-7-67 | 1,661 | | 2,000 | |
| | 299 | Pacific Kobes (2) c-73-I | Charlie Lake | 27-7-67 | 1,663 | 10,870 | 2,000 | 10,000 |
| | 314 | Pacific Kobes (B-1) a-99-I | Charlie Lake | 27-7-67 | 457 | | 2,000 | |
| | 251 | Pacific Townsend (A-2) d-21-G | Charlie Lake | 1-8-67 | 1,390 | | 2,000 | |
| | 141 | Pacific Kobes (1) d-94-I | Halfway | 1-8-67 | 9,377 | 21,207 | | (7) |
| | 177 | Pacific Kobes (A-1) b-35-A | Halfway | 2-6-66 | 11,830 | | | |
| | 314 | Pacific Kobes (B-1) a-99-A | Mississippian | 31-7-67 | 10,540 | 11,037 | 4,026 | 4,026 |
| | 164 | Pacific Townsend (A-1) a-20-H | Mississippian | 12-8-65 | 497 | | (4) | |
| Kotcho Lake | 2097 | Pacific Kotcho b-86-K | Slave Point | 30-3-67 | 100,000 | | 25,000[5] | |
| | 562 | Pacific Kotcho b-44-C | Slave Point | 5/6-4-60 | 105,000 | | 26,250[5] | |
| | 879 | West Nat Kotcho b-54-K | Slave Point | | | 1,072,000 | | 268,000 |
| | 1147 | West Nat Kotcho d-12-C | Slave Point | 12/13-2-63 | 42,000 | | 10,500[5] | |
| | 404 | West Nat Kotcho Lake c-67-K | Slave Point | 13/14-2-60 | 825,000 | | 206,250[5] | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Laprise Creek | 532 | West Nat Kotcho Lake d-39-J | Slave Point | | | | | 93,529 |
| | 327 | Dome Basco Laprise Ck a-35-H | Baldonnel | 14–6–67 | 9,630 | 303,641 | 39,296[6] | |
| | 474 | Dome Basco Laprise Creek d-13-H | Baldonnel | 9–6–67 | 6,570 | | | |
| | 483 | Dome Provo Laprise Creek b-2-H | Baldonnel | 10–6–67 | 11,225 | | | |
| | 490 | Dome Basco Laprise Creek a-81-A | Baldonnel | 28–6–67 | 6,760 | | | |
| | 653 | Dome Provo Laprise Creek d-91-A | Baldonnel | 6–6–67 | 2,995 | | | |
| | 654 | Dome Provo Laprise Creek a-25-H | Baldonnel | 8–6–67 | 3,038 | | | |
| | 665 | Dome Provo Laprise a-46-H | Baldonnel | 10–6–67 | 4,185 | | | |
| | 666 | Dome Provo Laprise Creek a-33-H | Baldonnel | 11–6–67 | 6,975 | | | |
| | 809 | Dome Provo Laprise d-91-H | Baldonnel | 16–6–67 | 8,400 | | | |
| | 837 | Dome Provo Laprise a-81-H | Baldonnel | 18–6–67 | 5,655 | | | |
| | 1056 | Dome Provo Laprise c-92-H | Baldonnel | 27–6–67 | 7,200 | | | |
| | 1225 | Dome Provo Laprise c-70-E | Baldonnel | 21–6–67 | 7,140 | | | |
| | 1251 | Dome Provo Laprise c-40-E | Baldonnel | 1–8–67 | 17,020 | | | |
| | 1445 | Dome Provo Laprise a-52-H | Baldonnel | 13–6–67 | 4,555 | | | |
| | 1837 | Dome Provo Laprise b-30-E | Baldonnel | 2–2–67 | 18,500 | | | |
| | 1852 | Dome Provo Laprise d-4-H | Baldonnel | 5–6–67 | 6,325 | | | |
| | 516 | Pacific Imperial Laprise d-68-E | Baldonnel | 24–9–67 | 8,823 | | 44,350[6] | |
| | 551 | Pacific Imperial Laprise c-78-E | Baldonnel | 18–7–67 | 8,155 | | | |
| | 650 | Pacific Imperial Laprise c-56-E | Baldonnel | 18–7–67 | 8,616 | | | |
| | 659 | Pacific Imperial Laprise b-44-E | Baldonnel | 20–7–67 | 18,539 | | | |
| | 670 | Pacific Imperial Laprise d-55-E | Baldonnel | 18–7–67 | 12,539 | | | |
| | 678 | Pacific Imperial Laprise a-46-E | Baldonnel | 17–7–67 | 4,402 | | | |
| | 690 | Pacific Imperial Laprise a-33-E | Baldonnel | 24–7–67 | 12,294 | | | |
| | 715 | Pacific Imperial Laprise a-22-E | Baldonnel | 19–7–67 | 4,297 | | | |
| | 1341 | Pacific Imperial Laprise a-99-E | Baldonnel | 19–7–67 | 12,032 | | | |
| | 1488 | Pacific Imperial Laprise a-49-E | Baldonnel | 17–7–67 | 18,446 | | | |
| | 1938 | Pacific Imperial Laprise a-29-E | Baldonnel | 31–10–66 | | | | |
| | 1948 | Pacific IOE Laprise a-85-D | Baldonnel | 25–7–67 | 6,000 | | | |
| | 1970 | Pacific Imp Laprise b-90-C | Baldonnel | 20–7–67 | 8,500 | | | |
| | 1979 | Pacific IOE Laprise d-3-E | Baldonnel | 19–7–67 | | | | |
| | 1999 | Pacific Imp Laprise b-100-C | Baldonnel | 7–12–66 | 14,255 | | | |
| | 1511 | Pacific Imperial Laprise c-24-E | Baldonnel | 17–1–67 | 2,450 | | | |
| | 1282 | Amerada Laprise d-33-D | Baldonnel | | | | | |
| | 1337 | Amerada Laprise a-7-E | Baldonnel | 8–11–63 | 5,300 | | (4) | |
| | 1378 | Amerada Laprise d-77-D | Baldonnel | 29–6–66 | 7,150 | | 2,000 | |
| | 1468 | Amerada Laprise d-55-D | Baldonnel | 2–7–66 | 15,500 | | 3,883 | |
| | 1477 | Amerada Laprise d-95-D | Baldonnel | 29–6–66 | 2,050 | | 2,000 | |
| | 1364 | Pacific IOE Laprise d-11-E | Baldonnel | | | | | |

1 Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.
2 A minimum production rate limit of 2,000 M c.f. per day is allowed for a well which the calculated P.R.L. would be less than 2,000 M c.f. per day.
3 Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.
4 Well withdrawn from production. There is no P.R.L. The present potential of the well or all wells in the pool will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.
5 Potential gas well which has not gone on production. The present potential of the well will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.
6 Pool or project P.R.L.
7 Production by good engineering practice.

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER 31, 1967—*Cont'd*

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. Well | A.O.F.P. in M C.F./D. Pool Total[1] | P.R.L. in M C.F./D.[2] Well | P.R.L. in M C.F./D.[2] Pool Total[3] |
|---|---|---|---|---|---|---|---|---|
| Laprise Creek | 1371 | Tenn Monsanto Laprise d-79-C | Baldonnel | 16-9-65 | 6,600 | | (4) | |
| | 1392 | Triad et al Laprise d-37-C | Baldonnel | 23-6-67 | 1,550 | | 2,000 | |
| Laprise Creek West | 873 | Dome CDP C & E W Laprise c-82-G | Baldonnel | 11-6-67 | 2,695 | 2,695 | (4) | (4) |
| | 1015 | Dome CDP C & E W Laprise c-71-G | Baldonnel | — | — | | | |
| Milligan Creek | 689 | Whitehall et al Milligan d-75-G | Halfway | — | — | — | — | — |
| Montney | 119 | Pac Sunray Montney (3) 16-32-86-19 | Bluesky-Gething | 25-9-58 | 814 | 814 | (4) | (4) |
| | 104 | Pac Sunray Montney (2) 14-36-86-19 | Charlie Lake | 4-7-58 | 2,200 | 2,200 | (4) | (4) |
| | 289 | Pac Sunray Montney (5) 14-31-86-19 | Halfway | 26-7-61 | 2,250 | 5,193 | (4) | 2,000 |
| | 801 | Pac White Rose Sec Montney 6-5-87-18 | Halfway | 2-6-67 | 2,943 | | 2,000 | |
| Nettle | 1434 | Union KCL ROC Nettle d-76-A | Bluesky-Gething | — | — | — | — | — |
| | 1411 | Union KCL ROC Nettle d-58-A | Halfway | — | — | — | — | — |
| Nig Creek | 61 | Texaco NFA Nig Creek a-79-B | Baldonnel | 20-7-67 | 17,600 | | | |
| | 131 | Texaco NFA Nig Creek a-12-G | Baldonnel | 12-7-67 | 12,500 | | | |
| | 383 | Texaco NFA Nig Creek b-70-B | Baldonnel | 27-6-67 | 14,000 | | | |
| | 447 | Texaco NFA Nig Creek b-2-G | Baldonnel | 7-7-67 | 34,200 | | | |
| | 456 | Texaco NFA Nig Creek a-1-G | Baldonnel | 19-6-67 | 18,900 | | | |
| | 729 | Texaco NFA Nig c-36-B | Baldonnel | 23-6-67 | 6,200 | | | |
| | 790 | Texaco NFA Nig d-71-B | Baldonnel | 28-6-67 | 2,550 | | | |
| | 819 | Texaco NFA Nig a-69-A | Baldonnel | 21-6-67 | 1,670 | | | |
| | 852 | Texaco NFA Nig b-44-G | Baldonnel | 17-10-67 | 365 | | | |
| | 967 | Texaco NFA Nig a-8-G | Baldonnel | 11-7-67 | 29,000 | | 80,300[6] | |
| | 1161 | Texaco NFA Nig c-90-B | Baldonnel | 16-6-67 | 10,200 | | | |
| | 1180 | Texaco NFA Nig d-15-B | Baldonnel | 22-6-67 | 9,700 | | | |
| | 1654 | Texaco NFA Nig c-6-H | Baldonnel | 13-7-67 | 10,000 | | | |
| | 1681 | Texaco NFA Nig d-75-B | Baldonnel | 29-6-67 | 8,000 | | | |
| | 1707 | Texaco NFA Nig c-14-H | Baldonnel | 23-9-67 | 3,500 | 243,375 | | 92,320 |
| | 1740 | Texaco NFA Nig a-6-G | Baldonnel | 14-7-67 | 10,500 | | | |
| | 1742 | Texaco NFA Nig c-33-H | Baldonnel | 20-7-67 | 12,000 | | | |
| | 1762 | Texaco NFA Nig a-77-B | Baldonnel | 30-6-67 | 17,000 | | | |
| | 2157 | Texaco NFA Nig d-33-B | Baldonnel | 22-9-67 | 530 | | | |
| | 2178 | Texaco NFA Nig c-14-G | Baldonnel | 15-10-67 | 400 | | | |
| | 1139 | Dome Provo Nig d-35-B | Baldonnel | 4-7-67 | 4,850 | | 2,000 | |
| | 1004 | Monsanto Nig d-13-B | Baldonnel | 4-12-66 | 2,800 | | 2,000 | |
| | 1475 | Monsanto Nig a-21-B | Baldonnel | 4-12-66 | 5,550 | | 2,000 | |
| | 1728 | Pacific Nig b-4-B | Baldonnel | 9-6-67 | 4,060 | | 2,000 | |
| | 1484 | Tenn Monsanto Nig C-A32-C | Baldonnel | — | — | | — | |
| | 294 | Texaco NFA Nig Creek a-31-F | Baldonnel | — | — | | — | |
| | 1976 | Texaco NFA Nig b-41-H | Baldonnel | — | — | | — | |
| | 2152 | Texaco NFA Nig d-87-A | Baldonnel | — | — | | — | |
| | 1373 | West Nat Nig a-3-B | Baldonnel | 9-6-67 | 1,500 | | 2,000 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parkland | 1613 | Whitehall Nig b-6-B | Baldonnel | 26–7–65 | 5,800 | | 2,000[5] | |
| | 153 | Pacific Imp Parkland 6-29-81-15 | Wabamun | 25–5–67 | 25,700 | 36,700 | 20,000[6] | 20,000[6] |
| | 1153 | Pacific Imp Parkland 10-28-81-15 | Wabamun | 26–5–67 | 11,000 | | | |
| Peejay | 1664 | CIGOL Mobil Peejay b-56-E | Halfway | 13–9–65 | 10,000 | | 2,500 | |
| | 713 | Pacific SR West Cdn Peejay d-52-I | Halfway | ––––– | ––––– | 10,000 | ––––– | 2,500 |
| | 893 | Pacific SR West Cdn Peejay d-43-I | Halfway | ––––– | ––––– | | ––––– | |
| | 1652 | Union HB Peejay b-54-E | Halfway | ––––– | ––––– | | ––––– | |
| Petitot River | 403 | West Nat Petitot River d-24-D | Slave Point | ––––– | ––––– | | ––––– | |
| | 533 | West Nat Petitot River b-1-D | Slave Point | 11/12–2–60 | 185,000 | 185,000 | 46,250[5] | 46,250 |
| | 722 | West Nat Petitot River b-90-K | Slave Point | ––––– | ––––– | | ––––– | |
| Red Creek | 93 | Pacific Red Creek (36) 5-27-85-21 | Charlie Lake | 27–5–65 | 3,308 | 3,308 | (4) | (4) |
| | 93 | Pacific Red Creek (36) 5-27-85-21 | Halfway | 27–5–65 | 2,484 | 2,484 | (4) | (4) |
| Rigel | 1372 | Denison Rigel 6-31-87-16 | Dunlevy | 12–8–65 | 4,050 | | (4) | |
| | 828 | Imp et al Rigel 6-27-88-18 | Dunlevy | 1–8–67 | 10,800 | | 2,873 | |
| | 1003 | Imp et al Rigel b-22-K | Dunlevy | ––––– | ––––– | | ––––– | |
| | 1032 | Imp et al Rigel 6-30-88-17 | Dunlevy | 15–8–67 | 20,800 | | 5,642 | |
| | 1118 | Imp et al Rigel 6-21-88-18 | Dunlevy | 8–8–67 | 9,900 | | 2,576 | |
| | 1163 | Imp et al Rigel 7-23-88-18 | Dunlevy | 1–8–67 | 5,300 | | 2,000 | |
| | 1978 | Imp et al Rigel 7-13-88-18 | Dunlevy | 14–8–67 | 20,000 | | 5,125 | |
| | 1107 | Imp et al Rigel 7-19-88-17 | Dunlevy | 21–8–67 | 18,200 | | 4,755 | |
| | 1385 | Imp Fina Rigel 6-28-88-17 | Dunlevy | ––––– | ––––– | | ––––– | |
| | 1465 | Imp Fina Rigel 10-14-88-18 | Dunlevy | 8–8–67 | 11,700 | | 3,045 | |
| | 1168 | Imp Fina Rigel 6-16-88-17 | Dunlevy | ––––– | ––––– | | ––––– | |
| | 1208 | Imp Fina Rigel 6-8-88-17 | Dunlevy | 3–8–67 | 3,000 | | 2,000 | |
| | 130 | Imp Fina Rigel 4-27-88-17 | Dunlevy | 3–8–67 | 5,700 | | 2,000 | |
| | 1090 | Imp Fina Rigel 6-10-88-17 | Dunlevy | 21–8–67 | 10,000 | | 2,630 | |
| | 1187 | Imp Fina Rigel 6-3-88-17 | Dunlevy | 28–8–67 | 18,500 | | 4,815 | |
| | 1593 | Imp Fina Rigel 11-3-88-18 | Dunlevy | ––––– | ––––– | | ––––– | |
| | 1312 | Imp Fina Rigel 8-1-88-17 | Dunlevy | ––––– | ––––– | 271,050 | ––––– | 75,843 |
| | 2054 | Imp IOE Fina Rigel a-21-J | Dunlevy | 14–2–67 | 14,500 | | 3,625 | |
| | 1739 | IOE Fina Rigel 16-24-87-17 | Dunlevy | ––––– | ––––– | | ––––– | |
| | 2127 | IOE Fina Rigel 10-25-88-17 | Dunlevy | 18/19–12–67 | 2,250 | | 2,000 | |
| | 1494 | IOE Fina Rigel 11-11-88-18 | Dunlevy | 28–8–67 | 20,500 | | 5,253 | |
| | 1486 | Monsanto IOE Fina Rigel 11-26-87-17 | Dunlevy | 22–8–64 | 8,600 | | 2,150 | |
| | 1354 | Monsanto Rigel 6-36-87-17 | Dunlevy | 19–8–66 | 11,500 | | 2,958 | |
| | 1973 | Monsanto Rigel 14-23-87-17 | Dunlevy | ––––– | ––––– | | ––––– | |
| | 1293 | Pacific Rigel 6-35-87-17 | Dunlevy | 25–8–66 | 4,400 | | 2,000 | |
| | 1381 | Richfield et al Rigel 10-19-88-18 | Dunlevy | ––––– | ––––– | | ––––– | |
| | 1324 | Sun Rigel 10-24-88-18 | Dunlevy | 9–6–67 | 5,900 | | (4) | |

1 Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.

2 A minimum production rate limit of 2,000 M c.f. per day is allowed for a well in which the calculated P.R.L. would be less than 2,000 M c.f. per day.

3 Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.

4 Well withdrawn from production. There is no P.R.L. The present potential of the well or all wells in the pool will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

5 Potential gas well which has not gone on production. The present potential of the well will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

6 Pool or project P.R.L.

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER 31, 1967—*Cont'd*

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. | | P.R.L. in M C.F./D.[2] | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Well | Pool Total[1] | Well | Pool Total[3] |
| Rigel | 1222 | Texaco NFA Rigel 10-29-88-18 | Dunlevy | 21/22-2-63 | 4,850 | | 2,000[5] | |
| | 1370 | Texaco NFA Rigel a-28-K | Dunlevy | 1-8-67 | 1,600 | | 2,000 | |
| | 195 | Texaco NFA Rigel (10) 9-31-88-18 | Dunlevy | 2-8-67 | 13,500 | | 4,381 | |
| | 1149 | Whitehall Rigel 6-14-88-17 | Dunlevy | — | — | | — | |
| | 1148 | Whitehall Rigel 6-15-88-17 | Dunlevy | 14-9-66 | 35,000 | | 9,380 | |
| | 1234 | Whitehall Rigel 11-18-88-16 | Dunlevy | — | — | | — | |
| | 1365 | Wintershall Rigel 10-34-87-17 | Dunlevy | 22-8-67 | 10,500 | | 2,635 | |
| Stoddart | 1902 | Dome Provo Stoddart 11-8-86-19 | Belloy | 15-7-67 | 7,600 | | 2,000 | |
| | 1841 | Jeff Lake Altair Stoddart 6-11-86-19 | Belloy | 25-8-66 | 22,000 | | 5,500 | |
| | 438 | Pacific et al Stoddart 10-1-86-20 | Belloy | — | — | | — | |
| | 1473 | Pacific et al Stoddart 11-16-86-19 | Belloy | 2-6-67 | 3,178 | | 2,000 | |
| | 244 | Pacific Stoddart (85) 4-24-86-20 | Belloy | 1-6-67 | 13,000 | 73,003 | 4,595 | 22,960 |
| | 262 | Pacific Stoddart (90) 2-13-86-20 | Belloy | 2-6-67 | 5,650 | | 2,165 | |
| | 2078 | Pacific Stoddart 6-10-86-19 | Belloy | — | — | | — | |
| | 2155 | Pacific Stoddart 11-2-86-19 | Belloy | 3-12-67 | 18,800 | | 4,700 | |
| | 1770 | Whitehall Stoddart 6-17-86-19 | Belloy | 20-1-66 | 2,775 | | 2,000 | |
| Stoddart West | 1190 | Pacific W Stoddart 11-10-86-20 | Belloy | 1-6-67 | 4,954 | 4,954 | 2,000 | 2,000 |
| Weasel | 1790 | Sinclair Pacific Weasel d-93-J | Baldonnel | 15/17-12-65 | 6,050 | 6,050 | 2,000 | 2,000 |
| | 709 | Pacific Sinclair Weasel d-50-A | Halfway | 1/3-3-61 | 21,500 | 21,500 | 5,375[5] | 5,375[5] |
| Wildmint | 1682 | Altair FPC Wildmint b-22-A | Halfway | — | — | — | — | — |
| | 1092 | Tenn Wildmint d-4-A | Halfway | — | — | — | — | — |
| Willow | 830 | Union HB Willow b-10-H | Halfway | — | — | — | — | — |
| | 1292 | Union HB Willow d-11-G | Halfway | — | — | — | — | — |
| Wolf | 1874 | Baysel Sinclair Wolf d-3-G | Halfway | — | — | — | — | — |
| Yoyo | 2068 | Cankee Uno-Tex Yoyo a-49-L | Pine Point | — | — | | — | |
| | 1431 | Frontier Yoyo c-18-L | Pine Point | 14-1-68 | 258,000 | | 64,500[5] | |
| | 2035 | Pacific Yoyo d-7-L | Pine Point | 21-2-67 | 115,000 | | 28,750[5] | |
| | 1569 | Placid Frontier Yoyo b-10-L | Pine Point | 28/29-3-65 | 63,000 | 642,000 | 15,750[5] | 160,500 |
| | 1831 | Tenn Altair Yoyo a-47-L | Pine Point | — | — | | — | |
| | 1313 | West Nat et al Yoyo b-24-L | Pine Point | 16-1-64 | 146,000 | | 36,500[5] | |
| | 1405 | West Nat Yoyo b-98-E | Pine Point | 9-2-67 | 60,000 | | 15,000[5] | |
| Other areas | 15 | Pacific Sunrise (3) 10-7-79-16 | Cadotte | — | — | — | — | — |
| | 17 | Pacific Sunrise (4) 10-9-79-16 | Cadotte | — | — | — | — | — |
| | 19 | Pacific Sunrise (6A) 11-31-78-16 | Cadotte | — | — | — | — | — |
| | *Nil* | Westcoast Pouce Coupe (1) 6-30-80-13 | Cadotte | — | — | — | — | — |
| | *Nil* | Westcoast Pouce Coupe (6) 8-18-80-13 | Cadotte | — | — | — | — | — |
| | *Nil* | Westcoast Kiskatinaw (5) 8-30-80-14 | Notikewin | — | — | — | — | — |
| | 410 | Imp Fina Altares a-83-A | Bluesky-Gething | 21-1-60 | 22,000 | | 5,500[5] | |
| | 641 | Imp Pac Sunray Wargen c-58-C | Bluesky-Gething | 5-10-60 | 14,500 | | 3,625[5] | |
| | 1893 | Sinclair Pacific Beavertail d-71-C | Bluesky-Gething | — | — | | — | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1915 | Sinclair Pacific Beavertail d-73-C | Bluesky-Gething | | | | | |
| | 1849 | Tenn Cdn Sup Dahl d-53-J | Bluesky-Gething | | | | | |
| | 1275 | Tenn Osborn 6-23-88-16 | Bluesky-Gething | | | | | |
| | 300 | Texaco NFA Junction (12) b-9-F | Bluesky-Gething | | | 36,500 | | 9,125[5] |
| | 571 | Texaco NFA Silver c-52-K | Bluesky-Gething | | | | | |
| | 987 | Triad BP Birley d-17-A | Bluesky-Gething | | | | | |
| | 695 | Triad BP Pickell Creek c-88-I | Bluesky-Gething | | | | | |
| | 1878 | Union HB Willow d-29-H | Bluesky-Gething | | | | | |
| | 1889 | Union HB Woodrush b-56-H | Bluesky-Gething | | | | | |
| | 1905 | Texcan N Nancy d-46-I | Gething | | | | | |
| | 1825 | Union HB Beaverdam d-64-L | Gething | | | 14,000 | | 3,500[5] |
| | 707 | Union ROC Firebird d-89-D | Gething | 1–3–63 | 14,000 | | 3,500[5] | |
| | 27 | Pacific Airport (3) 8-32-83-17 | Cadomin | 24–5–67 | 2,521 | 2,521 | 2,000 | 2,000 |
| | 122 | HB BA Union Lime c-80-C | Dunlevy | | | | | |
| | 497 | Union Fireweed d-53-G | Dunlevy | | | | | |
| | 1201 | CDR Union E Fireweed d-55-H | Dunlevy | | | | | |
| | 1396 | Gray Oil PRP NW Grizzly c-25-A | Dunlevy | 26–3–64 | 9,300 | | 2,325[5] | |
| | 1499 | Gray Oil PRP NW Grizzly d-59-A | Dunlevy | | | | | |
| | 1537 | IOE Fina N Rigel d-57-I | Dunlevy | | | 12,570 | | 4,325[5] |
| | 1620 | Richfield N Rigel a-27-I | Dunlevy | | | | | |
| | 1763 | Richfield N Rigel d-33-I | Dunlevy | | | | | |
| | 1257 | Texaco NFA E Osborn a-45-J | Dunlevy | | | | | |
| | 1192 | Texaco NFA N La Garde 10-12-88-16 | Dunlevy | 10–2–63 | 3,270 | | 2,000[5] | |
| | 1630 | Union Birch d-99-E | Dunlevy | | | | | |
| | 1332 | Altair Sarcee C&E Zeke c-34-L | Baldonnel | | | | | |
| | 1940 | Apache et al Wilder 7-2-84-20 | Baldonnel | | | | | |
| | 1384 | CDR Fireweed d-31-G | Baldonnel | | | | | |
| | 92 | Fargo Nig Creek (1) c-19-C | Baldonnel | | | | | |
| | 834 | FJP Union Birch b-62-I | Baldonnel | | | | | |
| | 386 | FPC Richfield Daiber (1) c-76-D | Baldonnel | 9–1–59 | 10,000 | | 2,500 | |
| | 432 | FPC Richfield Daiber c-56-D | Baldonnel | | | | | |
| | 1028 | Hunt Sands Sun Falls c-18-G | Baldonnel | | | | | |
| | 287 | Pacific Airport (97) 9-32-83-17 | Baldonnel | 31–10–62 | | | | |
| | 30 | Pacific Ft St John (5) 1-15-84-19 | Baldonnel | 25–5–67 | 1,623 | | 2,000 | |
| | 62 | Pacific Ft St John (19) 12-7-84-18 | Baldonnel | 17–7–53 | 2,100 | | (4) | |
| | 472 | Pacific Sunray Imp Sojer a-61-L | Baldonnel | | | | | |
| | 1865 | Pacific West Prod E Siphon 6-4-87-15 | Baldonnel | | | | | |
| | 1335 | Pan Am Dome Sikanni b-43-B | Baldonnel | 25–9–63 | 5,500 | | 2,000[5] | |
| | 1339 | Security Cypress a-65-C | Baldonnel | 1–8–63 | 11,200 | | (4) | |

[1] Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.
[2] A minimum production rate limit of 2,000 M c.f. per day is allowed for a well in which the calculated P.R.L. would be less than 2,000 M c.f. per day.
[3] Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.
[4] Well withdrawn from production. There is no P.R.L. The present potential of the well or all wells in the pool will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.
[5] Potential gas well which has not gone on production. The present potential of the well will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER 31, 1967—*Cont'd*

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. | | P.R.L. in M C.F./D.[2] | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Well | Pool Total[1] | Well | Pool Total[3] |
| Other areas | 737 | Security Cypress a-28-F | Baldonnel | 20–11–61 | 30,000 | 213,263 | (4) | 44,500[5] |
| | 1326 | Security Cypress d-87-C | Baldonnel | 12–6–63 | 25,000 | | (4) | |
| | 243 | Sinclair Bear Ck (Bk-3) 11-18-84-20 | Baldonnel | — | — | | — | |
| | 757 | Sinclair et al N Julienne c-54-H | Baldonnel | 11–1–62 | — | | 2,000[5] | |
| | 304 | Sinclair Julienne Ck (B13-2) a-50-D | Baldonnel | 25–8–66 | 4,950 | | 2,000[5] | |
| | 658 | Sinclair Pac Julienne Creek b-39-D | Baldonnel | — | — | | — | |
| | 1448 | Tenn Monsanto Nig d-39-C | Baldonnel | — | — | | — | |
| | 1200 | Tenn Osborn 6-35-87-15 | Baldonnel | 9–11–63 | 1,250 | | 2,000[5] | |
| | 120 | Texaco NFA Cameron River b-49-L | Baldonnel | — | — | | — | |
| | 1319 | Texaco NFA E Osborn 6-33-88-14 | Baldonnel | — | — | | — | |
| | 145 | Texaco NFA La Garde 7-21-87-15 | Baldonnel | — | — | | — | |
| | 1517 | Triad BP Sukunka a-43-B | Baldonnel | 23–9–65 | 120,000 | | 30,000 | |
| | 721 | Union HB Alder c-39-I | Baldonnel | — | — | | — | |
| | 4 | Westcoast Pingel (8) 13-11-81-17 | Baldonnel | — | — | | — | |
| | 276 | West Nat West Gundy Creek d-4-B | Baldonnel | — | — | | — | |
| | 2012 | Whitehall Numac Nig a-49-J | Baldonnel | — | — | | — | |
| | 1130 | White Rose Sec Montney 10-29-86-18 | Baldonnel | 24–9–62 | 1,640 | | 2,000[5] | |
| | 2165 | CanDel et al Kobes a-30-L | Charlie Lake | — | — | | — | |
| | 1954 | CEGO et al Flatrock 10-27-84-16 | Charlie Lake | — | — | | — | |
| | 1958 | Pacific et al N Pine 6-27-85-18 | Charlie Lake | 12–9–66 | 28,200 | | 7,050[5] | |
| | 1994 | Pacific et al N Pine 6-24-85-18 | Charlie Lake | 14–11–67 | 9,400 | | 2,350[5] | |
| | 36 | Pacific et al Pingel (1) 13-17-81-17 | Charlie Lake | — | — | | — | |
| | 444 | Pacific et al Siphon 11-27-86-16 | Charlie Lake | — | — | 40,250 | — | 11,400[5] |
| | 66 | Pacific Pingel Creek (2) 5-26-81-18 | Charlie Lake | — | — | | — | |
| | 240 | Richfield Prespatou Ck (1) d-59-A | Charlie Lake | — | — | | — | |
| | 1549 | Texaco NFA Redeye d-69-I | Charlie Lake | — | — | | — | |
| | 2000 | West Nat et al Lookout d-42-I | Charlie Lake | — | — | | — | |
| | 412 | West Nat et al W Jeans a-22-B | Charlie Lake | — | — | | — | |
| | 470 | West Nat et al W Jeans b-10-A | Charlie Lake | 19–9–60 | 2,650 | | 2,000[5] | |
| | 1194 | Texaco NFA La Garde 10-29-87-15 | Boundary Lake | 5–3–63 | 23,280 | 23,280 | 5,820[5] | 5,820[5] |
| | 1892 | Ashland Cankee Tb Snowberry b-57-D | Halfway | — | — | | — | |
| | 2165 | CanDel et al Kobes a-30-L | Halfway | — | — | | — | |
| | 1859 | Cankee CIGOL Melanie d-68-K | Halfway | — | — | | — | |
| | 1927 | Dome et al W Peejay d-31-G | Halfway | — | — | | — | |
| | 566 | Fina Tommy Lakes a-29-A | Halfway | — | — | | — | |
| | 176 | Ft St John Petroleums Farrell a-9-L | Halfway | 18-11-61 | 5,600 | | 2,000[5] | |
| | 1315 | Lobitos Black d-57-F | Halfway | — | — | | — | |
| | 750 | Pac Imp N Bubbles d-95-B | Halfway | 8/9–8–61 | 2,500 | | 2,000[5] | |
| | 35 | Pacific Airport (10) 12-34-83-17 | Halfway | 24–7–57 | 1,400 | | (4) | |
| | 1055 | Pacific Imperial N Bubbles d-6-G | Halfway | — | — | | — | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1271 | Pacific SR Can Del W Dede b-45-K | Halfway | 11-3-63 | 5,600 | | 2,000[5] | |
| | 47 | Pacific Wilder (14) 13-1-84-20 | Halfway | 1-12-53 | 5,500 | | 2,000[5] | |
| | 159 | Richfield et al Big Arrow (1) c-71-F | Halfway | — | — | 61,880 | — | 19,020[5] |
| | 238 | Sinclair et al Graham (B5-1) c-53-D | Halfway | — | — | | — | |
| | 304 | Sinclair Julienne Ck (B13-2) a-50-D | Halfway | — | — | | — | |
| | 658 | Sinclair Pac Julienne Creek b-39-D | Halfway | 24-6-61 | 4,000 | | 2,000[5] | |
| | 1564 | Sinclair Pacific Mink d-88-A | Halfway | — | — | | — | |
| | 1918 | CDR Sun Evergreen d-54-J | Halfway | — | — | | — | |
| | 1775 | Sun Texaco W Willow d-95-B | Halfway | — | — | | — | |
| | 433 | Texaco NFA Cameron River d-43-H | Halfway | — | — | | — | |
| | 1194 | Texaco NFA La Garde 10-29-87-15 | Halfway | 5/6-3-63 | 23,280 | | 5,520[5] | |
| | 160 | Texaco NFA Osborn (3) 13-26-88-16 | Halfway | — | — | | — | |
| | 1432 | Texaco Tepee d-99-G | Halfway | — | — | | — | |
| | 724 | Triad BP Birley a-5-A | Halfway | — | — | | — | |
| | 908 | Triad BP Pickell b-84-I | Halfway | — | — | | — | |
| | 1266 | Union et al W Milligan c-50-G | Halfway | 11-3-63 | 14,000 | | 3,500[5] | |
| | 1393 | BA HB W Pocketknife d-33-I | Permo-Carboniferous | 20-8-64 | 121,083 | | 30,271[5] | |
| | 315 | Pacific Town (A-1) c-69-J | Permo-Carboniferous | — | — | | — | |
| | 322 | Texaco NFA East Osborn (7) a-33-J | Permo-Carboniferous | — | — | 121,083 | — | 30,271[5] |
| | 697 | Amerada Pac Ft St John W 11-17-83-19 | Belloy | — | — | | — | |
| | 2199 | Apache Pac W Stoddart 11-30-86-20 | Belloy | — | — | | — | |
| | 154 | FPC Kilkerran 12-31-79-14 | Belloy | — | — | | — | |
| | 1355 | IOE Pac Parkland 10-26-81-16 | Belloy | 1-9-64 | 3,650 | 3,650 | 2,000[5] | 2,000[5] |
| | 102 | Pacific Red Creek (39) 6-7-85-20 | Belloy | — | — | | — | |
| | 135 | Pacific Two Rivers (37) 2-27-82-16 | Belloy | — | — | | — | |
| | 1959 | Uno-Tex Stoddard 11-34-85-19 | Belloy | — | — | | — | |
| | 348 | Pacific S Ft Nelson (1) b-96-B | Mississippian | — | — | | — | |
| | 468 | HB Pacific Pocketknife c-37-L | Mississippian | 19-7-60 | 26,600 | | 6,650[5] | |
| | 897 | Sohio C&E Ekwan a-55-G | Mississippian | — | — | | — | |
| | 385 | Sinclair et al Lily (XB 18-1) d-12-K | Mississippian | 23-4-59 | 24,900 | | 6,225[5] | |
| | 717 | Texaco NFA Judy c-53-D | Mississippian | — | — | | — | |
| | 947 | Texaco NFA Walrush b-86-L | Mississippian | — | — | 53,550 | — | 14,875[5] |
| | 508 | Union IOE Bigfoot d-27-C | Mississippian | — | — | | — | |
| | 138 | West Nat Bougie Creek a-49-I | Mississippian | — | — | | — | |
| | 507 | West Nat et al Jeans a-57-A | Mississippian | 21-9-66 | 2,050 | | 2,000[5] | |
| | 455 | West Nat et al E Jeans c-A1-H | Mississippian | — | — | | — | |
| | 230 | Sinclair et al Doe (B6-1) 6-16-81-14 | Kiskatinaw | — | — | | — | |
| | 1542 | Atlantic Tees c-15-J | Slave Point | — | — | — | — | — |
| | 157 | B.A. Shell Klua Creek (1) a-50-C | Slave Point | — | — | | — | |

[1] Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.

[2] A minimum production rate limit of 2,000 M c.f. per day is allowed for a well in which the calculated P.R.L. would be less than 2,000 M c.f. per day.

[3] Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.

[4] Well withdrawn from production. There is no P.R.L. The present potential of the well or all wells in the pool will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

[5] Potential gas well which has not gone on production. The present potential of the well will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.

TABLE 22.—AUTHORIZED ABSOLUTE OPEN-FLOW POTENTIAL TESTS AND PRODUCTION RATE LIMITS, DECEMBER 31, 1967—*Cont'd*

| Field | Well Authorization No. | Well Name | Pool | Date of Test | A.O.F.P. in M C.F./D. | | P.R.L. in M C.F./D.[2] | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Well | Pool Total[1] | Well | Pool Total[3] |
| Other areas | 129 | HB Imperial Union Paddy (1) a-49-B | Slave Point | | | | | |
| | 926 | Imp Junior c-98-C | Slave Point | 21–3–62 | 90,000 | | 22,500[5] | |
| | 1576 | IOE E Clarke b-6-A | Slave Point | | | | | |
| | 1249 | IOE Junior c-3-C | Slave Point | 26–3–63 | 12,700 | | 3,175[5] | |
| | 1239 | Pacific Gunnel c-95-L | Slave Point | | | | | |
| | 1913 | Pacific IOE S Clarke c-50-K | Slave Point | 14–6–66 | 16,000 | | 4,000[5] | |
| | 1816 | Pacific Shekilie b-24-A | Slave Point | | | | | |
| | 2058 | Pacific Cabin a-49-J | Slave Point | | | | | |
| | 594 | Pan Am A-1 Cam Lake a-31-I | Slave Point | | | | | |
| | 877 | Pan Am et al Dilly a-30-K | Slave Point | 16–3–62 | 14,700 | 684,100 | 3,675[5] | 171,025[5] |
| | 1570 | Placid Louise c-80-L | Slave Point | | | | | |
| | 1279 | SOBC Helmet b-49-G | Slave Point | | | | | |
| | 1835 | Socony Mobil Swat b-50-E | Slave Point | | | | | |
| | 1426 | Texaco NFA Tsea b-99-K | Slave Point | 10–3–64 | 12,600 | | 3,150[5] | |
| | 704 | Texaco NFA Tsea b-68-K | Slave Point | | | | | |
| | 999 | Triad Sohio Pac Jackfish a-30-K | Slave Point | | | | | |
| | 1245 | West Nat Cabin b-40-A | Slave Point | 2–3–63 | 28,900 | | 7,225[5] | |
| | 1406 | West Nat Cabin a-19-G | Slave Point | 12–2–64 | 31,200 | | 7,800[5] | |
| | 887 | West Nat et al Yoyo a-74-H | Slave Point | 21–3–62 | 185,000 | | 46,250[5] | |
| | 700 | West Nat Imp Clarke Lake b-78-J | Slave Point | | | | | |
| | 1274 | West Nat IOE S Clarke d-29-K | Slave Point | 21–1–64 | 145,000 | | 36,250[5] | |
| | 677 | West Nat Kathy b-30-F | Slave Point | 15–2–61 | 148,000 | | 37,000[5] | |
| | 527 | Pan Am A-1 Komie a-51-A | Pine Point | | | | | |
| | 1602 | Socony Mobil Sierra c-78-C | Pine Point | | | 75,200 | | 19,925[5] |
| | 1659 | Socony Mobil Sierra c-91-D | Pine Point | 26–2–67 | 71,700 | | 17,925[5] | |
| | 1230 | West Nat et al Yoyo b-29-I | Pine Point | 20–1–64 | 3,500 | | 2,000[5] | |
| | 682 | Pan Am Beaver River d-73-K | Nahanni | 6–3–62 | 85,000 | 85,000 | 21,250[5] | 21,250[5] |
| | 2241 | Amarillo Cabot W Jeans b-82-J | | | | | (8) | |
| | 2119 | Ashland Ck Tb Wargen d-19-B | | | | | (8) | |
| | 2071 | Baysel SR CanDel Osprey d-83-G | | | | | (8) | |
| | 2089 | CanDel et al Kobes a-41-I | | | | | (8) | |
| | 2056 | CDR Sun Evergreen b-43-J | | | | | (8) | |
| | 2139 | Champlin et al Two Rivers 6-9-86-13 | | | | | (8) | |
| | 2108 | Chevron N Helmet a-54-B | | | | | (8) | |
| | 2115 | KCL et al Woodrush d-83-H | | | | | (8) | |
| | 2138 | Pacific et al Ft St John 11-34-83-19 | | | | | (8) | |
| | 2038 | Pacific Sinclair Shekilie b-46-A | | | | | (8) | |
| | 2101 | Pacific SR CanDel Beaverdam d-71-I | | | | | (8) | |
| | 2116 | Pan Am Beaver c-45-K | | | | | (8) | |
| | 1895 | Placid Frontier Yoyo d-A15-I | | | | | (8) | |
| | 2110 | ROCK Pan Am Shekilie d-73-K | | | | | (8) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1814 | Socony Mobil S Sierra a-98-K | — | — | — | — | (8) | — |
| | 2066 | Tenn FPC Tooga d-18-K | — | — | — | — | (8) | — |
| | 2156 | Tenn S Inga 16-12-87-24 | — | — | — | — | (8) | — |
| | 2060 | Union ARCo Firebird d-43-D | — | — | — | — | (8) | — |
| | | Field totals | — | — | — | 5,065,144 | — | 1,559,962 |
| | | Other areas totals | — | — | — | 1,426,847 | — | 359,036 |
| | | Totals | — | — | — | 6,491,991 | — | 1,918,998 |

[1] Total A.O.F.P. for pool in field, including all gas wells which are not confidential and which an A.O.F.P. test has been approved.
[2] A minimum production rate limit of 2,000 M c.f. per day is allowed for a well in which the calculated P.R.L. would be less than 2,000 M c.f. per day.
[3] Total P.R.L. for pool in field, including potential gas wells which are not confidential but not including wells withdrawn from production.
[5] Potential gas well which has not gone on production. The present potential of the well will depend on the amount of production taken from the field or area since the latest A.O.F.P. test was made.
[8] Confidential well.

## TABLE 23.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1967

| Field | Well Authorization No. | Well Name | Location | Pool | Maximum Permissible Rate (Bbl./Day) |
|---|---|---|---|---|---|
| Aitken Creek | 485 | Union Aitken Creek b-42-L | b-42-L/94-A-13 | Gething | 874[1] |
| | 1160 | Union Aitken d-33-L | d-33-L/94-A-13 | Gething | |
| | 1173 | Union Aitken d-43-L | d-43-L/94-A-13 | Gething | |
| | 1186 | Union Aitken d-44-L | d-44-L/94-A-13 | Gething | |
| | 1205 | Union Aitken d-34-L | d-34-L/94-A-13 | Gething | |
| Beatton River | 309 | Triad Beatton River b-38-J | b-38-J/94-H-2 | Halfway | 2,054[1] |
| | 393 | Triad Beatton River d-39-J | d-39-J/94-H-2 | Halfway | |
| | 395 | Triad Beatton River d-29-J | d-29-J/94-H-2 | Halfway | |
| | 396 | Triad Beatton River d-28-J | d-28-J/94-H-2 | Halfway | |
| | 816 | Triad Beatton d-50-J | d-50-J/94-H-2 | Halfway | |
| | 896 | Triad Beatton d-49-J | d-49-J/94-H-2 | Halfway | |
| | 1038 | Triad Beatton b-59-J | b-59-J/94-H-2 | Halfway | |
| | 1224 | Triad Beatton b-28-J | b-28-J/94-H-2 | Halfway | |
| | 1419 | Triad Beatton b-49-J | b-49-J/94-H-2 | Halfway | |
| | 1552 | Triad Beatton b-58-J | b-58-J/94-H-2 | Halfway | |
| | 2123 | Triad Beatton d-19-J | d-19-J/94-H-2 | Halfway | |
| | 869 | Triad et al Beatton d-41-K | d-41-K/94-H-2 | Halfway | ---- |
| Beatton River West | 408 | Triad West Beatton River d-39-K | d-39-K/94-H-2 | Bluesky-Gething | 47 |
| | 441 | Triad West Beatton River d-48-K | d-48-K/94-H-2 | Bluesky-Gething | ---- |
| | 512 | Triad West Beatton River d-59-K | d-59-K/94-H-2 | Bluesky-Gething | 78 |
| | 515 | Triad West Beatton River d-57-K | d-57-K/94-H-2 | Bluesky-Gething | 78 |
| | 538 | Triad West Beatton River d-38-K | d-38-K/94-H-2 | Bluesky-Gething | ---- |
| | 1398 | Triad W Beatton d-58-K | d-58-K/94-H-2 | Bluesky-Gething | 30 |
| | 1408 | Whitehall et al W Beatton d-21-L | d-21-L/94-H-2 | Bluesky-Gething | 105 |
| | 1604 | Triad W Beatton a-40-K | a-40-K/94-H-2 | Bluesky-Gething | 115 |
| | 2014 | Whitehall Cdn-Sup W Beatton d-12-L | d-12-L/94-H-2 | Bluesky-Gething | 97 |
| Beaverdam | 1653 | Tenn Beaverdam d-38-L | d-38-L/94-A-16 | Halfway | 580 |
| Blueberry | 205 | West Nat et al Blueberry d-82-L | d-82-L/94-A-12 | Mississippian | 4,600[1] |
| | 242 | West Nat et al Blueberry d-50-K | d-50-K/94-A-12 | Mississippian | |
| | 272 | West Nat et al Blueberry d-46-D | d-46-D/94-A-13 | Mississippian | |
| | 549 | West Nat et al Blueberry c-A29-K | c-29-K/94-A-12 | Mississippian | |
| | 745 | West Nat et al Blueberry 6-25-88-25 | 6-25-88-25 W6M | Mississippian | |
| | 746 | West Nat et al Blueberry d-30-K | d-30-K/94-A-12 | Mississippian | |
| | 783 | West Nat et al Blueberry d-40-K | d-40-K/94-A-12 | Mississippian | |
| | 785 | West Nat et al Blueberry d-19-K | d-19-K/94-A-12 | Mississippian | |
| | 850 | West Nat et al Blueberry 14-25-88-25 | 14-25-88-25 W6M | Mississippian | |
| | 851 | West Nat et al Blueberry b-60-K | b-60-K/94-A-12 | Mississippian | |
| | 948 | West Nat et al Blueberry c-71-L | c-71-L/94-A-12 | Mississippian | |
| | 960 | West Nat et al Blueberry d-36-D | d-36-D/94-A-13 | Mississippian | |

| | | | | | |
|---|---|---|---|---|---|
| | 1072 | West Nat et al Blueberry b-92-L | b-92-L/94-A-12 | Mississippian | |
| | 1146 | West Nat et al Blueberry b-35-D | b-35-D/94-A-13 | Mississippian | |
| | 1169 | West Nat et al Blueberry d-25-D | d-25-D/94-A-13 | Mississippian | |
| | 1242 | West Nat et al Blueberry d-93-L | d-93-L/94-A-12 | Mississippian | |
| | 1258 | West Nat et al Blueberry b-24-D | b-24-D/94-A-13 | Mississippian | |
| | 1317 | West Nat et al Blueberry d-41-L | d-41-L/94-A-12 | Mississippian | |
| | 1333 | Decalta Blueberry d-57-D | d-57-D/94-A-13 | Mississippian | 97 |
| Boundary Lake | 488 | Dome Boundary Lake 8-35-85-14 | 8-35-85-14 W6M | Boundary Lake | |
| | 528 | Dome Boundary Lake 14-35-85-14 | 14-35-85-14 W6M | Boundary Lake | |
| | 550 | Dome Boundary Lake 8-26-85-14 | 8-26-85-14 W6M | Boundary Lake | |
| | 573 | Dome Boundary Lake 14-26-85-14 | 14-26-85-14 W6M | Boundary Lake | |
| | 642 | Dome Boundary Lake 8-2-86-14 | 8-2-86-14 W6M | Boundary Lake | |
| | 764 | Dome Boundary 8-11-86-14 | 8-11-86-14 W6M | Boundary Lake | |
| | 768 | Dome Boundary 8-22-85-14 | 8-22-85-14 W6M | Boundary Lake | |
| | 808 | Dome Boundary 8-14-86-14 | 8-14-86-14 W6M | Boundary Lake | |
| | 1033 | Dome Boundary 6-22-85-14 | 6-22-85-14 W6M | Boundary Lake | |
| | 1064 | Dome Boundary 14-2-86-14 | 14-2-86-14 W6M | Boundary Lake | |
| | 1070 | Dome Boundary 16-14-86-14 | 16-14-86-14 W6M | Boundary Lake | |
| | 1156 | Dome Boundary 8-3-86-14 | 8-3-86-14 W6M | Boundary Lake | |
| | 1440 | Dome Boundary 6-2-86-14 | 6-2-86-14 W6M | Boundary Lake | 2,429[1] |
| | 1470 | Dome Boundary 14-34-85-14 | 14-34-85-14 W6M | Boundary Lake | |
| | 1471 | Dome Boundary 4-35-85-14 | 4-35-85-14 W6M | Boundary Lake | |
| | 1665 | Dome Boundary 12-35-85-14 | 12-35-85-14 W6M | Boundary Lake | |
| | 1666 | Dome Boundary 2-3-85-14 | 2-3-85-14 W6M | Boundary Lake | |
| | 1667 | Dome Boundary 10-35-85-14 | 10-35-85-14 W6M | Boundary Lake | |
| | 1668 | Dome Boundary 10-34-85-14 | 10-34-85-14 W6M | Boundary Lake | |
| | 1669 | Dome Boundary 2-26-85-14 | 2-26-85-14 W6M | Boundary Lake | |
| | 1672 | Dome Boundary 4-26-85-14 | 4-26-85-14 W6M | Boundary Lake | |
| | 1673 | Dome Boundary 10-26-85-14 | 10-26-85-14 W6M | Boundary Lake | |
| | 1674 | Dome Boundary 12-26-85-14 | 12-26-85-14 W6M | Boundary Lake | |
| | 1676 | Dome Boundary 2-35-85-14 | 2-35-85-14 W6M | Boundary Lake | |
| | 1702 | Dome Boundary 6-3-86-14 | 6-3-86-14 W6M | Boundary Lake | |
| | 603 | Dome Boundary Lake 8-13-85-14 | 8-13-85-14 W6M | Boundary Lake | |
| | 625 | Dome Boundary Lake 8-12-85-14 | 8-12-75-14 W6M | Boundary Lake | |
| | 1670 | Dome Boundary 2-12-85-14 | 2-12-85-14 W6M | Boundary Lake | 733[1] |
| | 1671 | Dome Boundary 4-12-85-14 | 4-12-85-14 W6M | Boundary Lake | |
| | 1675 | Dome Boundary 10-12-85-14 | 10-12-85-14 W6M | Boundary Lake | |
| | 1677 | Dome Boundary 2-13-85-14 | 2-13-85-14 W6M | Boundary Lake | |
| | 1041 | Homestead et al Boundary 6-18-84-13 | 6-18-84-13 W6M | Boundary Lake | |
| | 1108 | Homestead et al Boundary 8-18-84-13 | 8-18-84-13 W6M | Boundary Lake | |
| | 250 | Imp Pac Boundary 1-23-84-14 | 1-23-84-14 W6M | Boundary Lake | |
| | 267 | Imperial Pacific Boundary 16-4-85-14 | 16-4-85-14 W6M | Boundary Lake | |
| | 282 | Imperial Pacific Boundary 6-11-85-14 | 6-11-85-14 W6M | Boundary Lake | |
| | 296 | Imp Pac Boundary 14-20-84-13 | 14-20-84-13 W6M | Boundary Lake | |
| | 360 | Imperial Pacific Boundary 8-10-85-14 | 8-10-85-14 W6M | Boundary Lake | |

[1] Pool M.P.R.

TABLE 23.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1967—*Continued*

| Field | Well Authorization No. | Well Name | Location | Pool | Maximum Permissible Rate (Bbl./Day) |
|---|---|---|---|---|---|
| Boundary Lake | 362 | Imperial Pacific Boundary 6-3-85-14 | 6-3-85-14 W6M | Boundary Lake | |
| | 363 | Imperial Pacific Boundary 14-3-85-14 | 14-3-85-14 W6M | Boundary Lake | |
| | 368 | Imperial Pac Boundary 14-7-85-13 | 14-7-85-13 W6M | Boundary Lake | |
| | 379 | Imperial Pacific Boundary 8-3-85-14 | 8-3-85-14 W6M | Boundary Lake | |
| | 493 | Imp Pac Boundary 14-2-85-14 | 14-2-85-14 W6M | Boundary Lake | |
| | 501 | Imp Pac Boundary 6-2-85-14 | 6-2-85-14 W6M | Boundary Lake | |
| | 521 | Imp et al Boundary 14-1-85-14 | 14-1-85-14 W6M | Boundary Lake | |
| | 523 | Imp Pac Boundary 8-18-85-13 | 8-18-85-13 W6M | Boundary Lake | |
| | 524 | Imp Pac Boundary 6-20-85-13 | 6-20-85-13 W6M | Boundary Lake | |
| | 734 | Imp Pac Boundary 6-18-85-13 | 6-18-85-13 W6M | Boundary Lake | |
| | 738 | Imp Pac Boundary 14-17-85-13 | 14-17-85-13 W6M | Boundary Lake | |
| | 758 | Imp Pac Boundary 6-13-85-14 | 6-13-85-14 W6M | Boundary Lake | |
| | 759 | Imp Pac Boundary 14-12-85-14 | 14-12-85-14 W6M | Boundary Lake | |
| | 760 | Imp Pac Boundary 6-17-85-13 | 6-17-85-13 W6M | Boundary Lake | |
| | 761 | Imp et al Boundary 6-1-85-14 | 6-1-85-14 W6M | Boundary Lake | |
| | 763 | Imp Pac Boundary 6-7-85-13 | 6-7-85 13 W6M | Boundary Lake | |
| | 767 | Imp Pac Boundary 14-8-85-13 | 14-8-85-13 W6M | Boundary Lake | |
| | 769 | Imp Pac Boundary 8-11-85-14 | 8-11-85-14 W6M | Boundary Lake | |
| | 770 | Imp et al Boundary 8-1-85-14 | 8-1-85-14 W6M | Boundary Lake | |
| | 774 | Imp Pac Boundary 8-20-85-13 | 8-20-85-13 W6M | Boundary Lake | |
| | 788 | Imp Pac Boundary 8-2-85-14 | 8-2-85-14 W6M | Boundary Lake | |
| | 789 | Imp Pac Boundary 6-6-85-13 | 6-6-85-13 W6M | Boundary Lake | |
| | 792 | Imp Pac Boundary 14-6-85-13 | 14-6-85-13 W6M | Boundary Lake | |
| | 793 | Imp et al Boundary 14-36-84-14 | 14-36-84-14 W6M | Boundary Lake | |
| | 795 | Imp Pac Boundary 8-6-85-13 | 8-6-85-13 W6M | Boundary Lake | |
| | 796 | Imp Pac Boundary 16-6-85-13 | 16-6-85-13 W6M | Boundary Lake | |
| | 804 | Imp et al Boundary 6-36-84-14 | 6-36-84-14 W6M | Boundary Lake | |
| | 805 | Imp Pac Boundary 14-35-84-14 | 14-35-84-14 W6M | Boundary Lake | |
| | 807 | Imp Pac Boundary 8-7-85-13 | 8-7-85-13 W6M | Boundary Lake | |
| | 813 | Imp Pac Boundary 6-5-85-13 | 6-5-85-13 W6M | Boundary Lake | |
| | 814 | Imp et al Boundary 8-36-84-14 | 8-36-84-14 W6M | Boundary Lake | |
| | 815 | Imp Pac Boundary 8-35-84-14 | 8-35-84-14 W6M | Boundary Lake | |
| | 821 | Imp Pac Boundary 14-11-85-14 | 14-11-85-14 W6M | Boundary Lake | |
| | 832 | Imp Pac Boundary 14-5-85-13 | 14-5-85-13 W6M | Boundary Lake | |
| | 833 | Imp Pac Boundary 6-35-84-14 | 6-35-84-14 W6M | Boundary Lake | |
| | 843 | Imp Pac Boundary 14-10-84-14 | 14-10-84-14 W6M | Boundary Lake | |
| | 847 | Imp Pac Boundary 6-8-85-13 | 6-8-85-13 W6M | Boundary Lake | |
| | 848 | Imp Pac Boundary 8-14-85-14 | 8-14-85-14 W6M | Boundary Lake | |
| | 861 | Imp Pac Boundary 8-34-84-14 | 8-34-84-14 W6M | Boundary Lake | |
| | 878 | Imp Pac Boundary 8-5-85-13 | 8-5-85-13 W6M | Boundary Lake | |

| | | | | |
|---|---|---|---|---|
| 883 | Imp Pac Boundary 14-34-84-14 | 14-34-84-14 W6M | Boundary Lake | |
| 888 | Imp Pac Boundary 14-31-84-13 | 14-31-84-13 W6M | Boundary Lake | |
| 889 | Imp Pac Boundary 16-8-85-13 | 16-8-85-13 W6M | Boundary Lake | |
| 906 | Imp Pac Boundary 8-8-85-13 | 8-8-85-13 W6M | Boundary Lake | |
| 927 | Imp Pac Boundary 6-26-84-14 | 6-26-84-14 W6M | Boundary Lake | |
| 928 | Imp Pac Boundary 8-25-84-14 | 8-25-84-14 W6M | Boundary Lake | |
| 929 | Imp Pac Boundary 14-23-84-14 | 14-23-84-14 W6M | Boundary Lake | |
| 930 | Imp et al Boundary 8-31-84-13 | 8-31-84-13 W6M | Boundary Lake | |
| 931 | Imp et al Boundary 6-31-84-13 | 6-31-84-13 W6M | Boundary Lake | |
| 935 | Imp Pac Boundary 14-32-84-13 | 14-32-84-13 W6M | Boundary Lake | |
| 965 | Imp Pac Boundary 6-32-84-13 | 6-32-84-13 W6M | Boundary Lake | |
| 966 | Imp Pac Boundary 8-26-84-14 | 8-26-84-14 W6M | Boundary Lake | |
| 975 | Imp et al Boundary 14-30-84-13 | 14-30-84-13 W6M | Boundary Lake | |
| 978 | Imp Pac Boundary 8-24-84-14 | 8-24-84-14 W6M | Boundary Lake | |
| 979 | Imp Pac Boundary 6-25-84-14 | 6-25-84-14 W6M | Boundary Lake | |
| 997 | Imp Pac Boundary 16-23-84-14 | 16-23-84-14 W6M | Boundary Lake | |
| 998 | Imp Pac Boundary 14-19-84-13 | 14-19-84-13 W6M | Boundary Lake | |
| 1010 | Imp Pac Boundary 14-24-84-14 | 14-24-84-14 W6M | Boundary Lake | |
| 1017 | Imp Pac Boundary 6-23-84-14 | 6-23-84-14 W6M | Boundary Lake | |
| 1019 | Imp Pac Boundary 6-30-84-13 | 6-30-84-13 W6M | Boundary Lake | 19,090[1] |
| 1035 | Imp et al Boundary 6-16-84-14 | 6-16-84-14 W6M | Boundary Lake | |
| 1036 | Imp Pac Boundary 6-24-84-14 | 6-24-84-14 W6M | Boundary Lake | |
| 1059 | Imp Pac Boundary 14-14-84-14 | 14-14-84-14 W6M | Boundary Lake | |
| 1060 | Imp Pac Boundary 14-29-84-13 | 14-29-84-13 W6M | Boundary Lake | |
| 1061 | Imp Pac Boundary 8-30-84-13 | 8-30-84-13 W6M | Boundary Lake | |
| 1076 | Imp Pac Boundary 8-15-85-14 | 8-15-85-14 W6M | Boundary Lake | |
| 1077 | Imp et al Boundary 14-25-84-14 | 14-25-84-14 W6M | Boundary Lake | |
| 1078 | Imp Pac Boundary 8-19-84-13 | 8-19-84-13 W6M | Boundary Lake | |
| 1080 | Imp Pac Boundary 14-13-84-14 | 14-13-84-14 W6M | Boundary Lake | |
| 1084 | Imp Pac Boundary 6-15-84-14 | 6-15-84-14 W6M | Boundary Lake | |
| 1085 | Imp Pac Boundary 16-13-84-14 | 16-13-84-14 W6M | Boundary Lake | |
| 1091 | Imp Pac Boundary 6-29-84-13 | 6-29-84-13 W6M | Boundary Lake | |
| 1098 | Imp Pac Boundary 6-19-84-13 | 6-19 84-13 W6M | Boundary Lake | |
| 1102 | Imp Pac Boundary 6-17-84-14 | 6-17-84-14 W6M | Boundary Lake | |
| 1111 | Imp et al Boundary 14-26-84-14 | 14-26-84-14 W6M | Boundary Lake | |
| 1117 | Imp Pac Boundary 6-20-84-13 | 6-20-84-13 W6M | Boundary Lake | |
| 1120 | Imp Pac Boundary 8-21-84-14 | 8-21-84-14 W6M | Boundary Lake | |
| 1124 | Imp Pac Boundary 6-14-85-14 | 6-14-85-14 W6M | Boundary Lake | |
| 1127 | Imp Pac Boundary 6-11-84-14 | 6-11-84-14 W6M | Boundary Lake | |
| 1128 | Imp et al Boundary 8-16-84-14 | 8-16-84-14 W6M | Boundary Lake | |
| 1136 | Imp Pac Boundary 8-11-84-14 | 8-11-84 14 W6M | Boundary Lake | |
| 1143 | Imp Pac Boundary 14-16-84-14 | 14-16-84-14 W6M | Boundary Lake | |
| 1151 | Imp Pac Boundary 8-17-84-14 | 8-17-84-14 W6M | Boundary Lake | |
| 1157 | Imp Pac Boundary 6-21-84-14 | 6-21-84-14 W6M | Boundary Lake | |
| 1164 | Imp Pac Boundary 14-8-84-14 | 14-8-84-14 W6M | Boundary Lake | |

[1] Pool M.P.R.

TABLE 23.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1967—*Continued*

| Field | Well Authorization No. | Well Name | Location | Pool | Maximum Permissible Rate (Bbl./Day) |
|---|---|---|---|---|---|
| Boundary Lake | 1166 | Imp Pac Boundary 14-2-84-14 | 14-2-84-14 W6M | Boundary Lake | |
| | 1172 | Imp Pac Boundary 14-21-84-14 | 14-21-84-14 W6M | Boundary Lake | |
| | 1189 | Imp Pac Boundary 8-20-84-14 | 8-20-84-14 W6M | Boundary Lake | |
| | 1220 | Imp Pac Boundary 14-17-84-14 | 14-17-84-14 W6M | Boundary Lake | |
| | 1228 | Imp Pac Boundary 16-20-84-14 | 16-20-84-14 W6M | Boundary Lake | |
| | 1273 | Imp Pac Boundary 8-18-84-14 | 8-18-84-14 W6M | Boundary Lake | |
| | 1343 | Imp Pac Boundary 16-18-84-14 | 16-18-84-14 W6M | Boundary Lake | |
| | 1357 | Imp Pac Boundary 16-7-84-14 | 16-7-84-14 W6M | Boundary Lake | |
| | 1358 | Imp Pac Boundary 16-4-84-14 | 16-4-84-14 W6M | Boundary Lake | |
| | 1367 | Imp Pac Boundary 8-9-84-14 | 8-9-84-14 W6M | Boundary Lake | |
| | 1369 | Imp Pac Boundary 14-4-84-14 | 14-4-84-14 W6M | Boundary Lake | |
| | 1386 | Imp Pac Boundary 16-20-84-13 | 16-20-84-13 W6M | Boundary Lake | |
| | 1400 | Imp Pac Boundary 8-29-84-13 | 8-29-84-13 W6M | Boundary Lake | |
| | 1425 | Imp Pac Boundary 16-29-84-13 | 16-29-84-13 W6M | Boundary Lake | |
| | 1450 | Imp Pac Boundary 14-7-84-14 | 14-7-84-14 W6M | Boundary Lake | |
| | 1495 | Imp Pac Boundary 9-10-85-14 | 9-10-85-14 W6M | Boundary Lake | |
| | 1545 | Imp Pac Boundary 3-10-85-14 | 3-10-85-14 W6M | Boundary Lake | |
| | 1513 | Imp Pac Boundary 16-9-85-14 | 16-9-85-14 W6M | Boundary Lake | |
| | 989 | Marathon Boundary 6-13-84-14 | 6-13-84-14 W6M | Boundary Lake | |
| | 1037 | Marathon Boundary 14-12-84-14 | 14-12-84-14 W6M | Boundary Lake | |
| | 1068 | Marathon Boundary 8-13-84-14 | 8-13-84-14 W6M | Boundary Lake | |
| | 1024 | Mobil Boundary 6-10-84-14 | 6-10-84-14 W6M | Boundary Lake | |
| | 1023 | Mobil Boundary 8-10-84-14 | 8-10-84-14 W6M | Boundary Lake | |
| | 895 | Pacific Boundary 16-14-85-14 | 16-14-85-14 W6M | Boundary Lake | |
| | 961 | Pacific Boundary 16-15-85-14 | 16-15-85-14 W6M | Boundary Lake | |
| | 742 | Sinclair Boundary 8-22-84-14 | 8-22-84-14 W6M | Boundary Lake | |
| | 743 | Sinclair Boundary 8-27-84-14 | 8-27-84-14 W6M | Boundary Lake | |
| | 755 | Sinclair Boundary 14-15-84-14 | 14-15-84-14 W6M | Boundary Lake | |
| | 780 | Sinclair Boundary 6-22-84-14 | 6-22-84-14 W6M | Boundary Lake | |
| | 794 | Sinclair Boundary 14-22-84-14 | 14-22-84-14 W6M | Boundary Lake | |
| | 802 | Sinclair Boundary 6-27-84-14 | 6-27-84-14 W6M | Boundary Lake | |
| | 803 | Sinclair Boundary 6-14-84-14 | 6-14-84-14 W6M | Boundary Lake | |
| | 841 | Sinclair Boundary 14-11-84-14 | 14-11-84-14 W6M | Boundary Lake | |
| | 853 | Sinclair Boundary 14-27-84-14 | 14-27-84-14 W6M | Boundary Lake | |
| | 865 | Sinclair Boundary 16-11-84-14 | 16-11-84-14 W6M | Boundary Lake | |
| | 866 | Sinclair Boundary 8-14-84-14 | 8-14-84-14 W6M | Boundary Lake | |
| | 941 | Sinclair Boundary 8-3-84-14 | 8-3-84-14 W6M | Boundary Lake | |
| | 942 | Sinclair Boundary 16-3-84-14 | 16-3-84-14 W6M | Boundary Lake | |
| | 969 | Sinclair et al Boundary 14-3-84-14 | 14-3-84-14 W6M | Boundary Lake | |
| | 982 | Sinclair Boundary 6-3-84-14 | 6-3-84-14 W6M | Boundary Lake | |

| | | | | |
|---|---|---|---|---|
| 563 | Amerada Cr BC-C Boundary 14-20-85-13 | 14-20-85-13 W6M | Boundary Lake | |
| 590 | Amerada Cr BC-B Boundary 14-18-85-13 | 14-18-85-13 W6M | Boundary Lake | |
| 591 | Amerada Cr BC-C Boundary 6-29-85-13 | 6-29-85-13 W6M | Boundary Lake | |
| 608 | Amerada Cr BC-D Boundary 8-24-85-14 | 8-24-85 14 W6M | Boundary Lake | |
| 629 | Amerada Boundary Lake 14-13-85-14 | 14-13-85-14 W6M | Boundary Lake | |
| 639 | Amerada Boundary Lake 6-24-85-14 | 6-24-85-14 W6M | Boundary Lake | |
| 692 | Amerada Boundary 11-24-85-14 | 11-24-85-14 W6M | Boundary Lake | |
| 771 | Amerada Boundary 14-29-85-13 | 14-29-85-13 W6M | Boundary Lake | |
| 918 | Basin Boundary 6-17-86-13 | 6-17-86-13 W6M | Boundary Lake | |
| 962 | Basin Boundary 14-17-86-13 | 14-17-86-13 W6M | Boundary Lake | |
| 604 | Marathon Boundary 14-8-86-13 | 14-8-86-13 W6M | Boundary Lake | |
| 618 | Marathon Boundary 6-19-85-13 | 6-19-85-13 W6M | Boundary Lake | |
| 632 | Marathon Boundary 8-19-85-13 | 8-19-85-13 W6M | Boundary Lake | |
| 635 | Marathon Boundary 14-19-85-13 | 14-19-85-13 W6M | Boundary Lake | |
| 898 | Marathon Boundary 14-5-86-13 | 14-5-86-13 W6M | Boundary Lake | |
| 949 | Marathon Boundary 6-8-86-13 | 6-8-86-13 W6M | Boundary Lake | |
| 643 | Sun Boundary Lake 14-23-85-14 | 14-23-85-14 W6M | Boundary Lake | |
| 646 | Sun Boundary Lake 6-23-85-14 | 6-23-85-14 W6M | Boundary Lake | |
| 652 | Sun Boundary Lake 8-23-85-14 | 8-23-85-14 W6M | Boundary Lake | |
| 101 | Texaco NFA Boundary L 6-6-86-13 (1) | 6-6-86-13 W6M | Boundary Lake | |
| 152 | Texaco NFA Boundary L 14-6-86-13 | 14-6-86-13 W6M | Boundary Lake | |
| 167 | Texaco NFA Boundary L 14-31-85-13 | 14-31-85-13 W6M | Boundary Lake | |
| 183 | Texaco NFA Boundary L 6-31-85-13 | 6-31-85-13 W6M | Boundary Lake | |
| 633 | Texaco NFA Boundary Lake 14-24-86-14 | 14-24-86-14 W6M | Boundary Lake | |
| 656 | Texaco NFA Boundary Lake 14-25-85-14 | 14-25-85-14 W6M | Boundary Lake | |
| 657 | Texaco NFA Boundary Lake 14-36-85-14 | 14-36-85-14 W6M | Boundary Lake | |
| 662 | Texaco NFA Boundary Lake 6-36-85-14 | 6-36-85-14 W6M | Boundary Lake | |
| 663 | Texaco NFA Boundary Lake 6-1-86-14 | 6-1-86-14 W6M | Boundary Lake | |
| 664 | Texaco NFA Boundary Lake 14-1-86-14 | 14-1-86-14 W6M | Boundary Lake | |
| 687 | Texaco NFA Boundary Lake 6-25-85-14 | 6-25-85-14 W6M | Boundary Lake | |
| 811 | Texaco NFA Boundary 6-18-86-13 | 6-18-86-13 W6M | Boundary Lake | |
| 829 | Texaco NFA Boundary 6-12-86-14 | 6-12-86-14 W6M | Boundary Lake | |
| 845 | Texaco NFA Boundary 8-27-85-14 | 8-27-85-14 W6M | Boundary Lake | |
| 857 | Texaco NFA Boundary 8-34-85-14 | 8-34-85-14 W6M | Boundary Lake | |
| 860 | Texaco NFA Boundary 16-1-86-14 | 16-1-86-14 W6M | Boundary Lake | |
| 862 | Texaco NFA Boundary 6-7-86-13 | 6-7-86-13 W6M | Boundary Lake | |
| 880 | Texaco NFA Boundary 6-13-86-14 | 6-13-86-14 W6M | Boundary Lake | 11,221[1] |
| 885 | Texaco NFA Boundary 6-24-86-14 | 6-24-86-14 W6M | Boundary Lake | |
| 900 | Texaco NFA Boundary 14-12-86-14 | 14-12-86-14 W6M | Boundary Lake | |
| 924 | Texaco NFA Boundary 6-27-85-14 | 6-27-85-14 W6M | Boundary Lake | |
| 952 | Texaco NFA Boundary 14-13-86-14 | 14-13-86-14 W6M | Boundary Lake | |
| 953 | Texaco NFA Boundary 8-7-86-13 | 8-7-86-13 W6M | Boundary Lake | |
| 971 | Texaco NFA Boundary 14-27-85-14 | 14-27-85-14 W6M | Boundary Lake | |
| 972 | Texaco NFA Boundary 8-6-86-13 | 8-6-86-13 W6M | Boundary Lake | |
| 995 | Texaco NFA Boundary 8-18-86-13 | 8-18-86-13 W6M | Boundary Lake | |

[1] Pool M.P.R.

TABLE 23.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1967—*Continued*

| Field | Well Authorization No. | Well Name | Location | Pool | Maximum Permissible Rate (Bbl./Day) |
|---|---|---|---|---|---|
| Boundary Lake | 1049 | Texaco NFA Boundary 8-19-86-13 | 8-19-86-13 W6M | Boundary Lake | |
| | 1050 | Texaco NFA Boundary 6-30-86-13 | 6-30-86-13 W6M | Boundary Lake | |
| | 1058 | Texaco NFA Boundary 8-36-85-14 | 8-36-85-14 W6M | Boundary Lake | |
| | 1073 | Texaco NFA Boundary 14-22-85-14 | 14-22-85-14 W6M | Boundary Lake | |
| | 1074 | Texaco NFA Boundary 6-19-86-13 | 6-19-86-13 W6M | Boundary Lake | |
| | 1083 | Texaco NFA Boundary 8-1-86-14 | 8-1-86-14 W6M | Boundary Lake | |
| | 1086 | Texaco NFA Boundary 8-24-86-14 | 8-24-86-14 W6M | Boundary Lake | |
| | 1096 | Texaco NFA Boundary 8-12-86-14 | 8-12-86-14 W6M | Boundary Lake | |
| | 1097 | Texaco NFA Boundary 8-30-85-13 | 8-30-85-13 W6M | Boundary Lake | |
| | 1100 | Texaco NFA Boundary 14-7-86-13 | 14-7-86-13 W6M | Boundary Lake | |
| | 1101 | Texaco NFA Boundary 8-13-86-14 | 8-13-86-14 W6M | Boundary Lake | |
| | 1116 | Texaco NFA Boundary 14-18-86-13 | 14-18-86-13 W6M | Boundary Lake | |
| | 1123 | Texaco NFA Boundary 14-19-86-13 | 14-19-86-13 W6M | Boundary Lake | |
| | 1137 | Texaco NFA Boundary 6-30-85-13 | 6-30-85-13 W6M | Boundary Lake | |
| | 1150 | Texaco NFA Boundary 8-31-85-13 | 8-31-85-13 W6M | Boundary Lake | |
| | 1167 | Texaco NFA Boundary 8-30-86-13 | 8-30-86-13 W6M | Boundary Lake | |
| | 1171 | Texaco NFA Boundary 14-30-85-14 | 14-30-85-14 W6M | Boundary Lake | |
| | 1539 | Texaco NFA Boundary 8-25-85-14 | 8-25-85-14 W6M | Boundary Lake | |
| | 1543 | Texaco NFA Boundary 16-28-85-14 | 16-28-85-14 W6M | Boundary Lake | |
| | 1558 | Texaco NFA Boundary 8-25-86-14 | 8-25-86-14 W6M | Boundary Lake | |
| | 1680 | Texaco NFA Boundary 8-28-85-14 | 8-28-85-14 W6M | Boundary Lake | |
| | 1717 | Texaco NFA Boundary 8-33-85-14 | 8-33-85-14 W6M | Boundary Lake | |
| | 1751 | Texaco NFA Boundary 14-28-85-14 | 14-28-85-14 W6M | Boundary Lake | |
| | 1767 | Texaco NFA Boundary 6-33-85-14 | 6-33-85-14 W6M | Boundary Lake | |
| | 1786 | Texaco NFA Boundary 6-28-85-14 | 6-28-85-14 W6M | Boundary Lake | |
| | 1798 | Texaco NFA Boundary 16-21-85-14 | 16-21-85-14 W6M | Boundary Lake | |
| | 1810 | Texaco NFA Boundary 4-34-85-14 | 4-34-85-14 W6M | Boundary Lake | |
| | 1858 | Texaco NFA Boundary 14-21-85-14 | 14-21-85-14 W6M | Boundary Lake | |
| | 270 | Pacific Boundary 8-15-85-14 | 8-15-85-14 W6M | Cadomin | 79 |
| | 361 | Decalta Boundary Lake 14-32-85-13 | 14-32-85-13 W6M | Boundary Lake | — |
| | 227 | Imperial Pac Boundary 11-10-85-14 | 11-10-85-14 W6M | Boundary Lake | — |
| | 991 | Imp Pac Boundary 8-32-84-13 | 8-32-84-13 W6M | Boundary Lake | — |
| | 1368 | Imp Pac Boundary 6-15-85-14 | 6-15-85-14 W6M | Boundary Lake | 134 |
| | 1482 | Texaco NFA Boundary 16-30-85-14 | 16-30-85-14 W6M | Boundary Lake | 20 |
| | 1720 | Texaco NFA Boundary 6-29-86-13 | 6-29-86-13 W6M | Boundary Lake | 35 |
| | 736 | Amerada Boundary 16-24-85-14 | 16-24-85-14 W6M | Halfway | 96 |
| | 1454 | Amerada Boundary A6-24-85-14 | 6-24-85-14 W6M | Halfway | 99 |
| | 667 | Pacific Boundary Lake 11-14-85-14 | 11-14-85-14 W6M | Halfway | 8 |
| | 646 | Sun Boundary Lake 6-23-85-14 | 6-23-85-14 W6M | Halfway | 83 |
| | 1097 | Texaco NFA Boundary 8-30-85-13 | 8-30-85-13 W6M | Halfway | 56 |

| | | | | | |
|---|---|---|---|---|---|
| | 1144 | Texaco NFA Boundary 16-25-85-14 | 16-25-85-14 W6M | Halfway | — |
| Buick Creek East | 1345 | Decalta et al E Buick c-74-A | c-74-A/94-A-14 | Dunlevy | — |
| Buick Creek West | 271 | Pacific W Buick Creek (13A) c-83-K | c-83-K/94-A-11 | Dunlevy | — |
| | 280 | Pacific West Buick Creek (15) b-76-C | b-76-C/94-A-14 | Dunlevy | — |
| Bulrush | 1267 | Union HB Sinclair Bulrush d-78-F | d-78-F/94-A-16 | Halfway | 3891 |
| | 1394 | Union HB Sinc Pac Bulrush d-89-F | d-89-F/94-A-16 | Halfway | |
| | 1551 | Union HB Sinc Pac Bulrush d-99-F | d-99-F/94-A-16 | Halfway | |
| | 1629 | Union HB Sinc Pac Bulrush d-88-F | d-88-F/94-A-16 | Halfway | |
| Bulrush East | 1843 | Dome Provo Co-op E Bulrush d-5-K | d-5-K/94-A-16 | Halfway | 41 |
| Charlie Lake | 269 | Imp Pac Charlie 13-5-84-18 | 13-5-84-18 W6M | Gething | — |
| Currant | 1590 | Pacific et al Currant d-17-C | d-17-C/94-A-16 | Halfway | 4391 |
| | 1635 | Pacific et al Currant d-16-C | d-16-C/94-A-16 | Halfway | |
| | 1646 | Pacific et al Currant d-6-C | d-6-C/94-A-16 | Halfway | |
| | 1700 | Pacific et al Currant d-5-C | d-5-C/94-A-16 | Halfway | |
| | 1724 | Pacific et al Currant d-27-C | d-27-C/94-A-16 | Halfway | |
| | 1752 | Pacific et al Currant b-15-C | b-15-C/94-A-16 | Halfway | |
| | 1921 | Pacific et al Currant b-26-C | b-26-C/94-A-16 | Halfway | |
| | 1768 | Union HB Currant d-28-C | d-28-C/94-A-16 | Halfway | — |
| Fort St. John | 34 | Pacific Ft St John (9) 3-14-83-18 | 3-14-83-18 W6M | Charlie Lake | 46 |
| | 214 | Pacific Ft St John (76) 10-14-83-18 | 10-14-83-18 W6M | Charlie Lake | 14 |
| | 216 | Pacific Ft St John (78) 9-23-83-18 | 9-23-83-18 W6M | Charlie Lake | 65 |
| | 225 | Pacific Ft St John (81) 1-23-83-18 | 1-23-83-18 W6M | Charlie Lake | 23 |
| | 171 | Imp Pac Ft St John (45) 9-19-83-18 | 9-19-83-18 W6M | Belloy | — |
| Halfway | 1986 | West Nat et al Halfway 14-11-87-25 | 14-11-87-25 W6M | Charlie Lake | 24 |
| Inga | 2098 | Cdn-Sup Whitehall Inga 6-17-88-23 | 6-17-88-23 W6M | Charlie Lake | 30 |
| | 1776 | Cdn Sup et al Inga 10-25-88-24 | 10-25-88-24 W6M | Charlie Lake | 138 |
| | 2006 | Cdn Sup Whitehall Inga 6-4-88-23 | 6-4-88-23 W6M | Charlie Lake | 143 |
| | 2020 | Cdn Sup Whitehall Inga 16-5-88-23 | 16-5-88-23 W6M | Charlie Lake | 90 |
| | 2048 | Cdn Sup Whitehall Inga 16-8-88-23 | 16-8-88-23 W6M | Charlie Lake | 103 |
| | 2065 | Cdn Sup Whitehall Inga 6-16-88-23 | 6-16-88-23 W6M | Charlie Lake | 48 |
| | 2041 | Cdn Sup Whitehall Inga 6-8-88-23 | 6-8-88-23 W6M | Charlie Lake | 16 |
| | 2112 | Cdn Sup Whitehall Inga d-6-J | d-6-J/94-A-12 | Charlie Lake | 56 |
| | 2143 | Cdn Sup Whitehall Inga 8-26-88-24 | 8-26-88-24 W6M | Charlie Lake | 92 |
| | 2163 | Cdn Sup Whitehall Inga 16-23-88-24 | 16-23-88-24 W6M | Charlie Lake | 56 |
| | 2036 | IOE et al Inga 16-33-87-23 | 16-33-87-23 W6M | Charlie Lake | 12 |
| | 1989 | IOE Pac Inga 6-33-87-23 | 6-33-87-23 W6M | Charlie Lake | 77 |
| | 2154 | IOE et al Inga 16-32-87-23 | 16-32-87-23 W6M | Charlie Lake | 13 |
| | 1981 | Tenn Cdn Sup et al Inga 16-24-88-24 | 16-24-88-24 W6M | Charlie Lake | 100 |
| | 1982 | Tenn Cdn Sup et al Inga 6-19-88-23 | 6-19-88-23 W6M | Charlie Lake | 163 |
| | 1997 | Tenn Cdn Sup et al Inga 6-12-88-24 | 6-12-88-24 W6M | Charlie Lake | 130 |
| | 2004 | Tenn Cdn Sup et al Inga 16-26-88-24 | 16-26-88-24 W6M | Charlie Lake | 125 |
| | 2015 | Tenn Cdn Sup et al Inga 6-30-88-23 | 6-30-88-23 W6M | Charlie Lake | 152 |
| | 2021 | Tenn Cdn Sup et al Inga 16-18-88-23 | 16-18-88-23 W6M | Charlie Lake | 82 |
| | 2029 | Tenn Cdn Sup et al Inga 16-1-88-23 | 16-1-88-23 W6M | Charlie Lake | 105 |
| | 2022 | Tenn Cdn Sup et al Inga 16-19-88-23 | 16-19-88-23 W6M | Charlie Lake | 62 |

[1] Pool M.P.R.

TABLE 23.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1967—*Continued*

| Field | Well Authorization No. | Well Name | Location | Pool | Maximum Permissible Rate (Bbl./Day) |
|---|---|---|---|---|---|
| Inga | 2047 | Tenn Cdn Sup et al Inga 6-18-88-23 | 6-18-88-23 W6M | Charlie Lake | 46 |
| | 2081 | Tenn Cdn Sup et al Inga 16-6-88-23 | 16-6-88-23 W6M | Charlie Lake | 87 |
| | 2045 | Tenn et al Inga 6-25-88-24 | 6-25-88-24 W6M | Charlie Lake | 162 |
| | 1968 | Tenn Cdn Sup et al Inga 6-24-88-24 | 6-24-88-24 W6M | Charlie Lake | 160 |
| | 1974 | Tenn et al Inga 6-13-88-24 | 6-13-88-24 W6M | Charlie Lake | 123 |
| | 1991 | Tenn Cdn Sup et al Inga 16-7-88-23 | 16-7-88-23 W6M | Charlie Lake | 62 |
| | 2183 | West Nat et al Inga 6-9-88-23 | 6-9-88-23 W6M | Charlie Lake | 141 |
| | 2212 | West Nat et al Inga 14-4-88-23 | 14-4-88-23 W6M | Charlie Lake | ........ |
| Milligan Creek | 248 | Union HB Milligan Creek d-73-G | d-73-G/94-A-2 | Halfway | 10,000[1] |
| | 341 | Union HB Milligan Creek d-64-G | d-64-G/94-A-2 | Halfway | |
| | 398 | Union HB Milligan Creek d-53-G | d-53-G/94-A-2 | Halfway | |
| | 401 | Union HB Milligan Creek d-52-G | d-52-G/94-A-2 | Halfway | |
| | 402 | Union HB Milligan Creek d-54-G | d-54-G/94-H-2 | Halfway | |
| | 409 | Union HB Milligan Creek d-42-G | d-42-G/94-H-2 | Halfway | |
| | 435 | Union HB Milligan Creek d-43-G | d-43-G/94-H-2 | Halfway | |
| | 436 | Union HB Milligan Creek d-74-G | d-74-G/94-H-2 | Halfway | |
| | 440 | Union HB Milligan Creek d-63-G | d-63-G/94-H-2 | Halfway | |
| | 826 | Union HB Milligan b-62-G | b-62-G/94-H-2 | Halfway | |
| | 875 | Union HB Milligan b-83-G | b-83-G/94-H-2 | Halfway | |
| | 899 | Union HB Milligan b-53-G | b-53-G/94-H-2 | Halfway | |
| | 909 | Union HB Milligan b-52-G | b-52-G/94-H-2 | Halfway | |
| | 911 | Union HB Milligan b-73-G | b-73-G/94-H-2 | Halfway | |
| | 973 | Union HB Milligan b-42-G | b-42-G/94-H-2 | Halfway | |
| | 985 | Union HB Milligan b-93-G | b-93-G/94-H-2 | Halfway | |
| | 1001 | Union HB Milligan d-62-G | d-62-G/94-H-2 | Halfway | |
| | 1011 | Union HB Milligan b-82-G | b-82-G/94-H-2 | Halfway | |
| | 1014 | Union HB Milligan d-84-G | d-84-G/94-H-2 | Halfway | |
| | 1170 | Union HB Milligan d-94-G | d-94-G/94-H-2 | Halfway | |
| | 1182 | Union HB Milligan c-72-G | c-72-G/94-H-2 | Halfway | |
| | 1493 | Union HB Milligan b-65-G | b-65-G/94-H-2 | Halfway | 157 |
| Nettle | 1321 | Union KCL ROC Nettle d-67-A | d-67-A/94-H-7 | Bluesky-Gething | ........ |
| | 1879 | Union KCL ROC Nettle d-68-A | d-68-A/94-H-7 | Bluesky-Gething | 74 |
| | 2018 | Union KCL ARCo Nettle d-69-A | d-69-A/94-H-7 | Bluesky-Gething | ........ |
| Nig Creek | 2152 | Texaco NFA Nig d-87-A | d-87-A/94-H-4 | Baldonnel | ........ |
| Osprey | 1610 | Pacific SR CanDel Osprey d-4-J | d-4-J/94-A-15 | Halfway | 49 |
| | 1658 | Baysel SR CanDel Osprey d-93-G | d-93-G/94-A-15 | Halfway | ........ |
| Peejay | 1584 | FPC Whitehall Peejay b-27-E | b-27-E/94-A-16 | Halfway | |
| | 902 | Medallion Ashland Peejay d-69-E | d-69-E/94-A-16 | Halfway | |
| | 903 | Medallion Ashland Peejay d-70-E | d-70-E/94-A-16 | Halfway | |
| | 981 | Medallion Aorco Blair Peejay d-60-E | d-60-E/94-A-16 | Halfway | |

| | | | | | |
|---|---|---|---|---|---|
| | 1026 | Medallion Sahland Peejay d-68-E | d-68-E/94-A-16 | Halfway | |
| | 1452 | Medallion Mobil Peejay d-57-E | d-57-E/94-A-16 | Halfway | |
| | 418 | Pacific Sinclair Peejay d-39-E | d-39-E/94-A-16 | Halfway | |
| | 543 | Pacific Sinclair Peejay d-29-E | d-29-E/94-A-16 | Halfway | |
| | 569 | Pacific SR West Cdn Peejay d-80-E | d-80-E/94-A-16 | Halfway | |
| | 577 | Pacific Sinclair Peejay d-48-E | d-48-E/94-A-16 | Halfway | 4,430[1] |
| | 578 | Pacific Sinclair Peejay d-38-E | d-38-E/94-A-16 | Halfway | |
| | 588 | Pacific Sinclair Peejay d-49-E | d-49-E/94-A-16 | Halfway | |
| | 589 | Pacific Sinclair Peejay d-28-E | d-28-E/94-A-16 | Halfway | |
| | 612 | Pacific Sinclair Peejay d-18-E | d-18-E/94-A-16 | Halfway | |
| | 881 | Pacific Sinclair Peejay d-59-E | d-59-E/94-A-16 | Halfway | |
| | 914 | Pacific Sinclair Peejay d-58-E | d-58-E/94-A-16 | Halfway | |
| | 915 | Pacific Sinclair Peejay d-47-E | d-47-E/94-A-16 | Halfway | |
| | 990 | Pacific SR CanDel Peejay d-81-H | d-81-H/94-A-15 | Halfway | |
| | 1030 | Pacific SR CanDel Peejay d-100-E | d-100-E/94-A-16 | Halfway | |
| | 2085 | Pacific et al Peejay b-48-E | b-48-E/94-A-16 | Halfway | |
| | 1575 | CIGOL Peejay d-43-E | d-43-E/94-A-16 | Halfway | |
| | 1684 | CIGOL Peejay d-100-C | d-100-C/94-A-16 | Halfway | |
| | 1690 | CIGOL Mobil Peejay d-34-E | d-34-E/94-A-16 | Halfway | |
| | 1704 | CIGOL Peejay d-1-E | d-1-E/94-A-16 | Halfway | |
| | 1706 | CIGOL Mobil Peejay d-35-E | d-35-E/94-A-16 | Halfway | |
| | 1715 | CIGOL Peejay d-10-F | d-10-F/94-A-16 | Halfway | |
| | 1718 | CIGOL Mobil Peejay d-26-E | d-26-E/94-A-16 | Halfway | |
| | 1969 | CIGOL Peejay b-11-E | b-11-E/94-A-16 | Halfway | |
| | 1971 | CIGOL Mobil Peejay b-45-E | b-45-E/94-A-16 | Halfway | |
| | 1600 | Texcan Peejay d-90-C | d-90-C/94-A-16 | Halfway | |
| | 1636 | Texcan Peejay d-80-C | d-80-C/94-A-16 | Halfway | |
| | 1698 | Texcan Peejay d-81-C | d-81-C/94-A-16 | Halfway | |
| | 1838 | Texcan Texaco Peejay d-62-D | d-62-D/94-A-16 | Halfway | |
| | 1891 | Texcan Texaco Peejay d-70-C | d-70-C/94-A-16 | Halfway | |
| | 1935 | Texcan Texaco Peejay d-60-C | d-60-C/94-A-16 | Halfway | |
| | 1598 | Union HB Sinc Pac Peejay b-9-F | b-9-F/94-A-16 | Halfway | 8,229[1] |
| | 1694 | Union HB Peejay d-24-E | d-24-E/94-A-16 | Halfway | |
| | 1699 | Union HB Peejay d-23-E | d-23-E/94-A-16 | Halfway | |
| | 1708 | Union HB Peejay d-92-D | d-92-D/94-A-16 | Halfway | |
| | 1721 | Union HB Peejay d-2-E | d-2-E/94-A-16 | Halfway | |
| | 1722 | Union HB Peejay d-82-D | d-82-D/94-A-16 | Halfway | |
| | 1725 | Union HB Peejay d-93-D | d-93-D/94-A-16 | Halfway | |
| | 1732 | Union HB Peejay d-3-E | d-3-E/94-A-16 | Halfway | |
| | 1735 | Union HB Peejay d-13-E | d-13-E/94-A-16 | Halfway | |
| | 1749 | Union HB Peejay d-83-D | d-83-D/94-A-16 | Halfway | |
| | 1759 | Union HB Peejay d-72-D | d-72-D/94-A-16 | Halfway | |
| | 1764 | Union HB Peejay d-22-E | d-22-E/94-A-16 | Halfway | |
| | 1783 | Union HB Peejay d-69-C | d-69-C/94-A-16 | Halfway | |
| | 1784 | Union HB Peejay d-73-D | d-73-D/94-A-16 | Halfway | |

[1] Pool M.P.R.

TABLE 23.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1967—*Continued*

| Field | Well Authorization No. | Well Name | Location | Pool | Maximum Permissible Rate (Bbl./Day) |
|---|---|---|---|---|---|
| Peejay | 1821 | Union HB Sinc Pac Peejay d-89-C | d-89-C/94-A-16 | Halfway | |
| | 1960 | Union HB Peejay d-68-C | d-68-C/94-A-16 | Halfway | |
| | 1487 | Baysel SR Peejay d-96-H | d-96-H/94-A-15 | Halfway | |
| | 1538 | Baysel SR Peejay d-97-H | d-97-H/94-A-15 | Halfway | |
| | 1625 | Baysel SR Peejay d-34-H | d-34-H/94-A-15 | Halfway | |
| | 1476 | CanDel SR Peejay d-65-H | d-65-H/94-A-15 | Halfway | |
| | 1483 | CanDel SR Peejay d-64-H | d-64-H/94-A-15 | Halfway | |
| | 1498 | CanDel SR Peejay d-53-H | d-53-H/94-A-15 | Halfway | |
| | 1503 | CanDel SR Peejay d-54-H | d-54-H/94-A-15 | Halfway | |
| | 1507 | CanDel SR Peejay d-55-H | d-55-H/94-A-15 | Halfway | |
| | 1515 | CanDel SR Peejay d-44-H | d-44-H/94-A-15 | Halfway | |
| | 1521 | CanDel SR Peejay d-63-H | d-63-H/94-A-15 | Halfway | |
| | 1603 | CanDel SR Peejay d-52-H | d-52-H/94-A-15 | Halfway | 5,404[1] |
| | 1801 | CanDel SR Peejay d-62-H | d-62-H/94-A-15 | Halfway | |
| | 1407 | Pacific SR CanDel Peejay d-85-H | d-85-H/94-A-15 | Halfway | |
| | 1467 | Pacific SR CanDel Peejay d-75-H | d-75-H/94-A-15 | Halfway | |
| | 1512 | Pacific SR CanDel Peejay d-66-H | d-66-H/94-A-15 | Halfway | |
| | 1522 | Pacific SR CanDel Peejay d-A74-H | d-74-H/94-A-15 | Halfway | |
| | 1540 | Pacific SR CanDel Peejay d-67-H | d-67-H/94-A-15 | Halfway | |
| | 1562 | Pacific SR CanDel Peejay d-68-H | d-68-H/94-A-15 | Halfway | |
| | 1987 | Pacific SR CanDel Peejay d-98-H | d-98-H/94-A-15 | Halfway | |
| | 2135 | Pacific SR CanDel Peejay d-57-H | d-57-H/94-A-15 | Halfway | |
| | 2219 | Pacific SR CanDel Peejay b-64-H | b-64-H/94-A-15 | Halfway | |
| | 1497 | Pacific Sinclair Peejay d-43-H | d-43-H/94-A-15 | Halfway | |
| | 1514 | Pacific Sinclair Peejay d-42-H | d-42-H/94-A-15 | Halfway | |
| | 1563 | Pacific Sinclair Peejay d-32-H | d-32-H/94-A-15 | Halfway | |
| | 1585 | Pacific Sinclair Peejay d-31-H | d-31-H/94-A-15 | Halfway | 3,046[1] |
| | 1627 | Pacific Sinclair Peejay d-21-H | d-21-H/94-A-15 | Halfway | |
| | 1632 | Pacific Sinclair Peejay d-41-H | d-41-H/94-A-15 | Halfway | |
| | 2195 | Pacific Sinclair Peejay b-41-H | b-41-H/94-A-15 | Halfway | |
| | 2196 | Pacific Sinclair Peejay b-50-E | b-50-E/94-A-16 | Halfway | |
| | 1461 | Tenn Peejay d-86-H | d-86-H/94-A-15 | Halfway | |
| | 1478 | Tenn Peejay d-76-H | d-76-H/94-A-15 | Halfway | |
| | 1490 | Tenn Peejay d-87-H | d-87-H/94-A-15 | Halfway | 1,806[1] |
| | 1491 | Tenn Peejay d-77-H | d-77-H/94-A-15 | Halfway | |
| | 1505 | Tenn Peejay d-78-H | d-78-H/94-A-15 | Halfway | |
| | 2023 | Decalta Ranger Peejay d-51-D | d-51-D/94-A-16 | Halfway | 35 |
| | 725 | Pacific SR West Cdn Peejay d-33-I | d-33-I/94-A-15 | Halfway | 5 |
| | 1851 | Pacific SR CanDel Peejay d-71-H | d-71-H/94-A-15 | Halfway | 59 |
| | 2172 | Pacific SR CanDel Peejay d-99-H | d-99-H/94-A-15 | Halfway | — |

| | | | | | |
|---|---|---|---|---|---|
| Peejay West | 1683 | Texcan Texaco Peejay d-61-D | d-61-D/94-A-15 | Halfway | — |
| | 956 | Pacific SR West Cdn W Peejay d-54-G | d-54-G/94-A-15 | Halfway | — |
| | 1008 | Pacific SR CanDel W Peejay d-44-G | d-44-G/94-A-15 | Halfway | — |
| Rigel | 1555 | Monsanto Rigel 6-13-87-17 | 6-13-87-17 W6M | Dunlevy | 242 |
| | 1616 | Monsanto IOE Fina Rigel 11-19-87-16 | 11-19-87-16 W6M | Dunlevy | 149 |
| | 1651 | Monsanto IOE Fina Rigel 8-18-87-16 | 8-18-87-16 W6M | Dunlevy | — |
| | 1692 | Monsanto IOE Fina Rigel 6-19-87-16 | 6-19-87-16 W6M | Dunlevy | 117 |
| | 1714 | Monsanto Rigel 6-31-87-17 | 6-31-87-17 W6M | Dunlevy | 72 |
| | 1781 | Monsanto Rigel 16-19-87-16 | 16-19-87-16 W6M | Dunlevy | 71 |
| | 1942 | Monsanto Rigel 6-23-87-17 | 6-23-87-17 W6M | Dunlevy | 139 |
| Stoddart | 1519 | Uno-Tex et al Stoddart 10-31-85-19 | 10-31-85-19 W6M | Dunlevy | 82 |
| | 1983 | Uno-Tex Stoddart A11-5-86-19 | 11-5-86-19 W6M | Dunlevy | — |
| | 2182 | Pacific et al Stoddart 10-35-85-19 | 10-35-85-19 W6M | Dunlevy | — |
| Weasel | 1709 | CanDel SR Weasel d-15-B | d-15-B/94-H-2 | Halfway | 41 |
| | 1713 | CanDel SR Weasel d-14-B | d-14-B/94-H-2 | Halfway | 221 |
| | 1726 | Dome Provo Weasel d-3-B | d-3-B/94-H-2 | Halfway | 78 |
| | 1734 | Dome Provo Weasel d-2-B | d-2-B/94-H-2 | Halfway | 56 |
| | 1631 | Pacific Sinclair Weasel d-30-A | d-30-A/94-H-2 | Halfway | 297 |
| | 1644 | Pacific Sinclair Weasel d-13-B | d-13-B/94-H-2 | Halfway | 49 |
| | 1748 | Pacific SR CanDel Weasel d-4-B | d-4-B/94-H-2 | Halfway | 217 |
| | 1761 | Pacific SR CanDel Weasel d-94-J | d-94-J/94-A-15 | Halfway | 429 |
| | 1805 | Pacific SR CanDel Weasel d-A5-B | d-5-B/94-H-2 | Halfway | 14 |
| | 1977 | Pacific Sinclair Weasel b-23-B | b-23-B/94-H-2 | Halfway | 20 |
| | 2055 | Pacific SR CanDel Weasel d-82-J | d-82-J/94-A-15 | Halfway | 178 |
| | 1601 | Tenn Ashland Weasel d-35-B | d-35-B/94-H-2 | Halfway | 249 |
| | 1637 | Tenn Ashland Weasel d-25-B | d-25-B/94-H-2 | Halfway | 40 |
| | 1655 | Tenn Ashland Weasel d-45-B | d-45-B/94-H-2 | Halfway | 248 |
| | 1662 | Tenn Ashland Weasel d-36-B | d-36-B/94-H-2 | Halfway | 326 |
| | 1679 | Tenn Ashland Weasel d-46-B | d-46-B/94-H-2 | Halfway | 73 |
| | 1688 | Tenn Ashland Weasel d-56-B | d-56-B/94-H-2 | Halfway | 114 |
| | 1689 | Tenn Ashland Weasel d-26-B | d-26-B/94-H-2 | Halfway | 102 |
| | 1703 | Tenn Ashland Weasel d-27-B | d-27-B/94-H-2 | Halfway | — |
| | 1757 | Tenn Ashland Weasel d-24-B | d-24-B/94-H-2 | Halfway | 99 |
| | 1794 | Tenn Ashland Weasel d-34-B | d-34-B/94-H-2 | Halfway | 84 |
| | 1809 | Tenn Ashland Weasel b-44-B | b-44-B/94-H-2 | Halfway | 40 |
| | 1811 | Union et al Weasel d-57-B | d-57-B/94-H-2 | Halfway | 316 |
| | 1857 | Union et al Weasel d-67-B | d-67-B/94-H-2 | Halfway | 179 |
| | 1897 | Union et al Weasel d-47-B | d-47-B/94-H-2 | Halfway | 98 |
| Wildmint | 530 | Union HB Wildmint d-46-A | d-46-A/94-H-2 | Halfway | |
| | 584 | Union HB Wildmint d-56-A | d-56-A/94-H-2 | Halfway | |
| | 840 | Union HB Wildmint b-24-A | b-24-A/94-H-2 | Halfway | |
| | 919 | Union HB Wildmint d-25-A | d-25-A/94-H-2 | Halfway | |
| | 945 | Union HB Wildmint b-56-A | b-56-A/94-H-2 | Halfway | |
| | 1195 | Union HB Wildmint b-34-A | b-34-A/94-H-2 | Halfway | |
| | 1226 | Union HB Wildmint d-24-A | d-24-A/94-H-2 | Halfway | 3,665[1] |

[1] Pool M.P.R.

TABLE 23.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1967—*Continued*

| Field | Well Authorization No. | Well Name | Location | Pool | Maximum Permissible Rate (Bbl./Day) |
|---|---|---|---|---|---|
| Wildmint | 1387 | Union HB Wildmint b-46-A | b-46-A/94-H-2 | Halfway | |
| | 1685 | Union HB Wildmint d-34-A | d-34-A/94-H-2 | Halfway | |
| | 1733 | Union HB Wildmint b-66-A | b-66-A/94-H-2 | Halfway | |
| | 1743 | Union HB Wildmint d-66-A | d-66-A/94-H-2 | Halfway | |
| | 1758 | Union HB Wildmint b-76-A | b-76-A/94-H-2 | Halfway | |
| | 1766 | Union HB Wildmint d-35-A | d-35-A/94-H-2 | Halfway | |
| | 1782 | Union HB Wildmint b-55-A | b-55-A/94-H-2 | Halfway | |
| | 1567 | CIGOL Wildmint d-13-A | d-13-A/94-H-2 | Halfway | — |
| | 1206 | Husky Colo Wildmint b-23-A | b-23-A/94-H-2 | Halfway | — |
| | 1304 | Husky Colo Wildmint d-16-A | d-16-A/94-H-2 | Halfway | — |
| | 1566 | Pacific SR CanDel Wildmint d-84-I | d-84-I/94-A-15 | Halfway | 108 |
| | 1121 | Tenn Wildmint d-5-A | d-5-A/94-H-2 | Halfway | 70 |
| | 1184 | Tenn Wildmint d-6-A | d-6-A/94-H-2 | Halfway | — |
| | 1191 | Tenn Wildmint d-95-I | d-95-I/94-A-15 | Halfway | 47 |
| | 1211 | Tenn Wildmint d-2-A | d-2-A/94-H-2 | Halfway | — |
| | 1750 | Tenn Wildmint d-7-A | d-7-A/94-H-2 | Halfway | 308 |
| | 1947 | Tenn Wildmint d-93-I | d-93-I/94-A-15 | Halfway | — |
| | 1289 | Texcan Wildmint d-94-I | d-94-I/94-A-15 | Halfway | 167 |
| | 963 | Union HB Wildmint d-26-A | d-26-A/94-H-2 | Halfway | — |
| | 984 | Union HB Wildmint d-15-A | d-15-A/94-H-2 | Halfway | — |
| Willow | 449 | Union HB Willow d-20-H | d-20-H/94-H-2 | Bluesky-Gething | 122 |
| Wolf | 1815 | Baysel Sinclair Wolf d-93-B | d-93-B/94-A-15 | Halfway | 142 |
| | 1916 | Pacific Sinclair Wolf d-82-B | d-82-B/94-A-15 | Halfway | 195 |
| | 1972 | Baysel Sinclair Wolf d-92-B | d-92-B/94-A-15 | Halfway | 37 |
| | 2062 | Frontier Pembina Wolf d-14-G | d-14-G/94-H-2 | Halfway | — |
| Other areas | 1840 | Cankee Terrebonne Woodrush d-47-H | d-47-H/94-A-16 | Halfway | 205 |
| | 2064 | Champlin Two Rivers 10-5-83-16 | 10-5-83-16 W6M | Charlie Lake | (2) |
| | 2191 | Decalta Pem Suptst S Inga 6-5-87-23 | 6-5-87-23 W6M | Charlie Lake | (2) |
| | 2206 | Decalta Pem Suptst S Inga 6-31-87-23 | 6-31-87-23 W6M | Charlie Lake | (2) |
| | 2189 | Dome Numac S Inga 6-18-87-23 | 6-18-87-23 W6M | Charlie Lake | (2) |
| | 2198 | Dome Numac S Inga 6-36-86-24 | 6-36-86-24 W6M | Charlie Lake | (2) |
| | 933 | Hunt Sands Pac Imp Coplin 7-16-86-23 | 7-16-86-23 W6M | Baldonnel | (2) |
| | 2169 | IOE Pac S Inga 6-19-87-23 | 6-19-87-23 W6M | Charlie Lake | (2) |
| | 2194 | IOE Pac S Inga A6-30-87-23 | 6-30-87-23 W6M | Charlie Lake | (2) |
| | 1531 | Pacific SR CanDel Ptarmigan d-90-I | d-90-I/94-A-15 | Halfway | (2) |
| | 2202 | Pacific S Inga 6-8-87-23 | 6-8-87-23 W6M | Charlie Lake | (2) |
| | 2188 | Pan Am Coplin 6-19-86-23 | 6-19-86-23 W6M | Charlie Lake | (2) |
| | 2213 | Shenandoah et al Coplin 6-17-86-23 | 6-17-86-23 W6M | Charlie Lake | (2) |
| | 2122 | Tenn S Inga 16-7-87-23 | 16-7-87-23 W6M | Charlie Lake | (2) |
| | 2151 | Tenn S Inga 16-36-86-24 | 16-36-86-24 W6M | Charlie Lake | (2) |

| | | | | | |
|---|---|---|---|---|---|
| | 2145 | Tenn S Inga 6-7-87-23 | 6-7-87-23 W6M | Charlie Lake | (2) |
| | 2180 | Tenn S Inga 16-6-87-23 | 16-6-87-23 W6M | Charlie Lake | (2) |
| | 2209 | Texaco S Inga 16-25-87-24 | 16-25-87-24 W6M | Charlie Lake | (2) |
| | 2208 | Texaco Texcan Coplin 16-21-85-23 | 16-21-85-23 W6M | Charlie Lake | (2) |
| | 1433 | Union HB BA Ladyfern d-48-H | d-48-H/94-A-15 | Bluesky-Gething | (2) |
| | 2096 | Union et al Crush d-28-F | d-28-F/94-A-16 | Halfway | (2) |
| | 2164 | Union et al Peejay b-98-C | b-98-C/94-A-16 | Halfway | (2) |
| | 2214 | Union et al Peejay d-39-F | d-39-F/94-A-16 | Halfway | (2) |
| | 2166 | West Nat et al S Inga 16-35-86-24 | 16-35-86-24 W6M | Charlie Lake | (2) |
| | 2212 | West Nat et al Inga 14-4-88-23 | 14-4-88-23 W6M | Charlie Lake | (2) |

[2] Confidential.

TABLE 24.—WELLS DRILLED AND DRILLING, 1967

| Well Authorization No. | Well Name | Date Spudded | Date Rig Released | Total Depth | 1967 Footage | Status at Dec. 31, 1967 |
|---|---|---|---|---|---|---|
| 2061 | Amarillo Antelope c-66-L | Jan. 13, 1967 | Jan. 24, 1967 | 3,670 | 3,670 | Abandoned—dry. |
| 2076 | Amarillo Arbour d-16-E | Jan. 25, 1967 | Feb. 1, 1967 | 3,600 | 3,600 | Abandoned—dry. |
| 2046 | Amarillo Aspen d-55-E | Dec. 21, 1966 | Jan. 2, 1967 | 3,581 | ...... | Abandoned—dry. |
| 2241 | Amarillo Cabot W Jeans b-82-J | Dec. 20, 1967 | ...... | ...... | 4,970 | Drilling. |
| 2086 | Amarillo Drake d-5-L | Feb. 3, 1967 | Feb. 10, 1967 | 3,600 | 3,600 | Abandoned—dry. |
| 2095 | Amarillo Groundpine b-40-K | Feb. 11, 1967 | Feb. 17, 1967 | 3,585 | 3,585 | Abandoned—dry. |
| 2063 | Amarillo Laurel b-12-D | Jan. 4, 1967 | Jan. 16, 1967 | 3,784 | 3,784 | Abandoned—dry. |
| 2043 | Amerada Laprise b-66-D | Dec. 21, 1966 | Jan. 10, 1967 | 4,065 | 740 | Abandoned—dry. |
| 2040 | Amerada Shell Cheves a-2-D | Dec. 26, 1966 | Mar. 9, 1967 | 8,630 | 6,100 | Abandoned—dry. |
| 2203 | Apache Fireweed b-70-E | Oct. 28, 1967 | Nov. 8, 1967 | 4,230 | 4,230 | Abandoned—dry. |
| 2199 | Apache Pac W Stoddart 11-30-86-20 | Oct. 13, 1967 | Nov. 4, 1967 | 6,561 | 6,561 | Finished drilling. |
| 2243 | Apache Pac W Stoddart 10-24-86-21 | Dec. 27, 1967 | ...... | ...... | 362 | Drilling. |
| 2119 | Ashland CK Tb Wargen d-19-B | Mar. 3, 1967 | Mar. 15, 1967 | 4,120 | 4,120 | Charlie Lake gas well. |
| 2149 | Banff Aquit Chasm d-44-J | June 28, 1967 | Aug. 16, 1967 | 8,160 | 8,160 | Abandoned—dry. |
| 2073 | BA St John Moberly 5-15-82-21 | Jan. 17, 1967 | Mar. 22, 1967 | 7,535 | 7,535 | Abandoned—dry. |
| 2071 | Baysel SR CanDel Osprey d-83-G | Jan. 14, 1967 | Jan. 27, 1967 | 3,912 | 3,912 | Halfway gas well. |
| 2234 | CanDel Barnwell HB Hoss b-82-G | Dec. 23, 1967 | ...... | ...... | 608 | Drilling. |
| 2089 | CanDel et al Farrell a-41-I | Feb. 17, 1967 | Apr. 12, 1967 | 6,135 | 6,135 | Multiple Charlie Lake-Halfway gas well. |
| 2165 | CanDel et al Farrell a-30-L | Aug. 6, 1967 | Oct. 31, 1967 | 8,341 | 8,341 | Multiple Charlie Lake-Halfway gas well. |
| 2120 | CanDel et al Peejay d-22-I | Mar. 1, 1967 | Mar. 14, 1967 | 3,799 | 3,799 | Abandoned—dry. |
| 2176 | Cankee Cdn-Sup Clarke d-72-G | Sept. 4, 1967 | Oct. 5, 1967 | 6,456 | 6,456 | Slave Point gas well. |
| 2111 | Cankee et al Elleh b-88-D | Feb. 25, 1967 | ...... | ...... | 7,395 | Drilling; suspended 21-3-67 to 15-11-67. |
| 2068 | Cankee Uno-Tex Yoyo a-49-L | Jan. 11, 1967 | Mar. 3, 1967 | 7,334 | 7,334 | Pine Point gas well. |
| 2231 | Cdn-Sup et al Gutah a-97-G | Dec. 25, 1967 | ...... | ...... | 1,388 | Drilling. |
| 2041 | Cdn-Sup Whitehall Inga 6-8-88-23 | Jan. 29, 1967 | Feb. 14, 1967 | 5,287 | 5,287 | Charlie Lake oil well. |
| 2048 | Cdn-Sup Whitehall Inga 16-8-88-23 | Dec. 21, 1966 | Jan. 4, 1967 | 5,400 | ...... | Charlie Lake oil well. |
| 2065 | Cdn-Sup Whitehall Inga 6-16-88-23 | Jan. 7, 1967 | Jan. 26, 1967 | 5,393 | 5,393 | Charlie Lake oil well. |
| 2098 | Cdn-Sup Whitehall Inga 6-17-88-23 | Feb. 16, 1967 | Mar. 5, 1967 | 5,425 | 5,425 | Charlie Lake oil well. |
| 2163 | Cdn-Sup Whitehall Inga 16-23-88-24 | Aug. 6, 1967 | Aug. 21, 1967 | 5,332 | 5,332 | Charlie Lake oil well. |
| 2143 | Cdn-Sup Whitehall Inga 8-26-88-24 | June 9, 1967 | June 24, 1967 | 5,212 | 5,212 | Charlie Lake oil well. |
| 2112 | Cdn-Sup Whitehall Inga d-6-J | Mar. 7, 1967 | Mar. 25, 1967 | 5,405 | 5,405 | Charlie Lake oil well. |
| 2144 | Cdn-Sup Whitehall Inga d-15-J | June 26, 1967 | July 24, 1967 | 6,275 | 5,275 | Abondoned. |
| 2056 | CDR Sun Evergreen b-43-J | Jan. 2, 1967 | Jan. 23, 1967 | 4,615 | 4,615 | Halfway gas well. |
| 2139 | Champlin et al Two Rivers 6-9-83-16 | May 28, 1967 | June 22, 1967 | 6,400 | 6,400 | Multiple Baldonnel-Halfway gas well. |
| 2133 | Champlin Two Rivers 14-32-82-16 | Mar. 21, 1967 | Apr. 11, 1967 | 5,262 | 5,262 | Abandoned—dry. |
| 2064 | Champlin Two Rivers 10-5-83-16 | Jan. 11, 1967 | Feb. 22, 1967 | 5,358 | 5,358 | Charlie Lake oil well. |
| 2108 | Chevron N Helmet a-54-B | Feb. 23, 1967 | Mar. 28, 1967 | 7,195 | 7,195 | Pine Point gas well. |
| 2200 | CIGOL Attachie 16-25-84-23 | Oct. 21, 1967 | Nov. 11, 1967 | 5,105 | 5,105 | Abandoned—dry. |
| 2103 | Clarke Apache N Beatton d-82-K | Feb. 18, 1967 | Feb. 25, 1967 | 3,810 | 3,810 | Abandoned—dry. |
| 2215 | Columbia Monkman Pass a-54-G | Nov. 5, 1967 | ...... | ...... | 3,982 | Drilling. |
| 2206 | Decalta Pem Suptst S Inga 6-31-86-23 | Oct. 24, 1967 | Nov. 14, 1967 | 5,527 | 5,527 | Charlie Lake oil well. |
| 2191 | Decalta Pem Suptst S Inga 6-5-87-23 | Sept. 23, 1967 | Oct. 13, 1967 | 5,410 | 5,410 | Charlie Lake oil well. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2126 | Dome CPOG et al Yeka c-39-E | Mar. 11, 1967 | Apr. 5, 1967 | 6,358 | 6,358 | Abandoned—dry. |
| 2225 | Dome et al Imp Slave c-10-I | Dec. 11, 1967 | | | 4,981 | Drilling. |
| 2053 | Dome et al Junior a-45-E | Jan. 8, 1967 | Feb. 25, 1967 | 6,864 | 6,864 | Abandoned—dry. |
| 2198 | Dome Numac S Inga 6-36-86-24 | Oct. 19, 1967 | Nov. 3, 1967 | 5,500 | 5,500 | Charlie Lake oil well. |
| 2189 | Dome Numac S Inga 6-18-87-23 | Sept. 22, 1967 | Oct. 8, 1967 | 5,413 | 5,413 | Charlie Lake oil well. |
| 2052 | Dome Provo Co-op Laurel b-10-C | Dec. 29, 1966 | Jan. 7, 1967 | 3,765 | 3,270 | Abandoned—dry. |
| 2197 | Fina Groundbirch 12-11-83-24 | Oct. 15, 1967 | Nov. 13, 1967 | 5,513 | 5,513 | Abandoned—dry. |
| 2142 | Forest SRC IOE Cedar d-100-G | June 9, 1967 | Sept. 1, 1967 | 7,883 | 7,883 | Abandoned—dry. |
| 2137 | Forest SRC IOE Bedji b-44-I | Mar. 24, 1967 | May 30, 1967 | 7,813 | 7,813 | Abandoned—dry. |
| 2175 | FPC Kilkerran 11-36-78-15 | Aug. 30, 1967 | Oct. 16, 1967 | 9,320 | 9,320 | Abandoned—dry. |
| 2062 | Frontier Pembina Wolf d-14-G | Jan. 9, 1967 | Jan. 22, 1967 | 4,052 | 4,052 | Halfway oil well. |
| 2099 | Gose Fish 1-21-84-19 | Feb. 26, 1967 | Mar. 16, 1967 | 5,220 | 5,220 | Abandoned—dry. |
| 2082 | Gose W Ft St John 10-10-83-19 | Feb. 10, 1967 | Mar. 16, 1967 | 6,157 | 6,157 | Abandoned—dry. |
| 2067 | GPD Cdn-Sup Osborn c-63-J | Jan. 10, 1967 | Jan. 22, 1967 | 4,145 | 4,145 | Abandoned—dry. |
| 2118 | Homestead et al N Nettle d-17-G | Mar. 16, 1967 | Mar. 25, 1967 | 3,925 | 3,925 | Abandoned—dry. |
| 2184 | Horizon Dawson A3-22-79-15 | Sept. 13, 1967 | Sept. 19, 1967 | 601 | 601 | Abandoned—dry. |
| 2216 | Horizon Dawson B3-22-79-15 | Nov. 1, 1967 | Nov. 16, 1967 | 1,639 | 1,639 | Dunvegan gas well. |
| 2072 | Horizon Sunrise 6-4-79-16 | Jan. 20, 1967 | Jan. 30, 1967 | 1,648 | 1,648 | Abandoned—dry. |
| 2054 | Imp IOE Fina Rigel a-21-J | Dec. 23, 1966 | Jan. 10, 1967 | 3,650 | 433 | Dunlevy gas well. |
| 2227 | IOE et al Flatrock 5-20-84-15 | Dec. 11, 1967 | | | 6,507 | Drilling. |
| 2177 | IOE et al Inga 6-27-87-23 | Aug. 27, 1967 | Sept. 17, 1967 | 5,696 | 5,696 | Abandoned—dry. |
| 2154 | IOE et al Inga 16-32-87-23 | July 21, 1967 | Aug. 5, 1967 | 5,347 | 5,347 | Charlie Lake oil well. |
| 2036 | IOE et al Inga 16-33-87-23 | Dec. 21, 1966 | Jan. 5, 1967 | 5,270 | 2,062 | Charlie Lake oil well. |
| 2127 | IOE Fina Rigel 10-25-88-17 | Mar. 13, 1967 | Mar. 22, 1967 | 3,744 | 3,744 | Dunlevy gas well. |
| 2074 | IOE Pac Inga 16-29-87-23 | Jan. 16, 1967 | Feb. 3, 1967 | 5,295 | 5,295 | Abandoned—dry. |
| 2190 | IOE Pac Inga 6-30-87-23 | Sept. 19, 1967 | Sept. 24, 1967 | 1,574 | 1,574 | Abandoned—dry. |
| 2169 | IOE Pac S Inga 6-19-87-23 | Aug. 9, 1967 | Aug. 24, 1967 | 5,215 | 5,215 | Charlie Lake oil well. |
| 2194 | IOE Pac S Inga A6-30-87-23 | Sept. 21, 1967 | Oct. 15, 1967 | 5,375 | 5,375 | Charlie Lake oil well. |
| 2159 | Jeff Lake et al Stoddart 10-25-86-20 | July 24, 1967 | Aug. 16, 1967 | 6,140 | 6,140 | Abandoned—dry. |
| 2115 | KCL et al Woodrush d-83-H | Feb. 27, 1967 | Mar. 7, 1967 | 3,701 | 3,701 | Halfway gas well. |
| 2017 | Kerr-McGee et al Sierra a-27-F | Dec. 15, 1966 | Feb. 3, 1967 | 7,600 | 4,670 | Abandoned—dry. |
| 2226 | KR et al E Bulrush d-95-F | Dec. 9, 1967 | Dec. 17, 1967 | 3,740 | 3,740 | Abandoned—dry. |
| 2077 | Mana et al Donis d-12-F | Jan. 23, 1967 | Feb. 1, 1967 | 3,850 | 3,850 | Abandoned. |
| 2204 | Mesa et al Altares d-93-G | Nov. 30, 1967 | | | 5,649 | Drilling. |
| 2186 | Mesa et al Dogrib a-69-I | Oct. 30, 1967 | Nov. 22, 1967 | 3,943 | 3,943 | Abandoned—junked. |
| 2222 | Mesa et al Dogrib a-A69-I | Nov. 23, 1967 | | | 5,955 | Drilling. |
| 2185 | Mesa et al Moose Lick b-8-K | Oct. 20, 1967 | Dec. 12, 1967 | 7,805 | 7,805 | Finished drilling. |
| 2160 | Mesa et al Prophet d-97-D | Aug. 17, 1967 | | | 9,598 | Drilling. |
| 2033 | Mesa et al Snow Worm d-79-E | Dec. 29, 1967 | Jan. 7, 1967 | 4,181 | 1,620 | Abandoned—dry. |
| 2201 | Mesa et al Wonowon b-10-F | Oct. 18, 1967 | Nov. 7, 1967 | 5,540 | 5,540 | Abandoned—dry. |
| 2134 | Monsanto Rigel 16-22-87-17 | Mar. 20, 1967 | Mar. 29, 1967 | 3,687 | 3,687 | Abandoned—dry. |
| 2049 | Mosbacher Cox BA Shell Klua a-37-F | Dec. 23, 1967 | Jan. 25, 1967 | 7,110 | 3,348 | Abandoned—dry. |
| 2233 | Mosbacher Cox Pacific Etsho d-79-E | Dec. 18, 1967 | | | 5,737 | Drilling. |
| 2250 | Pacific Alcon Parkland 7-27-81-16 | Dec. 30, 1967 | | | 657 | Drilling. |
| 2039 | Pacific Cabin b-64-B | Jan. 3, 1967 | Jan. 31, 1967 | 7,375 | 7,375 | Abandoned—dry. |
| 2058 | Pacific Cabin a-49-G | Jan. 6, 1967 | Feb. 7, 1967 | 7,308 | 7,308 | Slave Point gas well. |
| 2179 | Pacific et al Clarke a-A65-G | Aug. 31, 1967 | Sept. 15, 1967 | 2,340 | 2,340 | Water disposal. |

TABLE 24.—WELLS DRILLED AND DRILLING, 1967—*Continued*

| Well Authorization No. | Well Name | Date Spudded | Date Rig Released | Total Depth | 1967 Footage | Status at Dec. 31, 1967 |
|---|---|---|---|---|---|---|
| 2107 | Pacific et al Clarke c-20-I | Mar. 3, 1967 | Apr. 15, 1967 | 6,453 | 6,453 | Slave Point gas well. |
| 2106 | Pacific et al Clarke d-99-E | Feb. 20, 1967 | Apr. 2, 1967 | 7,340 | 7,340 | Abandoned—dry. |
| 2239 | Pacific et al Clarke c-43-J | Dec. 23, 1967 | ........ | —— | 2,300 | Drilling. |
| 2162 | Pacific et al Clarke b-46-J | Aug. 11, 1967 | Sept. 15, 1967 | 6,112 | 6,112 | Slave Point gas well. |
| 2100 | Pacific et al Clarke c-57-J | Feb. 13, 1967 | Mar. 9, 1967 | 7,056 | 7,056 | Abandoned—dry. |
| 2059 | Pacific et al Evie c-52-H | Jan. 9, 1967 | Feb. 27, 1967 | 7,895 | 7,895 | Abandoned. |
| 2138 | Pacific et al Ft St John 11-34-83-19 | Mar. 31, 1967 | Apr. 16, 1967 | 4,998 | 4,998 | Halfway gas well. |
| 2085 | Pacific et al Peejay b-48-E | Jan. 30, 1967 | Feb. 8, 1967 | 3,942 | 3,942 | Halfway oil well. |
| 2092 | Pacific et al Peejay b-49-E | Feb. 10, 1967 | Feb. 21, 1967 | 3,945 | 3,945 | Halfway oil well. |
| 2117 | Pacific et al Peejay b-69-E | Mar. 4, 1967 | Mar. 13, 1967 | 3,950 | 3,950 | Water injection. |
| 2135 | Pacific et al Peejay d-57-H | Mar. 20, 1967 | Mar. 29, 1967 | 3,955 | 3,955 | Halfway oil well. |
| 2219 | Pacific et al Peejay b-64-H | Nov. 14, 1967 | Nov. 21, 1967 | 3,950 | 3,950 | Water injection. |
| 2182 | Pacific et al Stoddart 10-35-85-19 | Oct. 28, 1967 | Nov. 17, 1967 | 6,204 | 6,204 | Finished drilling. |
| 2132 | Pacific et al Weasel d-92-J | Mar. 16, 1967 | Mar. 24, 1967 | 3,820 | 3,820 | Abandoned—dry. |
| 2240 | Pacific IMP Clarke b-69-L | Dec. 20, 1967 | ........ | ........ | 4,305 | Drilling. |
| 2171 | Pacific IMP Jedney d-19-B | Aug. 14, 1967 | Sept. 14, 1967 | 5,101 | 5,101 | Multiple Baldonnel-Halfway gas well. |
| 2252 | Pacific IOE Cache 13-16-86-22 | Dec. 29, 1967 | ........ | ........ | 570 | Drilling. |
| 2090 | Pacific Kathy c-52-E | Feb. 7, 1967 | Mar. 6, 1967 | 7,232 | 7,232 | Abandoned—dry. |
| 2097 | Pacific Kotcho b-86-K | Feb. 12, 1967 | Mar. 13, 1967 | 6,760 | 6,760 | Slave Point gas well. |
| 2202 | Pacific S Inga 6-8-87-23 | Oct. 18, 1967 | Nov. 6, 1967 | 5,542 | 5,542 | Charlie Lake oil well. |
| 2101 | Pacific SR CanDel Beaverdam d-71-I | Feb. 13, 1967 | Feb. 26, 1967 | 3,722 | 3,722 | Halfway gas well. |
| 2141 | Pacific SR CanDel Peejay d-58-H | June 5, 1967 | June 14, 1967 | 3,940 | 3,940 | Water injection. |
| 2170 | Pacific SR CanDel Peejay d-59-H | Aug. 16, 1967 | Aug. 26, 1967 | 3,966 | 3,966 | Abandoned—dry. |
| 2083 | Pacific SR CanDel Peejay d-72-H | Jan. 29, 1967 | Feb. 12, 1967 | 3,895 | 3,895 | Abandoned—dry. |
| 1987 | Pacific SR CanDel Peejay d-98-H | Feb. 15, 1967 | Feb. 25, 1967 | 3,894 | 3,894 | Halfway oil well. |
| 2172 | Pacific SR CanDel Peejay d-99-H | Aug. 28, 1967 | Sept. 7, 1967 | 3,919 | 3,919 | Halfway oil well. |
| 2084 | Pacific SR CanDel Weasel d-71-H | Jan. 31, 1967 | Feb. 9, 1967 | 3,810 | 3,810 | Abandoned—dry. |
| 2055 | Pacific SR CanDel Weasel d-82-J | Dec. 27, 1966 | Jan. 8, 1967 | 3,830 | 402 | Halfway oil well. |
| 2181 | Pacific SR CanDel Weasel d-95-J | Sept. 9, 1967 | Sept. 20, 1967 | 3,939 | 3,939 | Abandoned—dry. |
| 2196 | Pacific Sinclair Peejay b-50-E | Nov. 3, 1967 | Nov. 11, 1967 | 3.960 | 3,960 | Halfway oil well. |
| 2093 | Pacific Sinclair Peejay d-22-H | Feb. 23, 1967 | Mar. 4, 1967 | 3,993 | 3,993 | Water injection. |
| 2195 | Pacific Sinclair Peejay b-41-H | Oct. 20, 1967 | Nov. 1, 1967 | 3,958 | 3,958 | Halfway oil well. |
| 2038 | Pacific Sinclair Shekilie b-46-A | Dec. 23, 1966 | Feb. 3, 1967 | 6,690 | 3,289 | Slave Point gas well. |
| 2114 | Pacific Sinclair Weasel d-62-B | Feb. 28, 1967 | Mar. 8, 1967 | 3,731 | 3,731 | Abandoned—dry. |
| 2155 | Pacific Stoddart 11-2-86-19 | July 29, 1967 | Aug. 19, 1967 | 6,268 | 6,268 | Belloy gas well. |
| 2078 | Pacific Stoddart 6-10-86-19 | Jan. 24, 1967 | Feb. 22, 1967 | 6,155 | 6,155 | Belloy gas well. |
| 2217 | Pacific Tenaka b-7-C | Nov. 19, 1967 | Dec. 26, 1967 | 7,741 | 7,741 | Finished drilling. |
| 2173 | Pacific West Prod N Buick d-79-B | Aug. 14, 1967 | Aug. 25, 1967 | 3,877 | 3,877 | Abandoned—dry. |
| 2069 | Pacific West Prod N Buick a-81-C | Jan. 18, 1967 | Jan. 29, 1967 | 3,746 | 3,746 | Dunlevy gas well. |
| 2087 | Pacific West Prod N Buick b-82-C | Feb. 1, 1967 | Feb. 14, 1967 | 3,800 | 3,800 | Abandoned—dry. |
| 2161 | Pacific West Prod N Buick c-14-F | July 27, 1967 | Aug. 6, 1967 | 3,793 | 3,793 | Abandoned—dry. |
| 2016 | Pac West Prod Stoddart 11-7-86-19 | Nov. 28, 1966 | Jan. 1, 1967 | 6,445 | ........ | Abandoned—dry. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2035 | Pacific Yoyo d-7-L | Dec. 22, 1967 | Feb. 6, 1967 | 7,328 | 5,313 | Slave Point-Sulphur Point gas well. |
| 2116 | Pan Am Beaver c-45-K | Mar. 12, 1967 | Dec. 20, 1967 | 14,732 | 14,732 | Nahanni gas well. |
| 2205 | Pan Am Coplin 6-33-85-23 | Oct. 23, 1967 | Nov. 20, 1967 | 5,333 | 5,333 | Abandoned—dry. |
| 2237 | Pan Am Coplin 6-9-86-23 | Dec. 23, 1967 | | | 3,990 | Drilling. |
| 2188 | Pan Am Coplin 6-19-86-23 | Sept. 17, 1967 | Oct. 19, 1967 | 5,670 | 5,670 | Charlie Lake oil well. |
| 2211 | Pan Am W Coplin 16-12-86-24 | Oct. 28, 1967 | Nov. 18, 1967 | 5,647 | 5,647 | Abandoned—dry. |
| 2187 | Pan Am IOE Beaverskin d-86-F | Sept. 23, 1967 | Nov. 5, 1967 | 7,950 | 7,950 | Abandoned—dry. |
| 2256 | Pan Am Nettle d-93-B | Dec. 31, 1967 | | | 430 | Drilling. |
| 2150 | Pan Am Sheep c-86-D | July 2, 1967 | Nov. 20, 1967 | 10,307 | 10,307 | Abandoned—dry. |
| 2102 | Placid Frontier Komie a-23-L | Feb. 16, 1967 | Mar. 30, 1967 | 8,540 | 8,540 | Abandoned—dry. |
| 1895 | Placid Frontier Yoyo d-A15-I | Feb. 7, 1966 | Mar. 23, 1967 | 7,676 | 5,980 | Pine Point gas well, whipstocked hole. |
| 2110 | ROCK Pan Am Shekilie d-73-K | Feb. 24, 1967 | Apr. 3, 1967 | 6,618 | 6,618 | Mississippian gas well. |
| 2193 | Scurry N Valley Lower Post d-32-D | Sept. 20, 1967 | Nov. 27, 1967 | 4,626 | 4,626 | Abandoned—dry. |
| 2153 | Shell Anglo Pluto a-37-L | Aug. 11, 1967 | Oct. 12, 1967 | 12,225 | 12,225 | Abandoned—dry. |
| 2140 | Shell Anglo Prometheus d-43-G | June 11, 1967 | Aug. 8, 1967 | 7,662 | 7,662 | Abandoned—dry. |
| 2210 | Shell Anglo Zeus b-93-G | Nov. 9, 1967 | | | 7,989 | Drilling. |
| 2131 | Shell Hudsons Bay Schooler b-77-B | Mar. 17, 1967 | Oct. 11, 1967 | 11,470 | 12,951 | Abandoned—dry. Whipstocked hole. |
| 2213 | Shenandoah et al Coplin 6-17-86-23 | Nov. 2, 1967 | Nov. 25, 1967 | 5,510 | 5,510 | Charlie Lake oil well. |
| 1814 | Socony Mobil S Sierra a-98-K | Jan. 7, 1966 | Feb. 1, 1967 | 7,648 | 1,958 | Pine Point gas well, whipstocked hole; suspended 27-3-66 to 6-12-66. |
| 2019 | TGS et al Moberly 10-15-82-22 | Dec. 5, 1966 | Jan. 5, 1967 | 5,092 | | Finished drilling. |
| 2230 | TGS Falls c-32-F | Dec. 11, 1967 | | | 4,942 | Drilling. |
| 2168 | TGS Falls b-39-G | Aug. 11, 1967 | Nov. 24, 1967 | 10,500 | 10,500 | Abandoned—dry. |
| 2066 | Tenn FPC Tooga d-18-K | Jan. 7, 1967 | Feb. 6, 1967 | 6,541 | 6,541 | Slave Point gas well. |
| 2079 | Tenn Cdn-Sup et al Inga 6-6-88-23 | Jan. 21, 1967 | Feb. 4, 1967 | 5,416 | 5,416 | Charlie Lake gas well. |
| 2081 | Tenn Cdn-Sup et al Inga 16-6-88-23 | Feb. 20, 1967 | Mar. 5, 1967 | 5,245 | 5,245 | Charlie Lake oil well. |
| 2047 | Tenn Cdn-Sup et al Inga 6-18-88-23 | Feb. 5, 1967 | Feb. 17, 1967 | 5,512 | 5,512 | Charlie Lake oil well. |
| 2021 | Tenn Cdn-Sup et al Inga 16-18-88-23 | Jan. 2, 1967 | Jan. 18, 1967 | 5,419 | 5,419 | Charlie Lake oil well. |
| 2022 | Tenn Cdn-Sup et al Inga 16-19-88-23 | Feb. 6, 1967 | Feb. 18, 1967 | 5,328 | 5,328 | Charlie Lake oil well. |
| 2045 | Tenn Cdn-Sup et al Inga 6-25-88-24 | Dec. 31, 1966 | Jan. 13, 1967 | 5,280 | 5,172 | Charlie Lake oil well. |
| 2075 | Tenn Cdn-Sup et al Inga d-8-J | Jan. 16, 1967 | Feb. 2, 1967 | 5,300 | 5,300 | Abandoned—dry. |
| 2128 | Tenn IOE Peejay d-90-H | Mar. 13, 1967 | Mar. 19, 1967 | 3,950 | 3,950 | Abandoned—dry. |
| 2158 | Tenn Jedney d-59-F | July 22, 1967 | Aug. 24, 1967 | 4,331 | 4,331 | Abandoned—junked. |
| 2151 | Tenn S Inga 16-36-86-24 | July 10, 1967 | July 22, 1967 | 5,485 | 5,485 | Charlie Lake oil well. |
| 2192 | Tenn S Inga 6-6-87-23 | Sept. 22, 1967 | Oct. 2, 1967 | 5,147 | 5,147 | Abandoned—dry. |
| 2180 | Tenn S Inga 16-6-87-23 | Sept. 5, 1967 | Sept. 18, 1967 | 5,355 | 5,355 | Charlie Lake oil well. |
| 2145 | Tenn S Inga 6-7-87-23 | June 14, 1967 | July 2, 1967 | 5,514 | 5,514 | Charlie Lake oil well. |
| 2122 | Tenn S Inga 16-7-87-23 | Mar. 8, 1967 | Mar. 25, 1967 | 6,024 | 6,024 | Charlie Lake oil well. |
| 2156 | Tenn S Inga 16-12-87-24 | July 24, 1967 | Aug. 3, 1967 | 5,296 | 5,296 | Charlie Lake gas well. |
| 2167 | Tenn S Inga 6-13-87-24 | Aug. 5, 1967 | Aug. 15, 1967 | 5,059 | 5,059 | Abandoned—dry. |
| 2105 | Tenn Uno-Tex McD Kotcho a-25-J | Feb. 18, 1967 | Apr. 9, 1967 | 8,003 | 9,892 | Abandoned—dry. Whipstocked hole. |
| 2109 | Tenn Wildmint d-92-I | Feb. 26, 1967 | Mar. 3, 1967 | 3,700 | 3,700 | Abandoned—dry. |
| 2221 | Texaco Bernadet 6-28-87-24 | Dec. 4, 1967 | | | 5,958 | Drilling. |
| 2248 | Texaco NFA W Boundary 6-36-85-15 | Dec. 28, 1967 | | | 3,876 | Drilling. |
| 2207 | Texaco NFA Buick a-29-J | Oct. 24, 1967 | Nov. 10, 1967 | 4,400 | 4,400 | Abandoned—dry. |
| 2174 | Texaco NFA N Buick d-91-C | Aug. 26, 1967 | Sept. 4, 1967 | 3,765 | 3,765 | Dunlevy gas well. |
| 2080 | Texaco NFA S Currant a-81-K | Jan. 24, 1967 | Feb. 4, 1967 | 4,085 | 4,085 | Abandoned—dry. |

TABLE 24.—WELLS DRILLED AND DRILLING, 1967—*Continued*

| Well Authorization No. | Well Name | Date Spudded | Date Rig Released | Total Depth | 1967 Footage | Status at Dec. 31, 1967 |
|---|---|---|---|---|---|---|
| 2232 | Texaco NFA Missle d-54-A | Dec. 14, 1967 | | | 2,400 | Drilling. |
| 2152 | Texaco NFA Nig d-87-A | July 11, 1967 | July 25, 1967 | 4,435 | 4,435 | Baldonnel gas well. |
| 2157 | Texaco NFA Nig d-33-B | July 28, 1967 | Aug. 13, 1967 | 4,390 | 4,390 | Baldonnel gas well. |
| 2178 | Texaco NFA Nig c-14-G | Sept. 9, 1967 | Sept. 22, 1967 | 4,420 | 4,420 | Baldonnel gas well. |
| 2209 | Texaco S Inga 16-25-87-24 | Oct. 27, 1967 | Nov. 18, 1967 | 5,490 | 5,490 | Charlie Lake oil well. |
| 2208 | Texaco Texcan Coplin 16-21-85-23 | Oct. 27, 1967 | Nov. 30, 1967 | 5,301 | 5,301 | Charlie Lake oil well. |
| 2042 | Texcan Donis d-55-E | Dec. 23, 1966 | Jan. 6, 1967 | 3,990 | 140 | Abandoned—dry. |
| 2032 | Texcan Fox b-26-D | Jan. 7, 1967 | Jan. 21, 1967 | 4,094 | 4,094 | Finished drilling. |
| 2123 | Triad Beatton d-19-J | Mar. 10, 1967 | Mar. 20, 1967 | 3,800 | 3,800 | Halfway oil well. |
| 2136 | Triad Beatton b-29-J | Mar. 21, 1967 | Mar. 28, 1967 | 3,800 | 3,800 | Water injection. |
| 2129 | Triad Beatton c-43-K | Mar. 15, 1967 | Mar. 24, 1967 | 3,690 | 3,690 | Abandoned—dry. |
| 1939 | Triad BP Sukunka b-10-A | July 30, 1966 | Apr. 27, 1967 | 11,693 | 5,582 | Abandoned—dry. Whipstocked hole. |
| 2228 | Triad BPX IOE S Taylor 8-18-82-16 | Dec. 9, 1967 | | | 2,386 | Drilling. |
| 2104 | Triad CIGOL Conroy d-77-H | Feb. 26, 1967 | Mar. 10, 1967 | 3,450 | 3,450 | Abandoned—dry. |
| 2124 | Triad Milligan b-86-G | Mar. 11, 1967 | Mar. 21, 1967 | 3,800 | 3,800 | Abandoned—dry. |
| 2060 | Union ARCo Firebird d-43-D | Jan. 11, 1967 | Jan. 26, 1967 | 4,000 | 4,000 | Baldonnel gas well. |
| 2113 | Union et al Beaverdam d-76-L | Mar. 4, 1967 | Mar. 13, 1967 | 3,785 | 3,785 | Abandoned—dry. |
| 2044 | Union et al Big Arrow d-72-E | Dec. 26, 1966 | Jan. 8, 1967 | 3,960 | 636 | Abandoned—dry. |
| 2096 | Union et al Crush d-28-F | Feb. 15, 1967 | Feb. 23, 1967 | 3,930 | 3,930 | Halfway oil well. |
| 2164 | Union et al Peejay b-98-C | Nov. 13, 1967 | Nov. 22, 1967 | 3,940 | 3,940 | Halfway oil well. |
| 2051 | Union et al Skwat d-30-B | Dec. 31, 1966 | Jan. 9, 1967 | 3,670 | 3,153 | Abandoned—dry. |
| 2238 | Union HB Crush d-60-F | Dec. 17, 1967 | Dec. 24, 1967 | 3,850 | 3,850 | Abandoned—dry. |
| 2235 | Union HB Doig d-33-D | Dec. 20, 1967 | | | 4,003 | Drilling. |
| 2088 | Union HB E Milligan a-60-H | Feb. 7, 1967 | Feb. 13, 1967 | 3,730 | 3,730 | Abandoned—dry. |
| 2121 | Union HB et al Snowberry d-60-D | Mar. 4, 1967 | Mar. 12, 1967 | 3,725 | 3,725 | Abandoned—dry. |
| 2253 | Union HB Sinclair Crush d-38-F | Dec. 28, 1967 | | | 3,452 | Drilling. |
| 2214 | Union HB Sinclair Crush d-39-F | Oct. 31, 1967 | Nov. 12, 1967 | 3,903 | 3,903 | Halfway oil well. |
| 2220 | Union HB Sinc Crush d-49-F | Dec. 4, 1967 | Dec. 13, 1967 | 3,902 | 3,902 | Finished drilling. |
| 2030 | Union HB Snowberry d-50-D | Jan. 11, 1967 | Jan. 19, 1967 | 3,680 | 3,680 | Abandoned—dry. |
| 2027 | Union HB Wildmint d-67-A | Jan. 20, 1967 | Jan. 27, 1967 | 3,833 | 3,833 | Abandoned—dry. |
| 2218 | Uno-Tex et al Stoddart 6-31-85-19 | Nov. 14, 1967 | Dec. 6, 1967 | 6,515 | 6,515 | Finished drilling. |
| 2229 | Uno-Tex et al Yoyo c-34-I | Dec. 13, 1967 | | | 5,005 | Drilling. |
| 2236 | UOHL Cabin d-17-G | Dec. 18, 1967 | | | 5,683 | Drilling. |
| 2130 | West Dec Teck Bercli b-64-G | Mar. 16, 1967 | Mar. 27, 1967 | 4,055 | 4,055 | Abandoned—dry. |
| 2147 | West Nat et al Blueberry d-6-D | July 5, 1967 | Aug. 12, 1967 | 5,347 | 5,347 | Abandoned—dry. |
| 2146 | West Nat et al Blueberry d-38-K | Aug. 6, 1967 | Aug. 31, 1967 | 5,230 | 5,230 | Dunlevy gas. |
| 2212 | West Nat et al Inga 14-4-88-23 | Nov. 9, 1967 | Nov. 25, 1967 | 5,436 | 5,436 | Charlie Lake oil well. |
| 2050 | West Nat et al Inga 16-4-88-23 | Dec. 26, 1966 | Jan. 15, 1967 | 5,195 | 3,860 | Abandoned—dry. |
| 2183 | West Nat et al Inga 6-9-88-23 | Sept. 15, 1967 | Oct. 2, 1967 | 5,375 | 5,375 | Charlie Lake oil well. |
| 2070 | West Nat et al Inga 6-11-88-23 | Jan. 11, 1967 | | | 525 | Suspended. |
| 2037 | West Nat et al Inga 16-2-88-24 | Dec. 16, 1966 | Jan. 8, 1967 | 5,560 | 103 | Abandoned—dry. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2166 | West Nat et al S Inga 16-35-86-24 | Aug. 4, 1967 | Aug. 25, 1967 | 5,106 | 5,106 | Charlie Lake oil well. |
| 2148 | West Nat et al Lookout d-84-K | July 31, 1967 | Aug. 21, 1967 | 5,290 | 5,290 | Abandoned—dry. |
| 2244 | Whitehall ARCo Nig a-87-J | Dec. 24, 1967 | — | — | 3,654 | Drilling. |
| 2011 | Whitehall Cdn Sup Cameron c-76-L | Nov. 19, 1966 | Feb. 27, 1967 | 7,505 | 2,819 | Abandoned—dry. Whipstocked hole. |
| 2224 | Whitehall CTO S Inga 16-25-86-24 | Dec. 6, 1967 | Dec. 25, 1967 | 5,483 | 5,483 | Finished drilling. |
| 2012 | Whitehall Numac Nig a-49-J | Nov. 17, 1966 | Nov. 29, 1967 | 6,254 | 1,852 | Baldonnel gas well; hole deepened 7-11-67 to 29-11-67. |

## Table 25.—Oilfields and Gasfields Designated as at December 31, 1967

| Field | Date Designated | Date(s) Revised | Field Location | Pool(s) | Number of Wells Capable of Production | Discovery Well(s) | Pool(s) Discovered |
|---|---|---|---|---|---|---|---|
| Aitken Creek | Feb. 15, 1960 | Jan. 1, 1961<br>Oct. 1, 1963 | N.T.S. 94-A-13 | 3 | 8 | Union Aitken Creek b-42-L, oil<br>Union Aitken Creek a-53-L, gas | 3<br>3 |
| Beatton River | Aug. 7, 1959 | Jan. 1, 1962 | N.T.S. 94-H-2 | 9 | 13 | Triad Beatton River b-38-J, oil<br>Triad Beatton d-60-J, gas | 9<br>9 |
| Beatton River West | Aug. 7, 1959 | Jan. 1, 1962<br>Oct. 1, 1964 | N.T.S. 94-H-2 | 2 | 9 | Triad West Beatton River d-39-K, oil | 2 |
| Beaverdam | Apr. 1, 1966 | ——— | N.T.S. 94-A-16 | 9 | 3 | Tenn Beaverdam d-38-L, oil<br>Tenn Sun Beaverdam d-37-L, gas | 9<br>9 |
| Beg | July 1, 1961 | Jan. 1, 1962<br>Apr. 1, 1962<br>July 1, 1962<br>Apr. 1, 1963<br>Apr. 1, 1964 | N.T.S. 94-B-16, 94-G-1, 94-G-8 | 6, 9 | 33 | Pacific et al Beg b-17-K, gas<br>Pacific et al Beg d-10-G, gas | 6<br>9 |
| Beg West | Apr. 1, 1962 | Oct. 1, 1963 | N.T.S. 94-G-1 | 6 | 3 | Pacific et al W Beg a-79-F, gas | 6 |
| Bernadet | Oct. 1, 1963 | ——— | Tp. 87, 88, R. 24, 25, W. of 6th M. | 2 | 1 | West Nat et al Bernadet 8-1-88-25, gas | 2 |
| Blueberry | Feb. 7, 1958 | Dec. 22, 1958<br>Feb. 15, 1960<br>May 27, 1960<br>Oct. 1, 1961<br>Jan. 1, 1963 | N.T.S. 94-A-12, 94-A-13<br>Tp. 88, R. 25, W. of 6th M. | 5, 6, 7, 11 | 32 | West Nat et al Blueberry c-32-D (2), gas<br>West Nat et al Blueberry d-87-D (1), gas<br>West Nat et al Blueberry a-61-L, gas<br>West Nat et al Blueberry d-82-L (11), oil | 5<br>6<br>7<br>11 |
| Blueberry East | Dec. 22, 1958 | ——— | N.T.S. 94-A-13 | 6, 9, 11 | 2 | West Nat et al E Blueberry b-38-C (7), gas<br>West Nat et al E Blueberry b-36-C (17), gas | 6, 9<br>11 |
| Blueberry West | Feb. 7, 1958 | July 1, 1961 | N.T.S. 94-A-12, 94-B-9, 94-B-16<br>Tp. 88, R. 25, W. of 6th M. | 5, 6 | 3 | West Nat et al W Blueberry d-82-L (9), gas<br>West Nat et al W Blueberry d-19-L (12), gas | 5<br>6 |
| Boundary Lake | Oct. 30, 1956 | Feb. 7, 1958<br>Aug. 7, 1959<br>Feb. 15, 1960<br>Jan. 1, 1961<br>Apr. 1, 1961<br>July 1, 1961<br>Jan. 1, 1962<br>Apr. 1, 1962<br>Oct. 1, 1963<br>Oct. 1, 1964<br>Jan. 1, 1965<br>Oct. 1, 1965<br>Jan. 1, 1966<br>Apr. 1, 1966 | Tp. 84, 85, 86, 87, R. 13, W. of 6th M.<br>Tp. 83, 84, 85, 86, R. 14, W. of 6th M.<br>Tp. 84, R. 15, W. of 6th M. | 2, 3, 5, 6, 7, 8, 9 | 265 | Pacific Boundary 8-15-85-14<br>Pacific Boundary 12-10-85-14, gas<br>Amerada Boundary 8-5-85-14, gas<br>Texaco NFA Boundary L 6-6-85-14 (1), oil<br>Sun Boundary Lake 6-23-85-14, oil<br>Texaco NFA Boundary 16-31-86-13, gas | 2, 6<br>3<br>5<br>8<br>9<br>9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Boundary Lake North | Jan. 1, 1965 | Apr. 1, 1966 | Tp. 87, R. 14, W. of 6th M. | 9 | 4 | Texaco NFA N Boundary 7-3-87-14, gas | 9 |
| Bubbles | Nov. 24, 1959 | Feb. 15, 1960<br>May 27, 1960<br>Jan. 1, 1961 | N.T.S. 94-G-1, 94-G-8, 94-H-4 | 6 | 13 | Pacific Imperial Bubbles b-33-I, gas | 6 |
| Buick Creek | Feb. 7, 1958 | Aug. 7, 1959<br>Jan. 1, 1961<br>July 1, 1961<br>Oct. 1, 1961<br>Jan. 1, 1963<br>July 1, 1963<br>Oct. 1, 1963<br>Jan. 1, 1965 | N.T.S. 94-A-11, 94-A-14 | 5, 7 | 20 | Texaco NFA Buick Creek d-98-I (1), gas<br>Texaco NFA Buick Creek d-83-J (4), gas | 5<br>7 |
| Buick Creek East | Jan. 1, 1963 | Apr. 1, 1963<br>Oct. 1, 1963<br>July 1, 1964<br>Jan. 1, 1965 | N.T.S. 94-A-10, 94-A-11, 94-A-14, 94-A-15 | 2, 5 | 13 | Texaco NFA E Buick c-80-D, gas<br>Decalta et al E Buick c-74-A, oil<br>Texaco NFA E Buick a-31-A, gas | 2<br>5<br>5 |
| Buick Creek North | Apr. 1, 1967 | ———— | N.T.S. 94-A-14 | 5 | 6 | Pacific West Prod N Buick c-22-F, gas | 5 |
| Buick Creek West | Feb. 7, 1958 | Jan. 6, 1959<br>Feb. 15, 1960<br>Jan. 1, 1963 | N.T.S. 94-A-11, 94-A-14 | 3, 5, 6, 9 | 15 | Pacific West Buick Creek c-2-E (6), gas<br>Pacific W Buick Creek c-83-K (13A), oil<br>Pacific West Buick Creek b-78-C (2), gas<br>Pacific West Buick Creek d-58-C (8), gas<br>Pacific West Buick Creek b-23-E (1), gas | 3<br>5<br>5<br>6<br>9 |
| Bulrush | July 1, 1964 | Apr. 1, 1965 | N.T.S. 94-A-16 | 9 | 14 | Union HB Sinclair Bulrush d-78-F, oil<br>Union HB Sinc Pac Bulrush d-9-K, gas | 9<br>9 |
| Bulrush East | Apr. 1, 1967 | ———— | N.T.S. 94-A-16 | 9 | 1 | Dome Provo Co-op E Bulrush d-5-K, oil | 9 |
| Charlie Lake | Jan. 1, 1961 | ———— | Tp. 84, R. 18, W. of 6th M. | 3 | 1 | Imp Pac Charlie 13-5-84-14, oil | 3 |
| Clarke Lake | Feb. 15, 1960 | May 27, 1960<br>Jan. 1, 1961<br>Apr. 1, 1962<br>Apr. 1, 1965<br>Apr. 1, 1966<br>Jan. 1, 1967<br>Apr. 1, 1967<br>July 1, 1967 | N.T.S. 94-J-9, 94-J-10, 94-J-15, 94-J-16 | 13 | 23 | West Nat et al Clarke Lake c-47-J, gas | 13 |
| Currant | Oct. 1, 1965 | ———— | N.T.S. 94-A-9, 94-A-16 | 9 | 11 | Sinclair et al Currant d-17-C, oil<br>Union HB Sinc Pac Currant d-37-C, gas | 9<br>9 |
| Dawson Creek | Feb. 7, 1958 | ———— | Tp. 79, R. 15, W. of 6th M. | 1 | 1 | Pacific Sc Dawson Ck 1-15-79-15 (1), gas | 1 |
| Fort St. John | Aug. 22, 1965 | Feb. 7, 1958<br>Feb. 15, 1960<br>Jan. 1, 1961 | Tp. 83, R. 18, W. of 6th M. | 4, 6, 7, 9, 10 | 28 | Pacific Ft St John A3-29-83-18 (31), gas<br>Pacific Ft St John 14-15-83-18 (7), gas<br>Pacific Ft St John 3-14-83-18 (9), oil<br>Pacific Ft St John 1-20-83-18 (30), gas<br>Imp Pac Ft St John 9-19-83-18 (45), oil<br>Pacific Ft St John 14-21-83-18 (4), gas | 4<br>6<br>7<br>9<br>10<br>10 |
| Fort St. John Southeast | Feb. 7, 1958 | ———— | Tp. 82, 83, R. 17, W. of 6th M. | 4, 6, 9, 10 | 15 | Pac Ft St John SE 10-31-82-17 (80), gas<br>Pac Ft St John SE A4-10-83-17 (55), gas<br>Pac Ft St John SE 10-33-82-17 (22), gas<br>Pac Ft St John SE 4-10-83-17 (12), gas | 4<br>6<br>9<br>10 |

TABLE 25.—OILFIELDS AND GASFIELDS DESIGNATED AS AT DECEMBER 31, 1967—*Continued*

| Field | Date Designated | Date(s) Revised | Field Location | Pool(s) | Number of Wells Capable of Production | Discovery Well(s) | Pool(s) Discovered |
|---|---|---|---|---|---|---|---|
| Gundy Creek | Feb. 7, 1958 | Jan. 6, 1959 | N.T.S. 94-B-16 | 6 | 4 | West Nat Gundy Creek c-80-A, gas | 6 |
| Halfway | Dec. 22, 1958 | | Tp. 86, 87, R. 25, W. of 6th M. | 6, 9 | 3 | West Nat et al Halfway 5-1-87-25, gas<br>West Nat et al Halfway 8-11-87-25, gas | 6<br>9 |
| Highway | Feb. 7, 1958 | | N.T.S. 94-B-16 | 5, 6, 11 | 4 | West Nat et al Highway b-3-I, gas<br>Pacific Highway b-25-I (1), gas<br>Pacific Highway a-90-I (4), gas | 5<br>6<br>11 |
| Inga | Jan. 1, 1967 | | Tp. 87, 88, R. 23, 24, W. of 6th M.<br>N.T.S. 94-A-12 | 7 | 30 | Tenn Cdn-Sup et al Inga 13-7-88-23 | 7 |
| Jedney | Aug. 7, 1959 | Nov. 24, 1959<br>Feb. 15, 1960<br>Jan. 1, 1961<br>Apr. 1, 1961<br>Apr. 1, 1963<br>Oct. 1, 1963 | N.T.S. 94-G-1, 94-G-8 | 3, 6, 9 | 46 | Pacific Pan Am Dome Jedney c-8-F, gas<br>Pacific et al Jedney b-88-J, gas<br>Pacific Imp Jedney d-99-J, gas | 3<br>6<br>9 |
| Jedney West | July 1, 1964 | | N.T.S. 94-G-1, 94-G-8 | 6, 9 | 3 | Pacific et al W Jedney b-84-K, gas | 6, 9 |
| Kobes-Townsend | Dec. 22, 1958 | Feb. 15, 1960 | N.T.S. 94-B-8, 94-B-9 | 5, 7, 9, 11 | 12 | Pacific Kobes a-3-A (4), gas<br>Pacific Kobes d-94-I (1), gas<br>Pacific Townsend a-20-H (A-1), gas | 5<br>7, 9<br>11 |
| Kotcho Lake | Apr. 1, 1962 | Apr. 1, 1967 | N.T.S. 94-I-14, N.T.S. 94-P-3 | 13 | 6 | West Nat Kotcho Lake c-67-K, gas | 13 |
| Laprise Creek | Feb. 15, 1960 | Jan. 1, 1961<br>Apr. 1, 1961<br>Apr. 1, 1963<br>Jan. 1, 1964<br>Apr. 1, 1964 | N.T.S. 94-G-8, 94-H-4, 94-H-5 | 6 | 41 | Dome Basco Laprise Ck a-35-H, gas | 6 |
| Laprise Creek West | July 1, 1962 | | N.T.S. 94-G-8 | 6 | 2 | Dome CDP C&E W Laprise c-82-G, gas | 6 |
| Milligan Creek | Feb. 7, 1958 | Aug. 7, 1959<br>Feb. 15, 1960<br>Jan. 1, 1961<br>Apr. 1, 1962<br>July 1, 1963 | N.T.S. 94-H-2 | 9 | 23 | Union HB Milligan Creek d-73-G, oil<br>Whitehall et al Milligan d-75-G, gas | 9<br>9 |
| Montney | Feb. 7, 1958 | Jan. 6, 1959<br>Jan. 1, 1962 | Tp. 87, R. 18, W. of 6th M.<br>Tp. 86, 87, R. 19, W. of 6th M. | 2, 7, 9 | 4 | Pac Sunray Montney 16-32-86-19 (3), gas<br>Pac Sunray Montney 14-36-86-19 (2), gas<br>Pac Sunray Montney 14-31-86-19 (5), gas | 2<br>7<br>9 |
| Nettle | Apr. 1, 1966 | | N.T.S. 94-H-7 | 2 | 5 | Union KCL ROC Nettle d-67-A, oil<br>Union KCL ROC Nettle d-58-A, gas | 2<br>9 |
| Nig Creek | Aug. 7, 1959 | Feb. 15, 1960<br>Jan. 1, 1961<br>Apr. 1, 1961<br>Jan. 1, 1962<br>Apr. 1, 1962<br>Apr. 1, 1965 | N.T.S. 94-A-13, 94-H-4 | 6 | 32 | Texaco NFA Nig Creek a-79-B (1), gas | 6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Osprey | Apr. 1, 1966 | July 1, 1965<br>Apr. 1, 1966 | N.T.S. 94-A-15 | 9 | 2 | Pacific SR CanDel Osprey d-4-J, oil | 9 |
| Parkland | Feb. 7, 1958 | July 1, 1963 | Tp. 81, R. 15, W. of 6th M. | 12 | 2 | Pacific Imp Parkland 6-29-81-15, gas | 12 |
| Peejay | Feb. 15, 1960 | May 27, 1960<br>Jan. 1, 1961<br>Jan. 1, 1962<br>Apr. 1, 1962<br>July 1, 1965<br>Oct. 1, 1965<br>Jan. 1, 1966<br>Apr. 1, 1966<br>July 1, 1966<br>Oct. 1, 1966<br>Apr. 1, 1967<br>July 1, 1967 | N.T.S. 94-A-15, 94-A-16 | 9 | 112 | Pacific Sinclair Peejay d-39-E (B8-3), oil<br>Pacific SR West Cdn Peejay d-52-I, gas | 9<br>9 |
| Peejay West | Jan. 1, 1963 | | N.T.S. 94-A-15 | 9 | 2 | Pacific SR West Cdn W Peejay d-54-G, oil | 9 |
| Petitot River | Apr. 1, 1961 | | N.T.S. 94-P-12, 94-P-13 | 13 | 3 | West Nat Petitot River d-24-D, gas | 13 |
| Red Creek | Feb. 7, 1958 | Aug. 7, 1959<br>Feb. 15, 1960 | Tp. 85, R. 21, W. of 6th M. | 7, 9 | 2 | Pacific Red Creek 5-27-85-21 (36), gas | 7, 9 |
| Rigel | Oct. 1, 1962 | Jan. 1, 1963<br>Apr. 1, 1963<br>Jan. 1, 1964<br>Oct. 1, 1964<br>Oct. 1, 1965<br>Jan. 1, 1967<br>July 1, 1967 | N.T.S. 94-A-10<br>Tp. 87, 88, R. 16, W. of 6th M.<br>Tp. 87, 88, R. 17, W. of 6th M.<br>Tp. 88, R. 18, W. of 6th M.<br>Tp. 88, R. 19, W. of 6th M.<br>Tp. 88, R. 12, W. of 6th M. | 5 | 40 | Monsanto Rigel 6-13-87-17, oil<br>Imp Fina Rigel 4-27-88-17, gas | 5<br>5 |
| Stoddart | Jan. 6, 1959 | Feb. 15, 1960<br>Apr. 1, 1965<br>Jan. 1, 1966<br>Apr. 1, 1967 | Tp. 86, R. 19, 20, W. of 6th M.<br>Tp. 85, R. 20, W. of 6th M. | 10<br>10 | 6<br>13 | Pacific Stoddart 4-24-86-20 (85), gas | 10 |
| Stoddart West | Apr. 1, 1964 | | Tp. 86, R. 20, W. of 6th M. | 10 | 1 | Pacific W Stoddart 11-10-86-20, gas | 10 |
| Weasel | Apr. 1, 1966 | Apr. 1, 1967 | N.T.S. 94-H-2, 94-A-15 | 9 | 26 | Tenn Ashland Weasel d-35-B, oil<br>Pacific Sinclair Weasel d-50-A, gas | 9<br>9 |
| Wildmint | Jan. 1, 1962 | July 1, 1962<br>Jan. 1, 1963<br>Apr. 1, 1964<br>Jan. 1, 1966 | N.T.S. 94-A-15, 94-H-2 | 9 | 29 | Union HB Wildmint d-46-A, oil<br>Tenn Wildmint d-4-A, gas | 9<br>9 |
| Willow | July 1, 1963 | | N.T.S. 94-H-2 | 2, 9 | 3 | Union HB Willow d-20-H, oil<br>Union HB Willow b-10-H, gas | 2<br>9 |
| Wolf | Apr. 1, 1967 | | N.T.S. 94-H-15 | 9 | 5 | Baysel Sinclair Wolf d-93-B, oil | 9 |
| Yoyo | Apr. 1, 1965 | Apr. 1, 1967 | N.T.S. 94-I-13, 94-I-14 | 14 | 4 | West Nat et al Yoyo b-24-L, gas | 14 |

Numerical list of pools:—

1. Lower Cretaceous Cadotte sandstone.
2. Lower Cretaceous Bluesky-Gething sandstone.
3. Lower Cretaceous Gething sandstone.
4. Lower Cretaceous Cadomin sandstone.
5. Lower Cretaceous Dunlevy sandstone.
6. Triassic Baldonnel carbonate (includes Baldonnel A and B of Fort St. John area).
7. Triassic Charlie Lake sandstone and carbonate.
8. Triassic Boundary Lake carbonate.
9. Triassic Halfway sandstone.
10. Permian Belloy carbonate.
11. Mississippian Rundle carbonate.
12. Upper Devonian Wabamun carbonate.
13. Middle Devonian Slave Point carbonate.
14. Middle Devonian Pine Point carbonate.

## Table 26.—Number of Producing and Producible Wells at December 31, 1967[1]

| Field and Pool | Oil Wells | | Natural-gas Wells | |
|---|---|---|---|---|
| | Producing | Producible | Producing | Producible |
| Aitken Creek field—Gething | 5 | 5 | 2 | 3 |
| Beatton River field—Halfway | 9 | 12 | — | 1 |
| Beatton River West field—Bluesky-Gething | 6 | 9 | — | — |
| Beaverdam field—Halfway | — | 1 | — | 2 |
| Beg field— | | | | |
| Baldonnel | — | — | 12 | 17 |
| Halfway | — | — | 12 | 16 |
| Field totals | — | — | 24 | 33 |
| Beg West field—Baldonnel | — | — | 2 | 3 |
| Bernadet field—Bluesky-Gething | — | — | 1 | 1 |
| Blueberry field— | | | | |
| Dunlevy | — | — | 3 | 6 |
| Baldonnel | — | — | 2 | 4 |
| Charlie Lake | — | — | — | 2 |
| Halfway | — | — | — | 1 |
| Mississippian | 19 | 19 | — | — |
| Field totals | 19 | 19 | 5 | 13 |
| Blueberry East field— | | | | |
| Baldonnel | — | — | — | 1 |
| Halfway | — | — | — | — |
| Mississippian | — | — | — | 1 |
| Field totals | — | — | — | 2 |
| Blueberry West field— | | | | |
| Dunlevy | — | — | 2 | 2 |
| Baldonnel | — | — | — | 1 |
| Field totals | — | — | 2 | 3 |
| Boundary Lake field— | | | | |
| Bluesky-Gething | — | — | — | 2 |
| Gething | — | — | 1 | 2 |
| Cadomin | — | 1 | — | — |
| Dunlevy | — | — | — | 1 |
| Baldonnel | — | — | 3 | 6 |
| Boundary Lake | 228 | 243 | — | — |
| Basal Boundary Lake | — | — | 1 | 1 |
| Halfway | 4 | 7 | — | 2 |
| Field totals | 232 | 251 | 5 | 14 |
| Boundary Lake North field—Halfway | — | — | — | 4 |
| Bubbles field—Baldonnel | — | — | 8 | 13 |
| Buick Creek— | | | | |
| Dunlevy | — | — | 15 | 18 |
| Charlie Lake | — | — | — | 1 |
| Field totals | — | — | 15 | 19 |
| Buick Creek East field— | | | | |
| Bluesky-Gething | — | — | — | 2 |
| Dunlevy | — | 1 | 8 | 10 |
| Field totals | — | 1 | 8 | 12 |
| Buick Creek North field— | | | | |
| Bluesky-Gething | — | — | 1 | 2 |
| Dunlevy | — | — | 2 | 6 |
| Field totals | — | — | 3 | 8 |
| Buick Creek West field— | | | | |
| Gething | — | — | — | 1 |
| Dunlevy | — | 2 | 7 | 9 |
| Baldonnel | — | — | 1 | 2 |
| Halfway | — | — | — | 1 |
| Field totals | — | 2 | 8 | 13 |
| Bulrush field—Halfway | 3 | 4 | — | — |
| Bulrush East field—Halfway | 1 | 1 | — | — |
| Charlie Lake field—Gething | — | 1 | — | — |
| Clarke Lake field—Slave Point | — | — | 13 | 22 |
| Currant field—Halfway | 4 | 8 | — | 3 |
| Dawson Creek field—Cadotte | — | — | — | 1 |

[1] Each zone of a multiple completion is counted as a well.

TABLE 26.—NUMBER OF PRODUCING AND PRODUCIBLE WELLS AT DECEMBER 31, 1967[1]—*Continued*

| Field and Pool | Oil Wells | | Natural-gas Wells | |
|---|---|---|---|---|
| | Producing | Producible | Producing | Producible |
| Fort St. John field— | | | | |
| Cadomin | — | — | — | 2 |
| Baldonnel | — | — | 8 | 12 |
| Charlie Lake | 4 | 4 | — | 1 |
| Halfway | — | — | 5 | 6 |
| Belloy | — | 1 | 2 | 2 |
| Field totals | 4 | 5 | 15 | 23 |
| Fort St. John Southeast field— | | | | |
| Cadomin | — | — | — | 1 |
| Baldonnel | — | — | 1 | 2 |
| Halfway | — | — | 2 | 6 |
| Belloy | — | — | 4 | 6 |
| Field totals | — | — | 7 | 15 |
| Gundy Creek— | | | | |
| Baldonnel | — | — | — | 4 |
| Charlie Lake | — | — | — | 1 |
| Field totals | — | — | — | 5 |
| Halfway field— | | | | |
| Baldonnel | — | — | 1 | 2 |
| Charlie Lake | — | 1 | — | — |
| Halfway | — | — | — | 1 |
| Field totals | — | 1 | 1 | 3 |
| Highway field— | | | | |
| Dunlevy | — | — | 1 | 1 |
| Baldonnel | — | — | — | 4 |
| Mississippian | — | — | — | 1 |
| Field totals | — | — | 1 | 6 |
| Inga field—Charlie Lake | 25 | 29 | — | 2 |
| Jedney field— | | | | |
| Gething | — | — | — | 1 |
| Baldonnel | — | — | 16 | 22 |
| Halfway | — | — | 19 | 23 |
| Field totals | — | — | 35 | 46 |
| Jedney West field— | | | | |
| Baldonnel | — | — | — | 1 |
| Halfway | — | — | — | 2 |
| Field totals | — | — | — | 3 |
| Kobes-Townsend field— | | | | |
| Dunlevy | — | — | 3 | 3 |
| Charlie Lake | — | — | 4 | 5 |
| Halfway | — | — | 2 | 2 |
| Mississippian | — | — | 1 | 2 |
| Field totals | — | — | 10 | 12 |
| Kotcho Lake field—Slave Point | — | — | — | 6 |
| Laprise Creek field—Baldonnel | — | — | 33 | 40 |
| Laprise Creek West field—Baldonnel | — | — | — | 2 |
| Milligan Creek field—Halfway | 21 | 22 | — | 1 |
| Montney field— | | | | |
| Bluesky-Gething | — | — | — | 1 |
| Charlie Lake | — | — | — | 1 |
| Halfway | — | — | 1 | 2 |
| Field totals | — | — | 1 | 4 |
| Nettle field— | | | | |
| Bluesky-Gething | — | 3 | — | 1 |
| Halfway | — | — | — | 1 |
| Field totals | — | 3 | — | 2 |
| Nig Creek field—Baldonnel | 1 | 1 | 23 | 30 |
| Osprey field—Halfway | 1 | 2 | — | — |
| Parkland field—Wabamun | — | — | 2 | 2 |
| Peejay field—Halfway | 75 | 95 | — | 4 |
| Peejay West field—Halfway | — | 2 | — | — |
| Petitot River field—Slave Point | — | — | — | 3 |

[1] Each zone of a multiple completion is counted as a well.

TABLE 26.—NUMBER OF PRODUCING AND PRODUCIBLE WELLS AT DECEMBER 31, 1967[1]—*Continued*

| Field and Pool | Oil Wells | | Natural-gas Wells | |
|---|---|---|---|---|
| | Producing | Producible | Producing | Producible |
| Red Creek field— | | | | |
| Charlie Lake | — | — | — | 1 |
| Halfway | — | — | — | 1 |
| Field totals | — | — | — | 2 |
| Rigel field—Dunlevy | 5 | 7 | 20 | 34 |
| Stoddart field—Belloy | 2 | 2 | 6 | 9 |
| Stoddard West field—Belloy | — | — | 1 | 1 |
| Weasel field— | | | | |
| Baldonnel | — | — | — | 1 |
| Halfway | 23 | 25 | — | 1 |
| Field totals | 23 | 25 | — | 2 |
| Wildmint field—Halfway | 10 | 27 | — | 2 |
| Willow field— | | | | |
| Bluesky-Gething | 1 | 1 | — | — |
| Halfway | — | — | — | 2 |
| Field totals | 1 | 1 | — | 2 |
| Wolf field—Halfway | 3 | 4 | — | 1 |
| Yoyo field—Pine Point | — | — | — | 7 |
| Other areas— | | | | |
| Cadotte | — | — | — | 5 |
| Notikewin | — | — | — | 1 |
| Bluesky-Gething | — | 1 | — | 12 |
| Gething | — | — | — | 3 |
| Cadomin | — | — | 1 | 1 |
| Dunlevy | — | — | — | 10 |
| Baldonnel | — | 1 | — | 31 |
| Charlie Lake | — | — | — | 9 |
| Boundary Lake | — | — | — | 1 |
| Halfway | 1 | 2 | — | 25 |
| Permo-Carboniferous | — | — | — | 3 |
| Belloy | — | — | — | 5 |
| Mississippian | — | — | — | 11 |
| Kiskatinaw | — | — | — | 1 |
| Slave Point | — | — | 2 | 22 |
| Slave Point/Sulphur Point | — | — | — | 1 |
| Pine Point | — | — | — | 4 |
| Nahanni | — | — | 1 | 2 |
| Confidential | 13 | 17 | — | 25 |
| Areas totals | 14 | 21 | 4 | 172 |
| Totals | 464 | 561 | 255 | 611 |

[1] Each zone of a multiple completion is counted as a well.

(Quantities in barrels.)

| Field and Pool | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aitken Creek field— | | | | | | | | | | | | | |
| Gething | 26,523 | 21,053 | 27,817 | 21,608 | 26,836 | 27,297 | 28,699 | 28,338 | 26,522 | 30,433 | 25,538 | 28,166 | 318,830 |
| Gething[1] | 2,019 | 1,666 | 2,032 | 2,143 | 2,491 | 2,366 | 2,367 | 2,350 | 816 | 2,492 | 2,373 | 2,266 | 25,381 |
| Field totals | 28,542 | 22,719 | 29,849 | 23,751 | 29,327 | 29,663 | 31,066 | 30,688 | 27,338 | 32,925 | 27,911 | 30,432 | 344,211 |
| Beatton River field—Halfway | 22,316 | 29,083 | 31,234 | 26,154 | 29,621 | 29,362 | 30,234 | 27,628 | 28,036 | 35,318 | 35,451 | 35,644 | 360,081 |
| Beatton River West field — Bluesky-Gething | 11,633 | 13,062 | 12,664 | 11,437 | 10,137 | 9,060 | 12,866 | 11,418 | 13,396 | 13,541 | 7,875 | 12,016 | 139,105 |
| Beaverdam field—Halfway | | | | | | | | | | | | | |
| Blueberry field— | | | | | | | | | | | | | |
| Dunlevy[1] | 30 | 31 | 27 | 30 | 28 | 31 | 28 | 25 | 36 | 59 | 26 | 24 | 375 |
| Mississippian | 68,282 | 60,868 | 67,147 | 64,109 | 65,818 | 67,205 | 70,589 | 64,849 | 76,391 | 67,230 | 65,312 | 63,954 | 801,754 |
| Field totals | 68,312 | 60,899 | 67,174 | 64,139 | 65,846 | 67,236 | 70,617 | 64,874 | 76,427 | 67,289 | 65,338 | 63,978 | 802,129 |
| Blueberry East field—Baldonnel[1] | | | | | | | | | | | | | |
| Blueberry West field—Dunlevy | | | | | | | 1,213 | | | | | | 1,213 |
| Boundary Lake field— | | | | | | | | | | | | | |
| Cadomin | | | | | | | | 800 | | | | | 800 |
| Boundary Lake | 519,758 | 485,959 | 545,973 | 489,205 | 521,334 | 575,426 | 584,051 | 589,756 | 587,718 | 575,782 | 571,368 | 597,429 | 6,643,759 |
| Halfway | 4,967 | 4,139 | 4,128 | 4,518 | 5,065 | 4,868 | 5,207 | 5,222 | 5,050 | 4,973 | 4,579 | 5,670 | 58,386 |
| Field totals | 524,725 | 490,098 | 550,101 | 493,723 | 526,399 | 580,294 | 589,258 | 595,778 | 592,768 | 580,755 | 575,947 | 603,099 | 6,702,945 |
| Buick Creek field—Dunlevy[1] | 1,839 | 1,148 | 1,513 | 1,097 | 1,077 | 562 | 793 | 1,084 | 1,183 | 1,260 | 875 | 1,170 | 13,601 |
| Bulrush field—Halfway | 11,953 | 9,302 | 8,719 | 11,025 | 10,030 | 11,088 | 11,617 | 7,482 | 10,649 | 11,539 | 9,272 | 9,439 | 122,115 |
| Bulrush East field—Halfway | 539 | 481 | 496 | 479 | 54 | 442 | 644 | 567 | 534 | 506 | 475 | 482 | 5,699 |
| Currant field—Halfway | 7,854 | 9,809 | 7,399 | 7,606 | 8,892 | 7,854 | 9,847 | 8,970 | 8,862 | 13,984 | 11,632 | 13,971 | 116,680 |
| Fort St. John field— | | | | | | | | | | | | | |
| Charlie Lake | 1,901 | 1,727 | 2,054 | 1,227 | 1,822 | 2,088 | 1,942 | 1,570 | 1,865 | 2,309 | 1,851 | 1,930 | 22,286 |
| Belloy | | | | | | | | | | | | | |
| Field totals | 1,901 | 1,727 | 2,054 | 1,227 | 1,822 | 2,088 | 1,942 | 1,570 | 1,865 | 2,309 | 1,851 | 1,930 | 22,286 |
| Halfway field—Charlie Lake | | | 1,767 | 256 | | | | | | | | | 2,023 |
| Inga field—Charlie Lake | 51,062 | 62,290 | 67,584 | 45,266 | 25,799 | 54,598 | 81,333 | 71,906 | 81,153 | 76,266 | 85,294 | 98,457 | 801,008 |
| Milligan Creek field—Halfway | 318,996 | 266,805 | 323,956 | 266,830 | 294,709 | 323,635 | 316,714 | 291,794 | 275,859 | 297,013 | 283,656 | 298,677 | 3,558,644 |
| Nettle field—Bluesky-Gething | 2,501 | 584 | | | | | | | | | | | 3,085 |
| Nig Creek field—Baldonnel | | | | | | | | | 810 | 786 | | 277 | 1,873 |
| Osprey field—Halfway | 1,481 | 1,336 | 1,265 | 1,034 | 1,077 | 1,435 | 1,445 | 1,398 | 1,258 | 1,029 | 1,197 | 836 | 14,791 |
| Peejay field—Halfway | 320,433 | 269,976 | 367,262 | 403,783 | 509,337 | 507,551 | 504,534 | 443,461 | 462,793 | 456,803 | 451,603 | 447,285 | 5,144,821 |
| Rigel field—Dunlevy | 7,423 | 7,796 | 9,371 | 2,514 | 4,019 | 7,353 | 7,487 | 6,492 | 7,351 | 5,929 | 6,800 | 5,587 | 78,122 |
| Stoddart field—Belloy | 2,328 | 2,225 | 2,454 | 1,867 | 1,548 | 2,243 | 2,324 | 2,559 | 1,059 | 2,299 | 2,083 | 2,121 | 25,110 |
| Weasel field—Halfway | 72,802 | 75,939 | 77,628 | 71,906 | 74,158 | 72,333 | 69,494 | 69,648 | 79,349 | 73,327 | 70,747 | 69,064 | 876,395 |
| Wildmint field—Halfway | 42,125 | 36,767 | 36,806 | 34,557 | 35,101 | 35,154 | 24,116 | 36,917 | 40,647 | 38,827 | 36,200 | 26,660 | 423,877 |
| Willow field—Bluesky-Gething | 2,190 | 1,619 | 1,995 | 1,596 | 1,947 | 1,731 | 1,939 | 1,777 | 1,613 | 1,571 | 1,750 | 2,028 | 21,756 |
| Wolf field—Halfway | 4,998 | 4,684 | 6,051 | 5,241 | 5,006 | 4,641 | 4,524 | 4,278 | 4,672 | 4,993 | 4,830 | 5,571 | 59,489 |
| Other areas— | | | | | | | | | | | | | |
| Halfway | 443 | 15 | | | | | | | | | | 761 | 1,219 |
| Confidential | | | 1,963 | 355 | | | | | 264 | 1,703 | 19,268 | 31,538 | 55,091 |
| Area totals | 443 | 15 | 1,963 | 355 | | | | | 264 | 1,703 | 19,268 | 32,299 | 56,310 |
| Totals— | | | | | | | | | | | | | |
| Crude | 1,502,508 | 1,365,519 | 1,605,733 | 1,472,573 | 1,632,310 | 1,745,364 | 1,769,606 | 1,676,830 | 1,715,851 | 1,716,161 | 1,696,781 | 1,757,563 | 19,656,799 |
| Field condensate | 3,888 | 2,845 | 3,572 | 3,270 | 3,596 | 2,959 | 4,401 | 3,459 | 2,035 | 3,811 | 3,274 | 3,460 | 40,570 |
| Total crude and equivalent | 1,506,396 | 1,368,364 | 1,609,305 | 1,475,843 | 1,635,906 | 1,748,323 | 1,774,007 | 1,680,289 | 1,717,886 | 1,719,972 | 1,700,055 | 1,761,023 | 19,697,369 |

[1] Condensate.

## TABLE 28.—MONTHLY NATURAL-GAS PRODUCTION BY FIELDS AND POOLS, 1967

(Quantities in M s.c.f.)

| Field and Pool | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aitken Creek field—Gething | 360,473 | 197,476 | 191,967 | 226,122 | 251,520 | 203,324 | 213,422 | 203,369 | 60,392 | 222,795 | 188,027 | 211,855 | 2,530,742 |
| Beg field— | | | | | | | | | | | | | |
| Baldonnel | 438,278 | 366,584 | 438,782 | 381,991 | 459,757 | 181,420 | 426,397 | 355,089 | 372,188 | 314,129 | 400,645 | 453,740 | 4,589,000 |
| Halfway | 635,338 | 543,609 | 494,261 | 575,318 | 587,277 | 203,050 | 584,078 | 392,897 | 446,530 | 511,673 | 628,863 | 549,107 | 6,152,001 |
| Field totals | 1,073,616 | 910,193 | 933,043 | 957,309 | 1,047,034 | 384,470 | 1,010,475 | 747,986 | 818,718 | 825,802 | 1,029,508 | 1,002,847 | 10,741,001 |
| Beg West field—Baldonnel | 25,601 | 23,517 | 18,331 | 20,218 | 23,510 | 9,957 | 27,558 | 24,454 | 25,991 | 21,553 | 28,468 | 26,128 | 275,286 |
| Bernadet field—Bluesky-Gething | 11,175 | 8,644 | 9,173 | 8,593 | 9,248 | 7,719 | 3,974 | 8,094 | 6,057 | 7,641 | 6,770 | 6,772 | 93,860 |
| Blueberry field— | | | | | | | | | | | | | |
| Dunlevy | 102,698 | 82,163 | 98,049 | 95,687 | 99,712 | 88,390 | 85,771 | 101,813 | 129,076 | 96,510 | 53,045 | 52,685 | 1,085,599 |
| Baldonnel | 13,346 | 16,626 | 15,973 | 16,089 | 15,659 | 8,800 | 13,786 | 13,450 | 12,349 | 14,685 | 55,128 | 56,128 | 252,019 |
| Field totals | 116,044 | 98,789 | 114,022 | 111,776 | 115,371 | 97,190 | 99,557 | 115,263 | 141,425 | 111,195 | 108,173 | 108,813 | 1,337,618 |
| Blueberry East field—Baldonnel | 19,297 | 8,399 | 15,621 | 17,057 | 16,942 | 12,981 | 11,279 | 11,670 | 6,901 | 15,751 | 10,241 | | 146,139 |
| Blueberry West field—Dunlevy | 10,175 | 9,680 | 9,884 | 9,494 | 9,290 | 8,986 | 9,373 | 9,794 | 9,306 | 9,437 | 9,313 | 9,790 | 114,522 |
| Boundary Lake field— | | | | | | | | | | | | | |
| Baldonnel | 139,297 | 128,174 | 166,155 | 169,538 | 145,693 | 130,308 | 157,918 | 156,410 | 146,388 | 119,224 | 127,981 | 102,370 | 1,689,456 |
| Gething | | | | | | | | | | | 48,478 | 36,043 | 84,521 |
| Basal Boundary Lake | | 1,328 | 36,633 | 36,592 | 30,292 | 26,591 | 31,585 | 31,937 | 30,976 | 28,392 | 25,153 | 25,654 | 305,133 |
| Field totals | 139,297 | 129,502 | 202,788 | 206,130 | 175,985 | 156,899 | 189,503 | 188,347 | 177,364 | 147,616 | 201,612 | 164,067 | 2,079,110 |
| Bubbles field—Baldonnel | 784,146 | 687,716 | 772,496 | 690,902 | 656,065 | 575,491 | 616,830 | 143,262 | 631,132 | 694,867 | 671,035 | 680,426 | 7,604,368 |
| Buick Creek field—Dunlevy | 874,050 | 787,248 | 880,255 | 823,664 | 783,308 | 413,366 | 680,501 | 668,522 | 744,204 | 845,465 | 827,571 | 829,661 | 9,157,815 |
| Buick Creek East field—Dunlevy | 360,711 | 333,418 | 368,883 | 330,638 | 253,979 | 134,615 | 311,303 | 340,045 | 331,433 | 369,396 | 356,068 | 362,521 | 3,853,010 |
| Buick Creek North field— | | | | | | | | | | | | | |
| Bluesky-Gething | 63,488 | 59,606 | 61,619 | 44,446 | 55,532 | 67,782 | 43,698 | 29,928 | 10,547 | 28,661 | 57,005 | 56,516 | 578,828 |
| Dunlevy | 45,564 | 36,752 | 39,764 | 34,894 | 37,002 | 35,512 | 28,575 | 20,445 | 8,526 | 19,239 | 102,345 | 113,955 | 522,573 |
| Field totals | 109,052 | 96,358 | 101,383 | 79,340 | 92,534 | 103,294 | 72,273 | 50,373 | 19,073 | 47,900 | 159,350 | 170,471 | 1,101,401 |
| Buick Creek West field— | | | | | | | | | | | | | |
| Dunlevy | 326,121 | 338,671 | 344,751 | 338,865 | 176,100 | 4,426 | 267,126 | 353,731 | 222,264 | 326,266 | 369,418 | 367,978 | 3,435,717 |
| Baldonnel | 26,679 | 23,961 | 25,017 | 29,403 | 14,530 | 364 | 22,629 | 27,458 | 25,183 | 24,841 | 22,414 | 23,325 | 265,804 |
| Field totals | 352,800 | 362,632 | 369,768 | 368,268 | 190,630 | 4,790 | 289,755 | 381,189 | 247,447 | 351,107 | 391,832 | 391,303 | 3,701,521 |
| Clarke Lake field—Slave Point | 6,318,194 | 5,601,640 | 6,563,419 | 6,519,359 | 5,993,953 | 5,250,102 | 2,170,852 | 4,657,367 | 5,033,338 | 5,728,383 | 6,577,007 | 6,639,538 | 67,053,152 |
| Dawson Creek field—Cadotte | | | | | | 12,074 | 8,535 | 7,073 | 867 | | 10,240 | | 38,789 |
| Fort St. John field— | | | | | | | | | | | | | |
| Baldonnel | 364,242 | 250,069 | 258,963 | 213,682 | 184,744 | 254,046 | 234,752 | 257,979 | 307,340 | 358,116 | 337,137 | 358,196 | 3,379,266 |
| Halfway | 216,308 | 153,728 | 196,726 | 165,544 | 102,683 | 204,753 | 202,977 | 170,163 | 166,746 | 171,069 | 171,203 | 202,004 | 2,123,904 |
| Belloy | 61,024 | 59,757 | 56,721 | 47,427 | 43,713 | 55,678 | 52,508 | 44,839 | 47,344 | 51,972 | 54,704 | 53,550 | 629,237 |
| Field totals | 641,574 | 463,554 | 512,410 | 426,653 | 331,140 | 514,477 | 490,237 | 472,981 | 521,430 | 581,157 | 563,044 | 613,750 | 6,132,407 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fort St. John Southeast field— | | | | | | | | | | | | | |
| Baldonnel | 36,579 | 32,404 | 30,312 | 31,786 | 26,826 | 15,515 | 35,034 | 36,142 | 31,460 | 26,911 | 33,522 | 17,884 | 354,375 |
| Halfway | 71,921 | 61,187 | 60,432 | 61,577 | 36,807 | 26,443 | 43,673 | 66,321 | 46,414 | 48,464 | 60,736 | 75,765 | 659,740 |
| Belloy | 270,540 | 264,555 | 274,315 | 274,563 | 240,640 | 220,321 | 241,418 | 254,782 | 221,136 | 177,757 | 228,673 | 234,221 | 2,902,921 |
| Field totals | 379,040 | 358,146 | 365,059 | 367,926 | 304,273 | 262,279 | 320,125 | 357,245 | 299,010 | 253,132 | 322,931 | 327,870 | 3,917,036 |
| Halfway field—Baldonnel | 26,579 | 23,049 | 16,276 | 22,917 | 23,910 | 4,375 | 17,111 | 19,457 | 10,737 | 23,314 | 21,891 | 22,191 | 231,807 |
| Highway field—Dunlevy | 14,703 | 13,154 | 14,923 | 13,361 | 13,922 | 11,972 | 11,505 | 13,076 | 11,455 | 14,119 | 13,520 | 13,872 | 159,582 |
| Jedney field— | | | | | | | | | | | | | |
| Baldonnel | 1,198,859 | 1,057,634 | 1,163,465 | 1,011,989 | 673,863 | 679,340 | 884,727 | 848,986 | 654,991 | 1,030,639 | 908,155 | 1,086,054 | 11,198,702 |
| Halfway | 1,080,017 | 826,447 | 927,256 | 882,942 | 553,840 | 481,786 | 680,939 | 777,508 | 545,985 | 785,283 | 931,685 | 926,824 | 9,400,512 |
| Field totals | 2,278,876 | 1,884,081 | 2,090,721 | 1,894,931 | 1,227,703 | 1,161,126 | 1,565,666 | 1,626,494 | 1,200,976 | 1,815,922 | 1,839,840 | 2,012,878 | 20,599,214 |
| Kobes-Townsend field— | | | | | | | | | | | | | |
| Dunlevy | 89,273 | 83,104 | 87,849 | 80,411 | 69,462 | 23,646 | 46,870 | 77,998 | 66,864 | 86,601 | 81,837 | 86,603 | 880,518 |
| Charlie Lake | 93,155 | 94,959 | 260,025 | 79,633 | 38,311 | 34,002 | 37,272 | 45,719 | 211,864 | 84,081 | 77,904 | 79,391 | 1,136,316 |
| Halfway | 357,745 | 325,725 | 185,297 | 293,514 | 325,650 | 258,221 | 216,181 | 253,657 | 113,193 | 334,659 | 329,154 | 339,016 | 3,332,012 |
| Mississippian | 127,991 | 114,207 | 121,837 | 119,731 | 48,883 | 13,126 | 66,036 | 108,724 | 125,336 | 133,134 | 122,378 | 127,424 | 1,228,807 |
| Field totals | 668,164 | 617,995 | 655,008 | 573,289 | 482,306 | 328,995 | 366,359 | 486,098 | 517,257 | 638,475 | 611,273 | 632,434 | 6,577,653 |
| Laprise Creek field—Baldonnel | 2,089,210 | 1,900,665 | 2,175,071 | 2,230,217 | 2,363,268 | 2,339,466 | 2,155,457 | 2,360,778 | 2,052,922 | 2,458,008 | 2,480,101 | 2,618,189 | 27,223,352 |
| Laprise Creek West field—Baldonnel | | | | 6,551 | | | 5,099 | | | 14,672 | | | 26,322 |
| Montney field—Halfway | | | | 16,536 | 31,186 | 13,590 | 35,463 | 29,662 | 31,027 | 29,025 | 25,301 | 22,638 | 234,428 |
| Nig Creek field—Baldonnel | 1,322,131 | 1,794,555 | 2,125,365 | 1,685,799 | 1,316,595 | 888,635 | 1,570,124 | 1,381,697 | 1,377,739 | 1,694,411 | 1,674,654 | 1,939,514 | 18,771,219 |
| Parkland field—Wabamun | 564,313 | 468,240 | 533,972 | 516,694 | 419,569 | 3,524 | 421,539 | 418,668 | 489,204 | 518,307 | 490,755 | 501,334 | 5,346,119 |
| Rigel field—Dunlevy | 1,607,059 | 1,395,832 | 1,442,873 | 1,310,946 | 1,223,672 | 774,932 | 1,101,306 | 1,316,509 | 969,009 | 1,408,284 | 1,420,202 | 1,587,201 | 15,557,825 |
| Stoddart field—Belloy | 518,768 | 414,288 | 500,812 | 489,493 | 388,368 | 188,376 | 446,019 | 494,049 | 518,805 | 491,973 | 509,768 | 486,436 | 5,447,155 |
| Stoddart West field—Belloy | 27,263 | 31,621 | 18,649 | 29,397 | 24,184 | 2,329 | 29,323 | 35,110 | 34,979 | 25,228 | 17,483 | 2,032 | 277,598 |
| Other areas— | | | | | | | | | | | | | |
| Cadomin | 53,576 | 56,800 | 61,888 | 74,312 | 68,941 | 57,284 | 55,136 | 46,765 | 38,844 | 33,033 | 30,160 | 29,980 | 606,719 |
| Baldonnel | | | | 4,393 | 3,102 | | 6,255 | 1,644 | | 9,136 | 6,777 | | 31,307 |
| Slave Point | | | | | | | | | 250,521 | 59,663 | | 47,948 | 358,132 |
| Confidential | | | | | | | | | | | | 136,360 | 136,360 |
| Area totals | 53,576 | 56,800 | 61,888 | 78,705 | 72,043 | 57,284 | 61,391 | 48,409 | 289,365 | 101,832 | 36,937 | 214,288 | 1,132,518 |
| Totals, all fields | 20,745,887 | 18,677,192 | 21,064,060 | 20,032,285 | 17,841,508 | 13,926,618 | 14,311,914 | 16,617,041 | 16,577,563 | 19,466,767 | 20,602,915 | 21,598,819 | 221,462,569 |

Dry gasfields are Clarke Lake, Dawson Creek, and Parkland.
NOTE.—Table 28 shows gas production from gas wells only and does not include associated gas.

## TABLE 29.—SUMMARY OF DRILLING AND PRODUCTION STATISTICS, 1967

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Well authorizations— | | | | | | | | | | | | | |
| Issued | 28 | 33 | 18 | | 3 | 10 | 13 | 16 | 16 | 19 | 9 | 36 | 201 |
| Cancelled | | | | | 4 | 1 | 1 | 1 | | | | | 7 |
| Wells spudded | 34 | 30 | 25 | | 1 | 7 | 9 | 18 | 15 | 18 | 11 | 27 | 195 |
| Rigs operated during month | 38 | 33 | 32 | 13 | 4 | 10 | 19 | 25 | 24 | 27 | 30 | 33 | 52[1] |
| Rigs operating at month's end | 24 | 24 | 12 | 3 | 3 | 7 | 15 | 15 | 17 | 22 | 9 | 29 | |
| Development footage | 82,204 | 63,693 | 45,217 | 1,938 | 2,530 | 22,346 | 33,452 | 48,390 | 59,715 | 29,941 | 35,307 | 41,181 | 465,914 |
| Exploratory outpost footage | 56,409 | 53,185 | 46,338 | 11,179 | 807 | 3,601 | 19,160 | 22,029 | 19,741 | 25,056 | 18,272 | 34,191 | 309,968 |
| Exploratory wildcat footage | 40,895 | 22,474 | 50,828 | 7,880 | 6,660 | 10,410 | 15,730 | 21,135 | 17,511 | 29,349 | 25,002 | 40,744 | 288,618 |
| Total footage drilled | 179,508 | 139,352 | 142,383 | 20,997 | 9,997 | 36,357 | 68,342 | 91,554 | 96,967 | 84,346 | 78,581 | 116,116 | 1,064,500 |
| Wells abandoned | 18 | 16 | 20 | 5 | 1 | | 1 | 10 | 5 | 4 | 12 | 2 | 94 |
| Service wells | | | 3 | | | 1 | | | 1 | | 1 | | 6 |
| Finished drilling wells | 2 | | | | | | | | | | 2 | 5 | 9 |
| Oil wells completed | 7 | 8 | 6 | | | 1 | 2 | 4 | 2 | 5 | 11 | | 46 |
| Producible oil wells | 538 | 533 | 542 | 544 | 544 | 541 | 542 | 542 | 545 | 549 | 556 | 561 | |
| Producing oil wells | 450 | 454 | 461 | 456 | 436 | 455 | 451 | 451 | 453 | 456 | 456 | 464 | |
| Production in barrels | 1,502,508 | 1,365,519 | 1,605,733 | 1,472,573 | 1,632,310 | 1,745,364 | 1,769,606 | 1,676,830 | 1,715,851 | 1,716,161 | 1,696,781 | 1,757,563 | 19,656,799 |
| Average daily production | 48,468 | 48,768 | 51,797 | 49,086 | 52,655 | 58,178 | 57,084 | 54,091 | 57,195 | 55,360 | 56,560 | 56,696 | 53,854 |
| Gas wells completed | 5 | 8 | 7 | 5 | | 2 | 1 | 4 | 5 | 3 | 2 | 1 | 43 |
| Producible gas wells | 573 | 576 | 584 | 591 | 594 | 592 | 593 | 600 | 600 | 607 | 606 | 611 | |
| Producing gas wells | 247 | 252 | 252 | 250 | 240 | 232 | 240 | 248 | 247 | 258 | 263 | 255 | |
| Production in M s.c.f. | 23,083,431 | 20,421,553 | 23,119,719 | 21,972,603 | 19,935,262 | 16,265,438 | 16,459,294 | 18,738,076 | 18,766,687 | 21,768,568 | 22,749,594 | 23,595,733 | 246,875,958 |
| Average daily production | 744,627 | 729,341 | 745,797 | 732,420 | 643,073 | 542,181 | 530,944 | 604,454 | 625,556 | 702,212 | 758,320 | 761,153 | 676,372 |

[1] Rigs operated during 1967.

NOTE.—Each zone of a multiple completion is counted as one well.

## TABLE 30.—SUPPLY AND DISPOSITION OF CRUDE OIL AND CONDENSATE/PENTANES PLUS, 1967

(Quantities in barrels.)

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Available Supply* | | | | | | | | | | | | | |
| B.C. production— | | | | | | | | | | | | | |
| Crude | 1,502,508 | 1,365,519 | 1,605,733 | 1,472,573 | 1,632,310 | 1,745,364 | 1,769,606 | 1,676,830 | 1,715,851 | 1,716,161 | 1,696,781 | 1,757,563 | 19,656,799 |
| Field condensate | 3,888 | 2,845 | 3,572 | 3,270 | 3,596 | 2,959 | 4,401 | 3,459 | 2,035 | 3,811 | 3,274 | 3,460 | 40,570 |
| Plant condensate | 91,796 | 89,486 | 107,664 | 90,062 | 93,653 | 71,784 | 82,579 | 80,549 | 80,140 | 98,733 | 38,662 | 90,937 | 1,016,045 |
| Alberta imports—Crude and equivalent | 6,755,413 | 5,629,975 | 5,946,596 | 6,336,968 | 7,243,402 | 7,416,631 | 8,413,080 | 7,978,734 | 7,762,475 | 7,001,145 | 6,945,500 | 7,043,590 | 84,473,509 |
| Totals | 8,353,605 | 7,087,825 | 7,663,565 | 7,902,873 | 8,972,961 | 9,236,738 | 10,269,666 | 9,739,572 | 9,560,501 | 8,819,850 | 8,684,217 | 8,895,550 | 105,186,923 |
| *Disposition* | | | | | | | | | | | | | |
| Inventory increase/decrease (—) | | | | | | | | | | | | | |
| Field | 7,684 | —4,080 | —13,828 | —7,842 | —711 | —4,117 | 7,048 | 2,078 | —7,638 | —9,253 | 740 | 7,378 | —22,541 |
| Plant | —4,277 | 20,254 | 35,525 | 19,212 | —1,853 | —41,450 | —28,847 | 18,549 | 5,173 | 1,761 | —36,628 | —26,535 | —39,116 |
| B.C. transporters | —158,394 | 474,400 | —263,290 | 24,674 | 294,364 | 93,815 | —43,265 | —151,852 | 41,494 | —68,625 | —277,882 | 245,233 | 210,672 |
| Miscellaneous— | | | | | | | | | | | | | |
| Plant fuel | | | | | | | | | | | | | |
| Pipe-line use | 5,927 | 2,129 | 9,763 | 1,678 | 5,436 | 6,541 | 10,331 | 8,811 | 7,184 | 3,033 | 5,570 | 8,159 | 74,562 |
| Field losses and adjustments | | | | | | | | | | | 1,374 | —1,473 | —99 |
| Plant losses and adjustments | —3,128 | —1,836 | 2,798 | 3,764 | 14,226 | 12,495 | 15,511 | 2,501 | 595 | 1,887 | 1,013 | 26,535 | 76,361 |
| Transporters' losses and adjustments | —2,053 | 1,565 | 814 | 3,855 | —16,486 | —3,815 | 23,706 | —5,592 | 11,743 | 14,967 | 27,818 | 26,058 | 82,580 |
| Deliveries— | | | | | | | | | | | | | |
| B.C. refineries— | | | | | | | | | | | | | |
| B.C. crude | 1,448,310 | 1,226,508 | 1,479,378 | 1,076,045 | 1,406,632 | 1,558,197 | 1,188,794 | 1,351,829 | 1,551,960 | 1,606,049 | 1,641,023 | 1,627,851 | 17,162,576 |
| Alberta crude | 1,561,065 | 1,573,217 | 1,823,013 | 1,773,171 | 1,527,163 | 1,630,304 | 1,678,739 | 1,586,383 | 1,687,057 | 1,591,640 | 1,658,220 | 1,497,010 | 19,586,982 |
| B.C. condensate | 63,101 | 38,699 | 12,815 | 40,561 | 34,595 | 51,415 | 48,387 | 38,132 | 35,750 | 61,248 | 39,341 | 81,390 | 545,434 |
| Export to United States— | | | | | | | | | | | | | |
| B.C. crude | 68,345 | 10,802 | 166,290 | 283,332 | 240,645 | 288,847 | 462,487 | 370,297 | 168,045 | 34,492 | 88,245 | 114,189 | 2,296,016 |
| Alberta crude | 5,325,661 | 3,720,597 | 4,349,090 | 4,658,283 | 5,440,326 | 5,599,550 | 6,864,678 | 6,502,365 | 6,024,083 | 5,539,235 | 5,512,703 | 5,301,092 | 64,837,663 |
| B.C. condensate | 31,100 | 28,087 | 58,092 | 29,047 | 42,017 | 45,023 | 43,637 | 49,158 | 34,079 | 31,345 | 30,208 | 31,390 | 453,183 |
| Field sales | 2,204 | 1,580 | 873 | 715 | | 80 | 100 | 380 | 142 | 649 | 2,372 | 1,456 | 10,551 |
| Reporting adjustment | 8,060 | —4,097 | 2,232 | —3,622 | —13,393 | —147 | —1,640 | —33,467 | 834 | 11,422 | —9,900 | —44,183 | —87,901 |
| Totals | 8,353,605 | 7,087,825 | 7,663,565 | 7,902,873 | 8,972,961 | 9,236,738 | 10,269,666 | 9,739,572 | 9,560,501 | 8,819,850 | 8,684,217 | 8,895,550 | 105,186,923 |
| *B.C. Refineries* | | | | | | | | | | | | | |
| Receipts— | | | | | | | | | | | | | |
| B.C. crude | 1,448,310 | 1,226,508 | 1,479,378 | 1,076,045 | 1,406,632 | 1,558,477 | 1,187,295 | 1,450,960 | 1,452,696 | 1,591,658 | 1,617,299 | 1,690,049 | 17,185,307 |
| Alberta crude | 1,561,065 | 1,573,217 | 1,816,223 | 1,773,171 | 1,526,336 | 1,630,304 | 1,678,739 | 1,586,223 | 1,687,057 | 1,591,640 | 1,658,220 | 1,497,010 | 19,579,205 |
| Alberta butane | 14,822 | 13,055 | 14,717 | 3,331 | | | | | 5,651 | 17,030 | 20,775 | 15,255 | 104,636 |
| Total receipts | 3,024,197 | 2,812,780 | 3,310,318 | 2,852,547 | 2,932,968 | 3,188,781 | 2,866,034 | 3,037,183 | 3,145,404 | 3,200,328 | 3,296,294 | 3,202,314 | 36,869,148 |
| Inventory increase (decrease) | —123,251 | 119,374 | 78,650 | —103,174 | —147,834 | 12,682 | 224,631 | —39,097 | 74,156 | —80,086 | 157,139 | —45,910 | 127,280 |
| Losses and adjustments | —671 | 642 | 937 | —709 | —212 | 695 | —574 | —752 | —301 | 278 | 302 | 465 | 100 |
| Refinery runs | 3,148,119 | 2,692,764 | 3,230,731 | 2,956,430 | 3,081,014 | 3,175,404 | 2,641,977 | 3,077,032 | 3,071,549 | 3,280,136 | 3,138,853 | 3,247,759 | 36,741,768 |

# TABLE 31.—MONTHLY NATURAL-GAS DISPOSITION, 1967

(Quantities in M s.c.f.)

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Available Supply* | | | | | | | | | | | | | |
| B.C. production— | | | | | | | | | | | | | |
| Wet gas | 13,863,380 | 12,607,312 | 13,966,669 | 12,996,232 | 11,427,986 | 8,660,918 | 11,710,988 | 11,533,933 | 11,054,154 | 13,220,077 | 13,524,913 | 14,457,947 | 149,024,509 |
| Dry gas | 6,882,507 | 6,069,880 | 7,097,391 | 7,036,053 | 6,413,522 | 5,265,700 | 2,600,926 | 5,083,108 | 5,523,409 | 6,246,690 | 7,078,002 | 7,140,872 | 72,438,060 |
| Associated gas | 2,337,544 | 1,744,361 | 2,055,659 | 1,940,318 | 2,093,754 | 2,338,820 | 2,147,380 | 2,121,035 | 2,189,124 | 2,301,801 | 2,146,679 | 1,996,914 | 25,413,389 |
| Less injected | 1,118,740 | 488,949 | 560,558 | 633,840 | 729,286 | 735,985 | 561,784 | 668,193 | 528,697 | 746,790 | 630,807 | 530,065 | 7,933,694 |
| Net B.C. production | 21,964,691 | 19,932,604 | 22,559,161 | 21,338,763 | 19,205,976 | 15,529,453 | 15,897,510 | 18,069,883 | 18,237,990 | 21,021,778 | 22,118,787 | 23,065,668 | 238,942,264 |
| Alberta imports | 23,770,303 | 21,973,798 | 24,964,769 | 23,672,876 | 23,482,164 | 21,590,256 | 22,969,794 | 23,280,690 | 21,840,630 | 24,612,871 | 25,750,404 | 28,021,063 | 285,929,618 |
| Totals | 45,734,994 | 41,906,402 | 47,523,930 | 45,011,639 | 42,688,140 | 37,119,709 | 38,867,304 | 41,350,573 | 40,078,620 | 45,634,649 | 47,869,191 | 51,086,731 | 524,871,882 |
| *Disposition* | | | | | | | | | | | | | |
| Flared— | | | | | | | | | | | | | |
| Field | 964,292 | 846,118 | 996,815 | 892,371 | 753,292 | 1,063,895 | 1,116,512 | 897,318 | 1,036,427 | 1,775,876 | 959,436 | 1,076,800 | 12,319,152 |
| Plant— | | | | | | | | | | | | | |
| Residual gas | | | | | | | 150 | 6,900 | | 4,100 | 600 | | 11,750 |
| Natural gas | 653,234 | 578,657 | 689,445 | 666,747 | 644,717 | 593,043 | 254,662 | 525,550 | 554,713 | 618,614 | 698,268 | 717,235 | 7,194,885 |
| Gas-gathering systems | | 1,822 | 472 | | | | | | | | | | 2,294 |
| Fuel— | | | | | | | | | | | | | |
| Lease | 145,412 | 79,747 | 97,013 | 92,164 | 219,201 | 69,696 | 81,047 | 87,628 | 81,561 | 136,643 | 164,304 | 170,151 | 1,424,567 |
| Plant | 602,724 | 487,099 | 571,926 | 520,231 | 490,758 | 281,003 | 344,612 | 473,878 | 465,582 | 540,458 | 609,354 | 711,420 | 6,099,045 |
| Transporters | 974,923 | 1,062,410 | 1,161,221 | 1,010,850 | 755,651 | 470,987 | 619,731 | 777,645 | 719,597 | 970,486 | 1,079,533 | 1,181,194 | 10,784,228 |
| Gas-gathering systems | 574 | 164 | | 64,204 | 1,058 | 87 | 4,871 | 4,737 | 3,115 | 4,305 | 12,291 | 223,194 | 318,600 |
| Line pack changes— | | | | | | | | | | | | | |
| Gas-gathering systems | 38 | | —259 | 156 | 376 | 489 | 123 | 237 | —543 | 313 | 66,342 | —21,889 | 45,383 |
| Transporters | 46,842 | —202,244 | 63,864 | —53,468 | —48,896 | 36,685 | 70,044 | 42,292 | —75,584 | 131,194 | 15,958 | —196,640 | —169,953 |
| Losses and metering difference— | | | | | | | | | | | | | |
| Field | 305,210 | 454,004 | 546,448 | 683,916 | 386,825 | 226,492 | 513,504 | 163,474 | 530,716 | 466,999 | 555,558 | 538,052 | 5,371,198 |
| Gas-gathering systems | | | | 824 | | | | | | | | | 824 |
| Gas plants | 478,994 | 351,209 | 169,637 | 169,181 | —2,714 | 166,934 | 241,487 | 735,623 | 466,348 | 275,485 | 447,538 | 246,399 | 3,746,121 |
| Transporters | 98,200 | —15,705 | —64,630 | —74,376 | —62,373 | 40,654 | 220,281 | 73,883 | 287,929 | 59,695 | 60,846 | 163,118 | 787,522 |
| Processing shrinkage | 627,195 | 574,906 | 623,151 | 568,868 | 423,986 | 436,692 | 687,040 | 481,591 | 471,119 | 586,990 | 543,755 | 657,559 | 6,682,852 |
| Deliveries— | | | | | | | | | | | | | |
| B.C. distributors— | | | | | | | | | | | | | |
| Northeast | 336,889 | 295,132 | 322,882 | 216,241 | 168,340 | 146,155 | 135,096 | 159,418 | 150,925 | 223,643 | 269,190 | 339,295 | 2,763,206 |
| Interior | 2,278,747 | 2,048,911 | 2,113,229 | 1,789,296 | 1,573,582 | 1,292,892 | 1,149,246 | 1,255,360 | 1,240,995 | 1,671,382 | 2,062,392 | 2,305,113 | 20,781,145 |
| Lower Mainland | 5,109,976 | 4,886,115 | 5,698,485 | 5,284,884 | 3,860,850 | 2,440,667 | 2,517,895 | 4,194,468 | 3,616,085 | 4,691,824 | 5,104,216 | 5,946,082 | 53,351,547 |
| Export— | | | | | | | | | | | | | |
| B.C. natural gas | 11,010,237 | 9,980,541 | 11,028,666 | 10,815,439 | 11,016,343 | 9,045,746 | 9,237,760 | 9,906,771 | 9,639,585 | 10,745,245 | 10,793,576 | 10,523,845 | 123,743,754 |
| Alberta natural gas | 22,275,567 | 20,583,485 | 23,606,302 | 22,581,353 | 22,607,330 | 20,919,363 | 22,266,009 | 22,365,695 | 21,051,561 | 23,496,566 | 24,409,208 | 26,383,823 | 272,546,262 |
| Reporting adjustments | —114,060 | —105,969 | —100,737 | —217,242 | —100,186 | —111,771 | —592,766 | —801,895 | —161,511 | —765,169 | 16,826 | 121,980 | —2,932,500 |
| Totals | 45,734,994 | 41,906,402 | 47,523,930 | 45,011,639 | 42,688,140 | 37,119,709 | 38,867,304 | 41,350,573 | 40,078,620 | 45,634,649 | 47,869,191 | 51,086,731 | 524,871,882 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *B.C. Distributors* | | | | | | | | | | | | | |
| Receipts— | | | | | | | | | | | | | |
| Natural gas | 7,714,658 | 7,220,533 | 8,125,416 | 7,283,851 | 5,597,420 | 3,875,063 | 3,802,153 | 5,609,162 | 5,007,873 | 6,586,781 | 7,434,526 | 8,590,181 | 76,847,617 |
| L.P.G. gas | 100,346 | 73,446 | 78,314 | 62,327 | 52,755 | 40,428 | 38,960 | 38,739 | 40,901 | 60,993 | 73,625 | 100,719 | 761,553 |
| Disposition— | | | | | | | | | | | | | |
| Gas used in operations | 916 | 1,070 | 1,115 | 1,057 | 1,031 | 1,017 | 1,000 | 1,012 | 1,029 | 1,578 | 2,183 | 2,561 | 15,569 |
| Losses and adjustments | 135,963 | −334,571 | 228,181 | −548,164 | −517,043 | −366,207 | 1,731 | 118,080 | 246,883 | 1,188,871 | 916,401 | 992,510 | 2,062,635 |
| Line pack changes | −14,250 | 19,206 | −2,415 | −10,998 | −11,500 | 9,692 | 2,115 | 20,698 | 17,381 | 467 | 11,665 | −9,200 | 32,861 |
| Sales— | | | | | | | | | | | | | |
| Residential | 2,955,499 | 2,730,527 | 2,558,295 | 2,341,868 | 1,507,066 | 815,541 | 511,349 | 440,893 | 506,663 | 1,030,808 | 1,950,138 | 2,790,937 | 20,139,584 |
| Commercial | 1,616,493 | 1,541,910 | 1,467,190 | 1,348,515 | 970,828 | 598,446 | 439,516 | 410,274 | 461,735 | 727,054 | 1,195,577 | 1,625,906 | 12,403,444 |
| Industrial | 2,375,595 | 2,274,127 | 2,486,799 | 2,354,651 | 2,395,297 | 2,135,248 | 1,847,604 | 2,047,004 | 1,969,137 | 2,293,759 | 2,440,830 | 2,186,240 | 26,806,291 |
| Electric-power generation | 741,134 | 1,058,642 | 1,460,555 | 1,859,006 | 1,304,259 | 721,687 | 1,037,729 | 2,609,891 | 1,845,877 | 1,405,119 | 991,196 | 1,101,736 | 16,136,831 |
| Miscellaneous | 3,654 | 3,068 | 4,010 | 243 | 237 | 67 | 69 | 49 | 69 | 118 | 161 | 210 | 11,955 |
| Total sales | 7,692,375 | 7,608,274 | 7,976,849 | 7,904,283 | 6,177,687 | 4,270,989 | 3,836,267 | 5,508,111 | 4,783,481 | 5,456,858 | 6,577,902 | 7,705,029 | 75,498,105 |
| Value of sales to distributors | $5,902,997 | $5,555,585 | $5,897,364 | $5,060,811 | $3,869,196 | $2,591,380 | $2,369,828 | $2,673,798 | $2,733,175 | $4,313,749 | $5,217,240 | $6,318,512 | $52,503,635 |

TABLE 32.—MONTHLY BUTANE, PROPANE, AND SULPHUR DISPOSITION, 1967

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Butane* | | | | | | | | | | | | | |
| Production (bbl.)— | | | | | | | | | | | | | |
| Plant | 47,449 | 50,052 | 48,620 | 46,460 | 46,353 | 48,488 | 54,920 | 46,336 | 48,814 | 54,547 | 45,040 | 51,039 | 588,118 |
| Refinery | 12,770 | 11,668 | 15,554 | 11,781 | 16,150 | 12,811 | 14,792 | 12,860 | 25,093 | 20,855 | 18,068 | 12,795 | 185,197 |
| Opening inventory | 10,538 | 11,390 | 13,544 | 16,168 | 19,100 | 14,709 | 9,717 | 12,717 | 15,787 | 23,663 | 15,928 | 17,904 | 10,538 |
| Losses and adjustments | 2,657 | 4,470 | 3,273 | 4,102 | 3,535 | 3,199 | 12,943 | 2,495 | 5,543 | 8,427 | 2,682 | 14,704 | 68,030 |
| Plant fuel | 2,713 | 4,581 | 5,179 | 12,000 | 18,607 | 18,802 | 19,382 | 10,312 | 7,647 | 7,325 | | | 106,548 |
| Gasoline enrichment | 23,542 | 26,912 | 26,482 | 16,412 | 17,957 | 18,509 | 14,712 | 13,820 | 17,548 | 25,650 | 25,012 | 10,286 | 236,842 |
| Sales— | | | | | | | | | | | | | |
| British Columbia | 21,748 | 17,709 | 26,616 | 15,029 | 10,175 | 13,275 | 6,085 | 12,727 | 26,128 | 32,519 | 22,625 | 27,990 | 232,626 |
| Alberta | | 3,594 | | | 292 | | 145 | 507 | 2,921 | | | | 7,459 |
| Export | 8,707 | 2,300 | | 7,766 | 16,328 | 12,506 | 13,445 | 16,265 | 6,244 | 9,216 | 10,813 | 8,382 | 111,972 |
| Total sales | 30,455 | 23,603 | 26,616 | 22,795 | 26,795 | 25,781 | 19,675 | 29,499 | 35,293 | 41,735 | 33,438 | 36,372 | 352,057 |
| Closing inventory | 11,390 | 13,544 | 16,168 | 19,100 | 14,709 | 9,717 | 12,717 | 15,787 | 23,663 | 15,928 | 17,904 | 20,376 | 20,376 |
| *Propane* | | | | | | | | | | | | | |
| Production (bbl.)— | | | | | | | | | | | | | |
| Plant | 36,210 | 35,072 | 34,197 | 33,055 | 35,979 | 35,753 | 34,253 | 27,847 | 30,717 | 37,522 | 35,622 | 36,831 | 413,058 |
| Refinery | 26,517 | 23,433 | 30,073 | 27,821 | 27,547 | 26,946 | 27,174 | 27,808 | 21,866 | 30,141 | 30,862 | 26,058 | 326,246 |
| Opening inventory | 19,294 | 18,350 | 14,748 | 13,157 | 18,038 | 15,734 | 16,049 | 16,334 | 20,088 | 18,728 | 17,902 | 20,231 | 19,294 |
| Plant fuel | 911 | | 2,986 | 616 | 917 | | | | | | | | 5,430 |
| Losses and adjustments | 2,885 | −2,738 | 5,158 | 2,562 | 3,490 | 1,898 | 1,543 | −4 | 1,642 | 250 | −2,271 | −3,114 | 11,301 |
| Gasoline enrichment | | | | | | | | | | | | | |
| Sales in— | | | | | | | | | | | | | |
| British Columbia | 54,858 | 52,370 | 50,920 | 41,808 | 41,690 | 42,701 | 36,662 | 39,571 | 37,241 | 55,165 | 61,684 | 60,892 | 575,562 |
| Alberta | 2,355 | 5,404 | 1,553 | 1,462 | 2,817 | 1,936 | 1,009 | 997 | 1,649 | 74 | 161 | | 19,417 |
| Northwest Territories | | | | | | | | | | | | | |
| Yukon | | 1,554 | 653 | 1,785 | 1,074 | 1,523 | 594 | | | | | | 7,183 |
| Export sales— | | | | | | | | | | | | | |
| United States | 421 | 1,910 | 1,645 | 2,130 | 904 | 892 | 203 | 720 | 1,326 | 207 | 1,704 | | 12,062 |
| Offshore | 2,241 | 3,607 | 2,946 | 5,632 | 14,938 | 13,434 | 21,131 | 10,617 | 12,085 | 12,793 | 2,877 | 2,877 | 105,178 |
| Total sales | 59,875 | 64,845 | 57,717 | 52,817 | 61,423 | 60,486 | 59,599 | 51,905 | 52,301 | 68,239 | 66,426 | 63,769 | 719,402 |
| Closing inventory | 18,350 | 14,748 | 13,157 | 18,038 | 15,734 | 16,049 | 16,334 | 20,088 | 18,728 | 17,902 | 20,231 | 22,465 | 22,465 |
| *Sulphur* | | | | | | | | | | | | | |
| Production (long tons) | 5,851 | 4,861 | 5,367 | 4,964 | 2,720 | 2,386 | 3,606 | 3,737 | 3,024 | 3,862 | 3,904 | 4,343 | 48,625 |
| Opening inventory | 35,787 | 37,533 | 38,130 | 33,853 | 33,958 | 27,490 | 27,343 | 29,146 | 29,760 | 31,555 | 34,181 | 36,371 | 35,787 |
| Losses and adjustments | | | | | | | | | | | | 27 | 27 |
| Sales— | | | | | | | | | | | | | |
| British Columbia | 149 | 48 | 255 | 313 | 128 | 271 | 115 | 64 | 124 | 207 | 140 | 130 | 1,944 |
| Export | 3,956 | 4,216 | 9,389 | 4,546 | 9,060 | 2,262 | 1,688 | 3,059 | 1,105 | 1,029 | 1,574 | 8,993 | 50,877 |
| Total sales | 4,105 | 4,264 | 9,644 | 4,859 | 9,188 | 2,533 | 1,803 | 3,123 | 1,229 | 1,236 | 1,714 | 9,123 | 52,821 |
| Closing inventory | 37,533 | 38,130 | 33,853 | 33,958 | 27,490 | 27,343 | 29,146 | 29,760 | 31,555 | 34,181 | 36,371 | 31,564 | 31,564 |

NOTE.—December sales include accrued sales of 3,000 long tons.
Sales of sulphur are reported in this table in long tons. Sales in short tons, 59,160.

TABLE 33.—MONTHLY GROSS VALUES OF CRUDE OIL, NATURAL GAS, NATURAL-GAS LIQUIDS, AND SULPHUR TO PRODUCERS, 1967

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crude petroleum | $3,409,272 | $3,114,681 | $3,682,161 | $3,320,255 | $3,711,676 | $3,951,290 | $3,981,364 | $3,825,227 | $3,925,219 | $3,960,082 | $3,914,000 | $4,045,633 | $44,840,860 |
| Natural gas | 1,997,206 | 1,810,992 | 2,063,575 | 1,953,325 | 1,777,678 | 1,385,035 | 1,468,122 | 1,689,521 | 1,611,524 | 1,890,159 | 1,962,061 | 2,057,938 | 21,667,136 |
| Products— | | | | | | | | | | | | | |
| Natural-gas liquids[1] | $46,466 | $40,270 | $42,569 | $47,458 | $54,993 | $54,994 | $50,175 | $51,332 | $46,369 | $51,472 | $47,042 | $52,662 | $585,802 |
| Sulphur | 6,075 | 5,082 | 6,390 | 5,995 | 3,043 | 2,400 | 4,026 | 4,079 | 3,207 | 4,151 | 4,398 | 5,105 | 53,951 |
| Total products | $52,541 | $45,352 | $48,959 | $53,453 | $58,036 | $57,394 | $54,201 | $55,411 | $49,576 | $55,623 | $51,440 | $57,767 | $639,753 |
| Total value | $5,459,019 | $4,971,025 | $5,794,695 | $5,327,033 | $5,547,390 | $5,393,719 | $5,503,687 | $5,570,159 | $5,586,319 | $5,905,864 | $5,927,501 | $6,161,338 | $67,147,749 |

[1] Includes condensate, pentanes plus, propane, and butane, but does not include petroleum from Boundary Lake Gas Conservation Plant, which is included under "crude petroleum" sales values.

NOTE.—This statement includes amendments received up to June 27, 1968.

TABLE 34.—CRUDE-OIL PIPE-LINES, 1967

| Company | Fields Served | Size and Mileage of Main and Lateral Lines | | Pumping-stations | | Present Capacity (Bbl./Day) | Gathering Mileage | Throughput (Bbl./Day) | Storage Capacity (Bbl.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Size (In.) | Mileage | Number | Capacity (Bbl./Day) | | | | |
| B.C. Oil Transmission Co. Ltd. | Aitken Creek, Blueberry | 12¾ | 2.2 | 1 | 12,000 | 12,000 | 37.4 | 3,350 | 74,800 |
| | | 8⅝ | 62.8 | | | | | | |
| | Inga | 6⅝ | 1.7 | 1 | 6,000 | 4,000 | — | — | 1,000 |
| Trans-Prairie Pipelines (B.C.) Ltd. | Beatton River, Beatton River West, Boundary Lake, Bulrush, Currant, Milligan Creek, Osprey, Peejay, Weasel, Wildmint, Willow, Wolf | 4½ | 45.6 | 1 | 36,000 | 52,000[1] | 74.3 | 53,368 | 160,000 |
| | | 6⅝ | 24.3 | 2 | 45,000 | 45,000[2] | | | |
| | | 8⅝ | 103.0 | | | | | | |
| | | 12¾ | 39.0 | | | | | | |
| Western Pacific Products and Crude Oil Pipelines Ltd. | | 12 | 505.0 | 12 | 64,000 | 64,000 | — | 48,672 | 586,000 |

[1] Boundary Lake.
[2] Terminal to Western Pacific Products and Crude Oil line.

TABLE 35.—CRUDE-OIL REFINERIES, 1967

| Name | Location of Refinery | Type of Refinery | Year of First Operation | Source of Crude | Crude-oil Capacity (Bbl. per Calendar Day) | Storage Capacity (Bbl.) | Cracking-plant Units | Cracking Capacity (Bbl. per Calendar Day) | Other Units |
|---|---|---|---|---|---|---|---|---|---|
| The British American Oil Co. Ltd. | Kamloops | Comp. | 1954 | B.C. | 5,900 | 567,000 | Catalytic-fluid | 1,900 | Catalytic polymerization, catalytic reformer, distillate desulphurization, naphtha desulphurization, merox. |
| The British American Oil Co. Ltd. | Port Moody | Comp. | 1958 | B.C. and Alberta | 18,000 | 1,500,000 | Catalytic-fluid | 8,480 | Catalytic reformer, distillate desulphurization, alkalation-sulphuric acid, naphtha desulphurization, merox. |
| Chevron Canada Ltd. | North Burnaby | Comp. | 1936 | B.C. and Alberta | 18,000 | 1,604,400 | Catalytic-fluid | 8,100 | Catalytic polymerization, catalytic reformer, lube-oil blending plant, asphalt. |
| Imperial Oil Enterprises Ltd. | Ioco | S.C.A. | 1915 | B.C. and Alberta | 32,000 | 2,895,000 | Catalytic-fluid | 9,000 | Catalytic polymerization, powerformer, Ioluene extraction. |
| Pacific Petroleums Ltd. | Taylor | Comp. | 1957, 1961 | B.C. | 8,500 | 700,000 | Catalytic-fluid | 3,000 | Alkylation, asphalt, pentane, splitter, platformer, unifiner, H.D.S. unit. |
| Shell Canada Limited | Shellburn | Comp. | 1932 | B.C. and Alberta | 20,000 | 2,455,300 | Catalytic-fluid | 6,000 | Catalytic polymerization, platformer, vacuum flashing, solvent fractionation distillate hydrotreater. |
| Union Oil Company of Canada Limited | Prince George | Comp. | 1967 | B.C. | 7,500 | 395,000 | — | — | Unifiner, heavy naphtha, reformer. |

Symbols: S.C.A.=Skimming, cracking, and asphalt; Comp.=complete.

## TABLE 36.—NATURAL-GAS PIPE-LINES, 1967

| Company | Source of Natural Gas | Transmission-lines | | Compressor-stations | | Present Daily Capacity (M S.C.F.) | Gathering and Distribution Lines | | Areas Served by Distributors |
|---|---|---|---|---|---|---|---|---|---|
| | | Size (In.) | Mileage | Number | Horse-power | | Size (In.) | Mileage | |
| British Columbia Hydro and Power Authority | Westcoast Transmission Co. Ltd. | 30 | 39.1 | | | | | | |
| | | 24 | 13.3 | | | | | | |
| | | 20 | 43.2 | — | — | 528,000 | — | 3,145.0 | Lower Mainland of British Columbia. |
| | | 18 | 37.3 | | | | | | |
| | | 16 | 21.1 | | | | | | |
| | | 12 | 79.8 | | | | | | |
| Columbia Natural Gas Ltd. | Alberta Natural Gas Co. Ltd. | 6 | 37.7 | — | — | 17,130 | 8 | 1.7 | Cranbrook, Fernie, Kimberley, Chapman Camp, Creston, Marysville. |
| | | 4 | 11.2 | — | — | — | 6 | 2.4 | |
| | | 3 | 27.2 | — | — | — | 4 | 7.4 | |
| | | | | | | | 3 | 13.7 | |
| | | 2 | 0.5 | — | — | — | 2 | 26.6 | |
| | | | | | | | 1¼ | 31.0 | |
| Gas Trunk Line of British Columbia Ltd. | Beg field | — | — | 1 | 1,000 | — | 16 | 27.4 | To Westcoast Transmission Co. Ltd. |
| | | | | | | | 6⅝ | 6.9 | |
| | Boundary Lake field | — | — | — | — | — | 16 | 31.4 | |
| | | | | | | | 6⅝ | 1.77 | |
| | Jedney and Bubbles field | — | — | 4 | 4,960 | — | 12¾ | 31.5 | |
| | | | | | | | 10¾ | 7.0 | |
| | Laprise Creek field | — | — | 1 | 2,160 | — | 12¾ | 23.8 | |
| | Nig Creek | — | — | — | — | — | 16 | 28.3 | |
| Inland Natural Gas Co. Ltd. | Westcoast Transmission Co. Ltd. | 12 | 152.8 | | | | 8 | 12.2 | MacKenzie, Hudson Hope, Chetwynd, Prince George, Cariboo, Okanagan, and West Kootenay areas. |
| | | 10 | 116.0 | | | | 6 | 21.0 | |
| | | 8 | 17.1 | | | | 4 | 83.5 | |
| | | 6 | 75.2 | 1 | 1,100 | 78,600 | 3 | 48.3 | |
| | | 4 | 76.3 | | | | 2 | 373.8 | |
| | | 3 | 5.4 | | | | 1½ | 20.8 | |
| | | 2 | 35.6 | | | | 1¼ | 56.9 | |
| | | 1½ | 0.1 | | | | — | — | |
| Northland Utilities (B.C.) Ltd. | Peace River Transmission | 1¼ | 3.5 | — | — | 10,900 | — | 55.0 | Dawson Creek, Pouce Coupe, and Rolla. |
| | | — | 9.5 | — | — | — | — | — | |
| Plains Western Gas & Electric Co. Ltd. | Westcoast Transmission Co. Ltd. | 6 | 0.3 | — | — | — | 4 | 10.3 | Fort St. John, Aennofield, Taylor, and Grandhaven. |
| | | 4 | 10.75 | — | — | — | 3 | 1.7 | |
| | | 3 | 5.7 | — | — | — | 2 | 27.0 | |
| | | 2 | 0.9 | — | — | — | 1¼ | 0.1 | |
| | | | | | | | 8 | 1.5 | To Westcoast Transmission Co. Ltd. |
| Sun Oil Co. Ltd. | Buick Creek field | — | — | 1 | 495 | 9,000 | 6 | 1.0 | |
| | | | | | | | 4 | 1.2 | |
| | Rigel field | — | — | — | — | 2,000 | 3½ | 1.2 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Westcoast Transmission Co. Ltd. | Alberta | 26 | 32.5 | — | — | 215,000 | — | — | To Plains Western Gas & Electric Co. Ltd., Inland Natural Gas Co., British Columbia Hydro and Power Authority, and export to United States. |
| | McMahon Plant, Taylor | 36 | 40.0 | — | — | — | — | — | |
| | | 30 | 646.6 | 10 | 156,690 | 767,000 | — | — | |
| | Alaska Highway system | — | — | — | — | — | 26<br>20<br>18<br>12¾ | 37.5<br>19.3<br>17.9<br>9.9 | |
| | Blueberry West field | — | — | — | — | — | 8⅝ | 6.7 | |
| | Boundary Lake field | — | — | — | — | — | 16 | 0.5 | |
| | Buick Creek field | — | — | — | — | — | 10¾ | 5.6 | |
| | Buick Creek East field | — | — | — | — | — | 8⅝ | 6.6 | |
| | Buick Creek West field | — | — | 1 | 1,980 | — | 20 | 16.2 | |
| | Clarke Lake field | — | — | — | — | — | 16 | 8.2 | |
| | Dawson Creek field | — | — | — | — | — | 8⅝ | 5.4 | |
| | Fort St. John field | — | — | 5 | 3,455 | — | 18<br>10¾<br>8⅝ | 7.8<br>0.9<br>0.7 | |
| | Fort St. John Southeast field | — | — | — | — | — | 12¾ | 4.0 | |
| | Fort Nelson plant | 30 | 220.75 | — | — | 325,000 | — | — | |
| | Gundy Creek field | — | — | — | — | — | 10¾ | 6.1 | |
| | Kobes-Townsend field | — | — | 1 | 6,000 | — | 12¾<br>8⅝ | 18.9<br>5.5 | |
| | Montney field | — | — | — | — | — | 4½ | 7.4 | |
| | Parkland field | — | — | — | — | — | 8⅝ | 6.6 | |
| | Red Creek field | — | — | 1 | 230 | — | 4½ | 2.9 | |
| | Rigel field | — | — | 1 | 3,400 | — | 12¾<br>10¾ | 9.6<br>10.3 | |
| | Stoddart field | — | — | — | — | — | 8⅝ | 6.3 | |
| Western Natural Gas Co. (high-pressure system) | Blueberry field | — | — | 1 | 207 | 3,000 | 6<br>4<br>3<br>2 | 2.4<br>4.6<br>10.7<br>6.2 | To Westcoast Transmission Co. Ltd. |
| Western Natural Gas Co. (low-pressure system) | Blueberry field | — | — | 1 | 1,495 | 15,000 | 10¾<br>8⅝<br>6⅝<br>4½<br>3½ | 2.7<br>4.9<br>2.8<br>0.6<br>1.6 | To Westcoast Transmission Co. Ltd. |

## Table 37.—Gas-processing Plants, 1967

| Operator | Location | Fields Served | Plant Type | Date on Stream | Plant Capacity, Thousand M S.C.F./Day | | Natural-gas Liquids | Residual Gas to— |
|---|---|---|---|---|---|---|---|---|
| | | | | | In | Out | | |
| Gas Trunk Line of British Columbia Ltd. | N.W. ¼ Sec. 10, Tp. 85, R. 14, W. of 6th M. (Boundary Lake area) | Boundary Lake | Inlet separator, M.E.A. absorption treating, condensate stabilization | 1962 | 10 | 9.5 | Condensate | Westcoast Transmission Co. Ltd. |
| Imperial Oil Ltd. | S.E. ¼ Sec. 2, Tp. 85, R. 14, W. of 6th M. | Boundary Lake | Inlet separator, M.E.A. absorption treating, glycol absorption dehydration, combined refrigeration and oil absorption natural-gas liquid recovery, distillation | 1964 | 17 | 15 | Pentanes plus propane, butane | Westcoast Transmission Co. Ltd. |
| Pacific Petroleums Ltd. | Taylor | All B.C. producing gas-fields except Parkland, Clarke Lake, Dawson Creek, and Boundary Lake | Inlet separator, M.E.A. treating dry dessicant, dehydration oil absorption, distillation | 1957 | 435 | 400 | Condensate / pentanes plus | Westcoast Transmission Co. Ltd. and Plains Western |
| Westcoast Transmission Co. Ltd. | Lot 2683, P.R.D. | Clarke Lake | Potassium carb. M.E.A. treating absorption | 1965 | 200 | 170 | | Westcoast Transmission Co. Ltd. |

## Table 38.—Sulphur Plants, 1967

| Name | Location | Raw Material | Principal Product | Date on Production | Capacity (Long Tons per Day) |
|---|---|---|---|---|---|
| Jefferson Lake Petrochemical Co. of Canada Ltd. | Taylor | Hydrogen sulphide | Sulphur | 1957 | 300 |

# Inspection of Mines

By J. W. Peck, Chief Inspector of Mines

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## LIST OF ILLUSTRATIONS

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## MINES REGULATION ACT

On March 23, 1967, the *Mines Regulation Act* became law and the *Metalliferous Mines Regulation Act* was repealed. This Act, which regulates all mines other than coal, was first established in 1897. It was rewritten in 1911, 1924, 1935, and 1948. The last amendments were in 1960.

The new Act acknowledges changes in mining technology. New rules have been made to cover use of raise platforms, friction hoisting, new-type explosives, aerial tramways, higher electrical voltage, diesel equipment underground, etc. The rules covering quarries and open pits have been greatly expanded to recognize the trend toward this type of mining. Non-destructive testing of hoisting-ropes and other gear can be requested, and incentive for its use is also provided by allowing longer rope use under certain circumstances. A new provision on noise control requires that the manager take all reasonable measures to ensure that noise levels do not exceed suitable standards. If they do exceed them, suitable protective equipment must be provided and worn by all persons affected. After July 1, 1968, rock-drilling machines used underground must be equipped with a device to give a noise attenuation satisfactory to the Chief Inspector.

Contractors as well as mine managers have been given the responsibility of enforcing the Act.

The minimum age limit for underground and open-pit face work is 18, except that 17-year-olds may be employed for purposes of training under an approved programme. The restriction against women working underground remains but has been lifted for surface employment.

## FATAL ACCIDENTS

In 1967 there were 31 fatal accidents connected with the mining industry. Of this total, 16 took place in coal mines, with 15 being killed in the April 3rd explosion in the Balmer North mine of Crows Nest Industries Limited. For mines other than coal, the 15 fatal accidents is the highest since 1964, when an equivalent number occurred. The average of fatal accidents for the past 10 years for mines other than coal is 10.7.

The following table shows the mines at which fatal accidents occurred during 1967, with comparative figures for 1966:—

| Mine or Place | Location | Number of Fatal Accidents | |
|---|---|---|---|
| | | 1967 | 1966 |
| Mines other than coal— | | | |
| Abbotsford Gravel Sales Ltd. | Matsqui | 1 | .... |
| Bralorne Mine | Bralorne | 1 | .... |
| Britannia | Britannia Beach | .... | 1 |
| Caledonia | Retallack | .... | 1 |
| Craigmont Mine | Merritt | 2 | .... |
| F.L. (Zeballos Iron Mines Limited) | Zeballos | 1 | .... |
| Glen Copper Mines Limited | Legate Creek | 1 | .... |
| Granduc | Leduc Glacier | 2 | 1 |
| Hecla | Silverton | .... | 1 |
| Jedway Iron Ore Limited | Jedway | 1 | .... |
| Jersey | Salmo | 1 | 1 |
| Mineral King Mine | Toby Creek | 1 | 1 |
| Mount Washington | Courtenay | .... | 1 |
| Old Sport (Coast Copper Mines Limited) | Port McNeill | .... | 1 |
| Penticton Gravel & Excavating Ltd. | Westbank | 1 | .... |
| Scranton (Blue Star Mines Limited) | Ainsworth | 1 | .... |
| Tasu (Wesfrob Mines Limited) | Tasu | 1 | .... |
| Texada Mine | Gillies Bay | 1 | .... |
| Coal mines— | | | |
| Balmer North | Michel | 15 | 1 |
| Balmer South | Michel | 1 | 1 |
| Bulkley Valley | Telkwa | .... | 1 |
| Totals | | 31 | 11 |

The following table classifies accidents as to cause and location:—

| Cause | Number | Location | |
|---|---|---|---|
| | | Surface | Underground |
| Vehicles— | | | |
| (a) Loss of control | 5 | 4 | 1 |
| (b) Unsafe practices | 2 | 1 | 1 |
| Explosion | 15 | .... | 15 |
| Falls of rock, coal, or gravel | 5 | 1 | 4 |
| Falls— | | | |
| (a) Lack of communication | 1 | .... | 1 |
| (b) Improper guarding | 1 | .... | 1 |
| Blasting—drilled into concealed explosives | 1 | .... | 1 |
| Drowning—inexperience | 1 | 1 | .... |
| Totals | 31 | 7 | 24 |

A description of each fatal accident follows.

*Antonio Colosimo,* aged 43, married, and employed as a miner by Crows Nest Industries Limited, was suffocated by a fall of coal in the Balmer South mine, Michel Colliery, about 5.10 p.m. on January 13, 1967.

The accident took place in No. 5 room in the No. 2 Incline district, where the coal is 45 feet thick and the pillars are extracted on the retreat. Normally the coal is mined with a continuous miner machine, but at the time of the accident the " miner " was inoperative and Colosimo and his partner had been assigned to drill a number of holes in the high side of the rib at the end of the timbers. Three holes had been completed, and Colosimo's partner was checking the rib with a bar, prior to further drilling, when a large quantity of coal fell from above burying Colosimo and trapping his partner's legs. A third workman, a shuttle-car operator who was behind the last timber set, was uninjured. Colosimo's partner received only minor injuries and was released without difficulty, but Colosimo was not found for approximately two hours, a second cave of coal having occurred before the body was uncovered. There was no sign of life when the deceased was released.

Investigation indicated that approximately 50 tons of coal had to be removed before the body of the deceased was uncovered. The body was found in the centre of the roadway about 5 feet ahead of the front set of timbers. It is not known why the deceased should have been ahead of the timber supports. Apparently the deceased's partner was unaware of the fact that he was ahead of the timber at the time of the accident. Further instructions have since been issued prohibiting workmen from advancing ahead of timber supports in pillar-extraction places.

The inquest was held in Natal on January 19, 1967. The jury returned a verdict of accidental death with no blame attached to anyone. It recommended " that all men be instructed that no man go beyond the last set in the caving pillars."

*James J. Barber,* aged 17 and employed as a shovel oiler at the Craigmont mine of Craigmont Mines Limited, was instantly killed about 11 p.m. on January 13, 1967, when a truck in which he was riding left the road leading from the stockpile to the pit. The driver was able to jump from the truck before it left the road and received only minor injuries.

The truck involved was a 35-ton Caterpillar haulage truck being driven empty from the stockpile to the pit. Apparently, prior to the accident, Barber had driven the truck for several trips. However, it was indicated that at the time of the accident the truck was being driven by the assigned driver and Barber was riding with him. According to the driver, as the truck was proceeding down the ramp of the stockpile (grade, 7 per cent), Barber placed his foot beneath the accelerator pedal causing the engine to stall. In the type of truck being driven the power steering fails to function when the engine is stopped, and thus the driver found it difficult to steer the vehicle, and it left the road and rolled approximately 300 feet down the slope of a waste dump. The driver managed to jump clear as the truck was leaving the road and suffered only bruises and abrasions. Barber, however, remained with the truck and was instantly killed. His body was found approximately 100 feet above the truck.

Investigation of the accident scene indicated that the truck travelled approximately 460 feet from the bottom of the ramp to the point where it left the road. There was no indication of the brakes having been applied during the travel of this distance. The roadway was approximately level from the bottom of the ramp to the point where the truck left the road.

Regulations prohibit unauthorized operation of equipment and unauthorized riding in vehicles. The deceased was neither authorized to operate the truck involved in the accident nor was he authorized to ride in it. Regulations also forbid " horseplay."

The inquest was held at Merritt on February 1, 1967. A verdict of accidental death was returned with no blame attached to anyone. The jury recommended that company rules be more strictly enforced.

*Robert Gerald Logan,* aged 35, married, and employed as a scraperman by Aetna Investment Corporation Limited, was instantly killed at the Mineral King mine by a fall of rock at about 10.30 a.m. on February 20, 1967.

The accident took place in No. 55A stope. This was an open stope approximately 60 feet wide, at 60 degrees, and with the back over 100 feet high. On the day of the accident, Logan was operating a slusher hoist while two miners were working, above and to the side, in the same stope. At the time of the accident, Logan was, apparently, climbing a pile of muck, with the intention of changing the haul-back pulley, when a quantity of rock fell from above and struck him. Immediately prior to this, the two miners, who were drilling a pillar at the time, heard a loud crack and noted that a large quantity of rock fell from the wall of the stope across from where they were working. Because of the dust created, Logan could not be seen, but when no reply was received from their shouts the two miners went down to investigate. Logan was found lying on the rock pile with a large rock on his head and one or two other rocks on his left arm. There was no sign of life, but assistance was summoned and an acting shiftboss, trained in first aid, arrived on the scene with first-aid supplies. However, on examining the body, he could find no sign of life.

Investigation indicated that rock bolts had been used in 55A stope and that one rock bolt, probably put in six years previously, was in the portion of ground that fell. This portion of ground was estimated to be about 40 feet in length. A short time prior to the fall of rock, the two miners had checked the wall with their lights but failed to find any cracks. At about 9.30 a.m. on the day of the accident, the shiftboss had checked the walls of the stope and was of the opinion that they were safe. This checking was also done with his lamp. Also, at about 9.30 a.m. on the same day, the walls of the stope had been examined by the mine foreman and found by him to be secure. It was indicated that some cracks existed in the walls of the pillar that the two miners were drilling, and this, apparently, was one of the reasons the pillar was being drilled preparatory to blasting. However, as investigation revealed no apparent change in this portion of ground after the accident, it would seem that the condition of the pillar had no direct bearing on the cause of the rock fall.

The inquest was held at Invermere on March 3, 1967. The jury found that the deceased came to his death accidentally when crushed by a fall of rock with no blame attached to anyone, but recommended:—

" When removing unsafe rocks a skilled team only be employed in the working place until the removal of the rocks, etc., is removed.

" Further installation of bolts be checked by supervisory personnel so as to ensure proper sound installation."

*David Jerome Mitchell,* aged 39, married, and employed as a miner by R. F. Fry and Associates, was fatally injured at the Craigmont mine on March 30, 1967, at about 3.15 p.m. when a Scoot-Crete mobile ore-carrier he was operating plunged into the 796 waste-pass on 3339 level. His body was recovered about 50 feet below 3339 level and under the Scoot-Crete.

The inquest jury found that the deceased met his death from multiple injuries received when the Scoot-Crete he was operating ran over a bumper block and fell down a raise. No blame was attached to anyone but the jury recommended " that muck and rock around the bumper block be cleaned regularly."

The stop or bumper block in question was of timber and 10 inches high. About 5 inches of this block was exposed. Testimony at the inquest revealed that this normally would be enough to stop a Scoot-Crete while dumping. There is also a laced timber curtain which hangs vertically down above the dump block, and this must be pushed back by the Scoot-Crete when dumping. Since the accident, another timber has been placed across the throat of the raise to prevent any dumping machine from going down the raise if it should go over the dump block.

*Thomas John Howe,* aged 37, married, and employed as a tractor operator for Granduc Operating Company, died of suffocation on April 12, 1967, by being smothered in ice and snow after the D-7 Caterpillar tractor he was operating in the Chute section of the Leduc road fell into an ice crevasse in Frank Mackie Glacier near Stewart.

Howe was employed keeping open the winter access road across the glacier to the Leduc camp. On the day of the accident he was working alone endeavouring to make a diversion in the steep Chute section of the road and in an area that had not been examined for possible crevasses below the surface snow. The tractor apparently broke through the surface crust and dropped into a crevasse. The accompanying ice and snow falling with the tractor packed tightly around Howe, who was in a jack-knifed position in the operator's seat. He apparently suffocated without being able to free himself.

The inquest jury made the following recommendations:—

(1) Discontinue the use of tractors on the Chute area of the Frank Mackie Glacier.

(2) All work on the glacier operations should be conducted with a minimum work team of two individuals.

(3) Tractors or equipment on ice operations should work in pairs within sight of one another.

*Raymond Norris Foster,* aged 34, married, and employed as a front-end loader operator by Abbotsford Gravel Sales Ltd., was suffocated on April 19, 1967, when buried by caving gravel in the company's pit at the south end of Clearbrook Road, Municipality of Matsqui.

The extraction of gravel from this pit is normally done with a Sauerman scraper, but as this equipment was under repair, two shifts were employed daily using a Hough front-end loader to transport gravel to the conveyor feed-hopper. At about 9.15 p.m. Foster, who had been at the processing plant, returned to the east face of the pit to continue supplying pit-run gravel to the feed-hopper. About 20 minutes later when the conveyor was running empty, Foster's partner went to the pit face to investigate. He saw the front-end loader parked about 25 feet out from the pit face, and the loader headlights showed a considerable amount of sloughed material between it and the face. As Foster was not seen, his helper immediately got the assistance of two others. On moving the loader back, Foster's body was found next to the bucket; about 1½ feet of sandy gravel was under him and 10 inches of the same material covered him.

A survey of the pit face after the accident indicated the vertical height of the pit face was 49 feet and it was sloped at 72 degrees. Foster's body was found 48 feet horizontally away from the line of the pit rim. Careful examination of the sloughed material did not reveal any roots or large stones which might have induced Foster to get off the loader. No explanation can be given as to why he was between the loader and the pit face. Had he remained in the driving seat, it is highly unlikely he would have been endangered at the pit face.

The inquest was held in Matsqui on May 16th, at which time the jury's verdict was accidental death by suffocation caused by pressure of gravel on the chest of the deceaesd. The following rider was attached:—

" Whereas no regulations were broken under the *Mines Regulation Act,* we do recommend that employees receive regular safety instructions from the employers."

*Francis Edward Murray,* aged 43, married, and employed as an equipment operator at Penticton Gravel & Excavating Ltd., was fatally injured on July 19, 1967, when a front-end loader he was operating left a road and overturned.

There were no witnesses. It was the end of the day shift in the Westbank gravel pit of Penticton Gravel & Excavating Ltd., and Murray was driving a Hough, Model HO, front-end loader from the gravel pit down an access road to the machine-shop, where it was customary to park the equipment at the end of each shift. A reconstruction of the accident would indicate the loader was permitted to travel to the left of the road, where the wheels mounted the ascending gravel bank, then a turn was partially made for the machine to run diagonally across the road, which was 17 feet wide, to the right. At this point it descended the 8-foot drop to crash into a parked D-4 Caterpillar tractor.

Several workers were immediately on the scene, and Murray was found still in the cab on the driver's seat but crushed between the tractor and the loader, which had now come to rest on its side. He was released and transported to the Penticton hospital. Medical evidence suggested death was instantaneous and due to multiple injuries, most severe of which was a fracture of the upper cervical spine with compression of the spinal cord and antusion of the brain, which would cause respiratory paralysis. There was no autopsy evidence to suggest cause for the accident.

A check by a qualified mechanic of the loader gave no mechanical reason for the accident. No inquest was held, but the Coroner conducted an inquiry and made a statement as follows:—

" In my opinion, F. E. Murray died July 19th, 1967, at approximately 4:30 p.m. Death was due to fractures and dislocations of the cervical spine with compression of the spinal cord and brain damage. Although the brake lining of one wheel was in poor condition, it was not felt that this was a factor when the loader overturned. Death was accidental with no blame attached."

*Eugene Joseph Harris,* aged 29 and employed as a prospector by Glen Copper Mines Limited, was reported missing and presumed drowned on September 29, 1967, in Zymoetz River near Terrace.

On September 28th Harris and his partner were assigned to locate and extend a claim line. He did not return to camp that evening. The following day two men working in that area reported having seen a person dressed in similar clothes to those being worn by Harris attempt to cross the Zymoetz River by wading. This person was swept off his feet and downstream before anything could be done to rescue him. No body has been found and hence no inquest has been held.

*Gary Charles Paton,* aged 22, married, and employed as a mechanic for Texada Mines Limited, was killed on October 2, 1967, as a result of falling into the Midway ore-pass on 1650 level of Texada mine.

Paton and his partner were servicing a Transloader at the Midway ore-pass dump on 1650 level. In performance of this servicing, it was necessary to use an air-powered grease gun and an air-powered wrench. In order to obtain the compressed air for these purposes, the main supply to the three-position gate control was turned off while the three-way valve was in its closed position and the forward or opening hose-line was removed. This line was then connected in turn to the grease gun and wrench, which operated by turning on the main valve and putting the three-way valve in its forward position. On completion of this work the main air valve was closed and the air hose reconnected to the gate, but the three-way valve was not moved from its forward or opening position. Paton directed his partner to operate the Transloader to check the work that had been done. After giving these instructions he moved around the Transloader and stepped onto the dump gate, at which time the partner had got into the driving-seat position, and noticing the air-line main valve was closed he then opened it. In doing this the dump gate opened as the valve was in the forward position, and Paton fell into the open ore-pass.

The Coroner's inquest was held in Powell River on November 2nd, at which time the jury brought in a verdict of accidental death with no blame attached. The following recommendations were made:—

"(1) A system of spring loaded leverage be installed to keep the door in a closed position when not in use.

"(2) Hoses on air doors should not be used for the operation of other equipment.

"(3) A suitable outlet [*sic*—" walkway "] away from the opening to the mill [*sic*—ore pass] door and/or extensions to be used at all times."

Concurrence is made to these recommendations.

*Frank Harold Kadoski,* aged 21, single, and employed as a surface labourer at the Tasu mine of Wesfrob Mines Limited, was fatally injured on November 17, 1967, when crushed between a stationary Traxcavator and a moving truck.

The deceased and two other men had been working in the dock area but were detailed to take a Traxcavator to the townsite warehouse, about 500 yards east, to move a highway trailer. On reaching the warehouse area the men were uncertain which trailer required being moved as there were others in the vicinity. The Traxcavator was stopped on a hill and close to the middle of the 16-foot-wide road, alongside of which was a trailer. The near corner of the trailer jutted into the road a distance of 5 feet. Kadoski and one of his partners stood talking behind the Traxcavator. At this same time a pick-up truck was backed down the road, stopping on the opposite side of the road to the trailer and about 15 feet from it.

Shortly after the foreman had sent Kadoski and his partners to the warehouse area, he found he had immediate need for them at the dock. He then took a nearby 5-ton flat-deck hoist-equipped truck and drove to the warehouse area to recall the men. While travelling at an estimated speed of 10 to 15 miles per hour and on turning a blind corner in the road, he looked down the hill and saw the various before-mentioned vehicles blocking the road about 100 feet ahead of him. He applied the foot-brake without apparent results, so he then applied the hand-brake. The truck skidded on the gravel, struck the rear end of the pick-up a glancing blow, and continued on to strike the Traxcavator beside which the two men were standing. One man jumped to safety beside the trailer, but Kadoski, once he was alerted to his danger, made an attempt to go toward the pick-up truck and then changed his mind to go toward the trailer, but was caught before he could do so.

The vehicles were then separated and Kadoski removed, but he died soon after. The attending doctor advised that death was by suffocation from an acute pulmonary edema caused by fractured ribs puncturing the lungs.

The foot-brake of the flat-deck truck was checked after the accident and was found to be functioning satisfactorily within operating range. It was also determined that the driver of the flat-bed truck had not operated that particular vehicle previously, but that he had driven similar air-brake-equipped vehicles before the accident.

The jury found " that Frank Harold Kadoski came to his death on November 17, 1967, at Tasu, B.C., by accidental death, with no blame attached to any party or parties involved. However, we recommend that no person, or persons, regardless of their position or authority, operate equipment, unless previously instructed in proper operation of this equipment, by a qualified instructor, i.e. vehicles or equipment, equipped with air brakes."

*Ludovic Luigi Montanaro,* aged 38 and employed as a miner in the Tide Lake adit of Granduc Mines Limited, was fatally injured on November 21, 1967, by being struck by a falling slab of rock.

The workman was scaling loose rock at the left side of the tunnel face when a large slab, which two other men had just previously tried to move, slipped out of the face, broke, and a portion fell on his back. He was removed immediately, but en route to the surface died from shock developed as a result of fractured and crushed vertebræ in the sacral and lumbar areas and from accompanying internal injuries and complications.

*Magiel Johannes Fryters,* aged 36, married, and employed as mine foreman at the Scranton mine of Blue Star Mines Limited, Ainsworth, was, on November 23, 1967, instantly killed by a blast when the rock drill on which he was working struck explosives in a missed hole at the face of 5900 level.

Fryters was helping a miner finish the drilling of a drift round of 28 holes. The drift face showed a clean break for the previous round, and no bootleg holes were seen. This face had been scaled, washed, and examined by two miners and the foreman. Blasting had been done with 1- by 8-inch Forcite, No. 6 caps (hand-crimped), tape fuse, igniter cord, and the holes were bottom-primed. The miner was having some difficulty collaring a knee hole, so Fryters assisted him by guiding the direction of the drill steel. The steel entered a misfired knee hole from the previous round and detonated some concealed explosive. The resulting blast killed Fryters and broke the miner's left leg.

The inquest held in Kaslo, January 15, 1968, found that death was accidental and recommended that machine rather than hand crimpers be used when securing detonators to safety fuse.

*Alex Sander Walker,* aged 25, married, and employed at Bralorne mine of Bralorne Pioneer Mines Limited, died on November 25, 1967, from injuries he received after falling 129 feet down a 4-foot-diameter steel-lined mill-hole in 4177-23 cut-and-fill stope.

The deceased, who had been drilling at the east end, crossed the stope, passing the open centre mill-hole, into which the west side crew was scraping ore. He climbed up the muck pile beyond the mill-hole and asked the west end crew for a loan of their stoper as his was broken. They refused as it was their intention to use it soon after. Walker remained for a couple of minutes and then backed down the muck pile. The man nearest to Walker saw him start down but turned away momentarily, and then, on looking back, saw Walker's light disappearing down the mill-hole.

Walker was removed unconscious from the chute at the bottom of the mill-hole and was delivered to the doctor within an hour of the accident. He was then taken to Bralorne hospital and from there to Lillooet hospital, where he died about 3½ hours after his fall. The doctor performing the autopsy stated the cause of death was from "shock induced by loss of blood into the lungs and chest cavity, brain injury, multiple bruises and fractures and other internal injuries, all of which are compatible with a fall from a great height."

At the inquest the jury returned the following verdict:—

"We find that Alex Sander Walker died accidentally and would like to recommend that Rule 247 (*a*), Section 23 be enforced at all times and that management make it a condition of employment."

Section 23, Rule 247 (*a*), *Mines Regulation Act* states: "The top of every mill-hole, manway, or other opening shall be kept covered or otherwise adequately protected."

*John Farkas,* aged 45, married, and employed at the Jersey mine of Canadian Exploration Limited, was killed instantly when his head was crushed under a wheel of a Scooptram on November 29, 1967.

On the day of the fatality, Farkas was repairing the starter of the Scooptram and was assisted by an apprentice who was inexperienced with the Scooptram. Farkas was lying face up on a creeper under the back end of the machine and asked the apprentice to try the starter. He assured the apprentice that it was safe to do so. The machine started successfully, but as the throttle was stuck at about three-quarters of full throttle the engine, being in first gear of reverse, developed sufficient power to overcome the emergency brakes. As the Scooptram started to move back, Farkas tried to get out but his head was crushed under a wheel.

A throttle return spring had been broken previously and was unreported by the operators.

The inquest was held in Nelson on December 13th. The jury found no blame attached to anyone, but added a rider stating that all machine defects be reported in writing and that repairs be effected without delay.

*Heinrick Viher,* aged 28, single, and employed as a blaster at the F.L. mine of Zeballos Iron Mines Limited at Zeballos, was killed in the 2440 level adit on December 7, 1967, when crushed by a surface rockslide initiated by an underground blast.

While at the portal building at 2440 level, Viher fired electrically a blast underground on the south wall of No. 4 stope. The blast, comprising 65 holes, was loaded with 1,500 pounds of 75 per cent Forcite. Viher then started to return underground to turn on the ventilating fan, and as he reached the portal, some 30 seconds after initiating the blast, he was trapped in a large slide of overburden and snow. The slide, estimated to contain 200,000 tons of rock, filled the stope when the crown pillar collapsed and also continued down the steep hillside to destroy the installations at 2440 level and on into the canyon on Blacksand Creek. Viher's body was found crushed beneath the collapsed timber and fallen rocks at the portal of 2440 level.

An examination of the mine showed that No. 4 stope had been mined through to the surface at its west end and had an opening 60 feet wide and 80 feet long. This was about 250 feet north and 250 feet higher in elevation than the 2440 portal. Underground it was found that the blast removed a 10-foot thick slice, 120 feet high and 70 feet wide, on the south side of No. 4 stope. It was also found that the remainder of the crown pillar over No. 4 stope had collapsed. Failure had taken place along a number of slips paralleling the Morod fault, which formed the west boundary of the orebody, and along a slip normal to the fault at the north end of the stope.

At the inquest the jury found that the deceased " came to his death . . . by being fatally crushed by a rockslide after an underground blast. No blame attached to anyone."

*John Sydney Muncey*, aged 30, married, and employed as pit supervisor at Jedway Iron Ore Limited, was instantly killed at about 11 p.m. on December 11, 1967, when he fell beneath the right track of the D-7 Caterpillar tractor he was operating on the road between the mine and mill.

The deceased and an accompanying workman were using the tractor to remove a truck from a ditch into which Muncey had previously driven it. After completing this task the workman drove the truck back to the equipment garage while Muncey intended to bring the tractor to the garage. Apparently before returning he attempted to repair the road by using the bulldozing blade attached to the tractor. Shortly thereafter the tractor was observed to be travelling down the road with no one at its controls. It was stopped and a search was made for Muncey, who was found in a badly crushed condition on the road, apparently as the result of having been run over by the tractor he had been operating.

The investigation of the accident disclosed the deceased and his assistant had been consuming intoxicating liquor prior to the accident. The autopsy report indicated a blood alcohol content of 0.15 per cent. The assistant was charged under section 23, Rule 280, of the *Mines Regulation Act* of having been under the influence of intoxicating liquor near machinery in motion. A guilty plea was entered and a fine of $75 imposed.

## THE BALMER NORTH MINE DISASTER

The following is a special report that was issued by the Chief Inspector on July 25, 1967. It included a report by L. Wardman, Senior Electrical Inspector, and V. E. Dawson, Mechanical Inspector, but that report is not included here. These Inspectors were detailed to conduct an examination of all electrical and mechanical equipment involved in the disaster. Their conclusion was that on all the equipment checked no indication of electrical arcing could be found and, therefore, the possibility of ignition from an electrical source was most improbable.

### The Time and Site

At 3.59 p.m. on Monday, April 3, 1967, an explosion occurred in the Balmer North mine of Crows Nest Industries Limited near Natal which took the lives of 15 workmen and injured 10 others. The names, ages, and occupations of the killed and injured are given in Appendix 1.

Entrance to the mine is by two rock tunnels driven parallel 150 feet apart to reach the coal seam about 1,200 feet from the portals. One portal is the intake and here was situated the main fan, offset from the axis of the tunnel. In the other or return tunnel was the main conveyor belt which carried the coal outside to a transshipping pile. When the explosion took place the blast from same travelled through the workings and out the rock tunnels destroying the surface structures such as the conveyor house, snowsheds, etc. The fan, itself, was not damaged, but of course ceased to operate because of the destruction of the electrical cables.

The explosion occurred during a change of shift. All the morning shift workmen, with the exception of two mechanics, had left the mine and a party of afternoon shift workmen, numbering 22, had just entered the return tunnel and were proceeding alongside the main conveyor belt when they were struck by the blast of the explosion. They were hurled in all directions, while another workman who was just about to enter the portal was blown over a rock dump outside the mine.

## The Rescue

The officials and workmen outside the mine immediately took advantage of the fact that the ventilation was practically stationary and that, in fact, fresh air was being drawn for a short period back into the mine by the cooling down of the explosion. They rushed into the mine and rescued 10 workmen who had been injured (one of whom died shortly afterwards in the hospital) and recovered the bodies of 11 workmen who had been killed.

There were still three men missing in the mine, and rescue operations were now organized on a large scale. Mine rescue equipment was rushed to the mine from other operations of Crows Nest Industries Limited and from the mine rescue station of the British Columbia Department of Mines and Petroleum Resources, 23 miles away, at Fernie. Three mine rescue teams were formed from trained personnel at the colliery, and the body of one of the missing men was found in the return rock tunnel by one of the first teams to enter the mine. There was considerable difficulty however in reaching the site where the two mechanics had been working owing to caved ground and concentrations of methane and carbon monoxide. Two more mine rescue teams were obtained from the Sullivan mine of Cominco Ltd., about 85 miles away, and these arrived in the evening with their equipment. Temporary fan ventilation was established to clear the rock tunnels to the destroyed overcast located 1,200 feet from the portal. From this point ventilation was re-established by rebuilding destroyed stoppings until a point was reached estimated to be about 500 feet from where the mechanics had been working. From this point the atmosphere was deadly but a determined effort by the rescue teams resulted in the finding of the bodies and they were recovered about 6.00 a.m. the following morning, 14 hours after the time of the explosion.

The response of individuals and organizations was immediate and generous. Extra doctors came from Fernie and Coleman to help the two local doctors at the nearby Michel hospital. The womenfolk of Michel and Natal assisted the local nurses and supplied bed clothes, food, etc. Mine rescue men throughout the Province offered help and standby teams were organized at the Bluebell mine, Riondel, and at Coleman Collieries, Coleman, Alberta. The Department of Mines and Petroleum Resources was, of course, involved from the outset with the District Inspector of Mines and the Mine Rescue Instructors from Fernie, Nelson, and Cranbrook, being on site quickly. The Minister and Deputy Chief Inspector of Mines also arrived early and remained throughout the rescue. Officials of Crows Nest Industries co-operated fully and all necessary resources of the colliery were used. The Civil Defence emergency truck was rushed from Nelson and was of valuable help in supplying hot meals throughout the long night. The R.C.M.P. also provided valuable service.

The mine rescue teams wore the McCaa 2-hour self contained breathing apparatus. No difficulty was experienced in any of the rescue procedures. The teams worked in one-hour relays and precautions were taken to send a coal mine-rescue man, who was familiar with the mine workings, with each of the Sullivan metal mine teams.

### THE DEAD AND INJURED

The names are listed in the appendix to Mr. Bonar's report. The two mechanics were believed to have died from the effects of burns and inhalation of fumes, while the other 13 workmen who were in the return rock tunnel died from multiple injuries. Injuries to the survivors varied from minor lacerations to severe fractures and multiple contusions. One workman required a leg amputation.

### THE INVESTIGATION

R. B. Bonar, Deputy Chief Inspector of Mines, was detailed to make an in-investigation of the explosion, while L. Wardman, Senior Inspector, Electrical-Mechanical, and V. E. Dawson, Mechanical Inspector, were required to check out all electrical and mechanical equipment involved in the explosion. The Chief Inspector visited the mine on April 4th and again on April 19th and 20th.

### THE INQUEST

The inquest was held at Natal, B.C., on April 16, 1967. The explosion which caused the deaths was stated as of unknown origin but occurring in the vicinity of continuous miner machine No. 843 which was near the gob area of No. 1 and No. 2 entries. The jury recommended " that roof heights of excavations be controlled until an adequate supply of ventilation can be directed at all times into any or all caving places in the mines, and particularly into any place where a cave in the roof had occurred, so that these areas would be free of large concentrations of methane gas at all times," and further " that stringent dust control measures be instituted, with proper regard being paid to their enforcement by Company officials, as well as Mine Inspectors."

### OBSERVATIONS

1. Roof support in this mine was mainly by rock bolts. These stood the blast of the explosion quite well. The caved areas which caused rescue problems were where timber had been used.

2. The requirement of the *Coal Mines Regulation Act* that the fan be placed in such a position it cannot be damaged by an explosion was satisfied in this case. The fan was not damaged and it was made available for rescue work within an hour after the explosion.

3. The standardization of mine rescue training in coal and metal mines and the use of competitions to stimulate this training showed up as an asset in this disaster. None of the mine rescue crews had ever worked under similar conditions before, and for the metal mine teams it was their first experience in a coal mine, yet they all conducted themselves as experienced men. Tribute must be paid to these men and all the " back-up " personnel for carrying out a dangerous rescue without a single mishap.

4. It would appear the dust explosion was suppressed by pools of water in sumps or on the floor of the entries. Stone dust barriers to stop explosions have been tried in the past without much success in the room and pillar method of mining but serious consideration should be given to water barriers as they can have a practical application.

5. The application of limestone in roadways and working places to decrease the explosion hazard was as required by the *Coal Mines Regulation Act.* The

monthly sampling and assaying of dust samples taken from roof, floor, and sides indicated such dust was incombustible. However, as all transport of coal in this mine is by conveyor belt and as the coal is friable and dusty, any explosion had a ready source of coal dust to propagate itself.

6. The rapid advance of the continuous miner machines does permit excess emissions of methane but no undue difficulty had been noted in the ventilating of the headings. In the return air stream at no time had a discernible gas cap been reported on the safety lamp.

## Conclusions

It is concurred that the source of explosion was from the gob area at the face of Nos. 1 and 2 Entries. Methane certainly accumulated there as is evident from the fact that a sample taken from there on April 27, 1967, assayed 28 per cent methane. The layering effect from this source of methane to a possible source of ignition was considered and ruled out as highly improbable. In any event, no source of ignition could be determined. All electrical equipment was found to be in good order and all machinery was idle except for two fans. No matches or cigarettes were found on any of the workmen who were killed. The two mechanics who were in the mine at the time, and who were in the path of the explosion, were replacing a hydraulic pump and there was no indication their work would have been an ignition source. Thus the opinion, as put forth by Mr. Bonar, that a fall of rock in the gob area caused an incendiary spark is the most acceptable. Caving had been reported as having occurred in the gob area. After the explosion it was observed that the roof had further caved in this gob area and this cave took with it the roof bolts which had supported the back. A fall of 40 feet could have taken place and in the right methane-air mixture the collision of any iron roof bolts would be the most probable source of ignition.

## Future Work

The following instructions were issued on April 24, 1967, to allow rehabilitation of the Balmer North mine:—

1. The abnormal amounts of visible coal-dust and debris must be loaded up and taken out of the mine. As each roadway in the mine is cleaned up a thorough coating of limestone dust must be applied.

2. The present caving area at the faces of Nos. 1, 2, and 3 entries must be sealed off without undue delay.

3. Any future pillar drawing that is contemplated must have the approval of the Chief Inspector of Mines as per section 48 of the *Coal Mines Regulation Act*.

4. To reduce the make of coal-dust from spillage and at transfer points a system of water-sprays on all belts must be introduced as far as practical.

5. A system of barriers to prevent the propagation of a coal-dust explosion must be set up in all producing sections of the mine. The type and placement of such barriers must be approved by the Chief Inspector of Mines.

6. The present system of a continuous circuit of air through the mine must be split into two sections with only two continuous miners per split—with the ultimate goal of one split per miner as soon as development of the mine permits.

7. No production of coal from any section of the mine is to be allowed until the section has been examined and approved by the District Inspector of Mines.

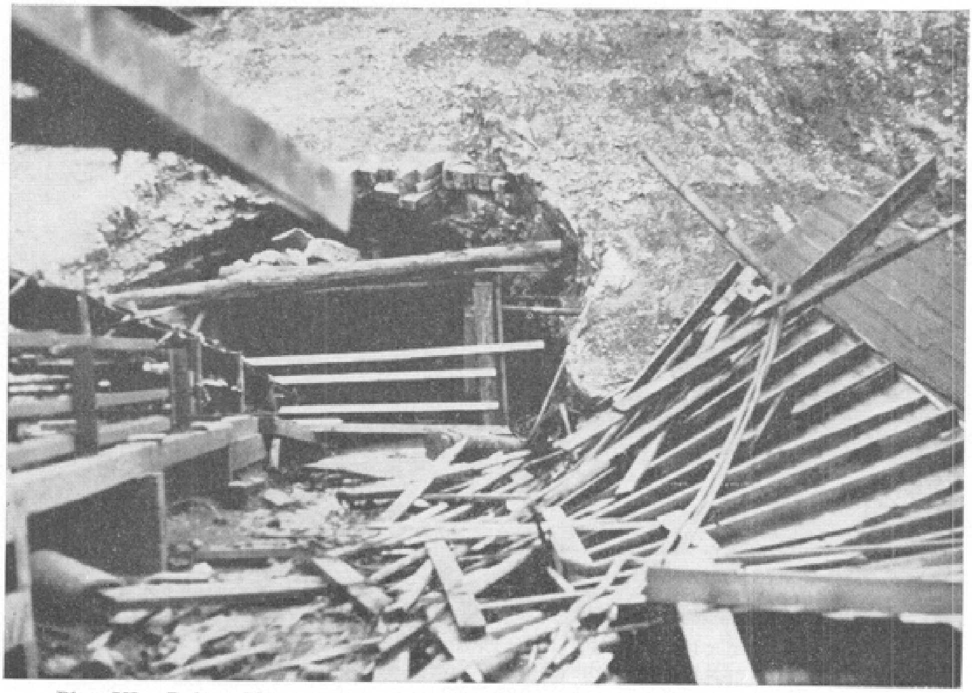

Plate XIA. Balmer North mine. Portal of No. 1 or return tunnel showing wreckage of snowshed.

Plate XIB. Balmer North mine. Portal of No. 1 tunnel showing wreckage between portal and truck-loading bin.

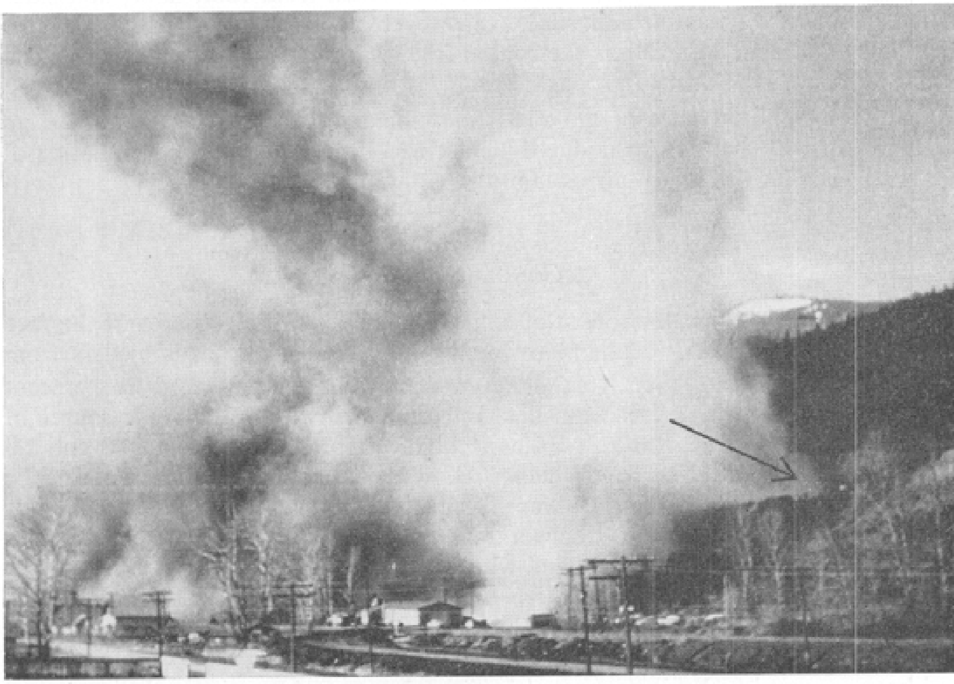

Plate XA. Balmer North mine. Photograph taken immediately after the explosion showing smoke and gases issuing from mine portals. (Courtesy of F. Mitchell.)

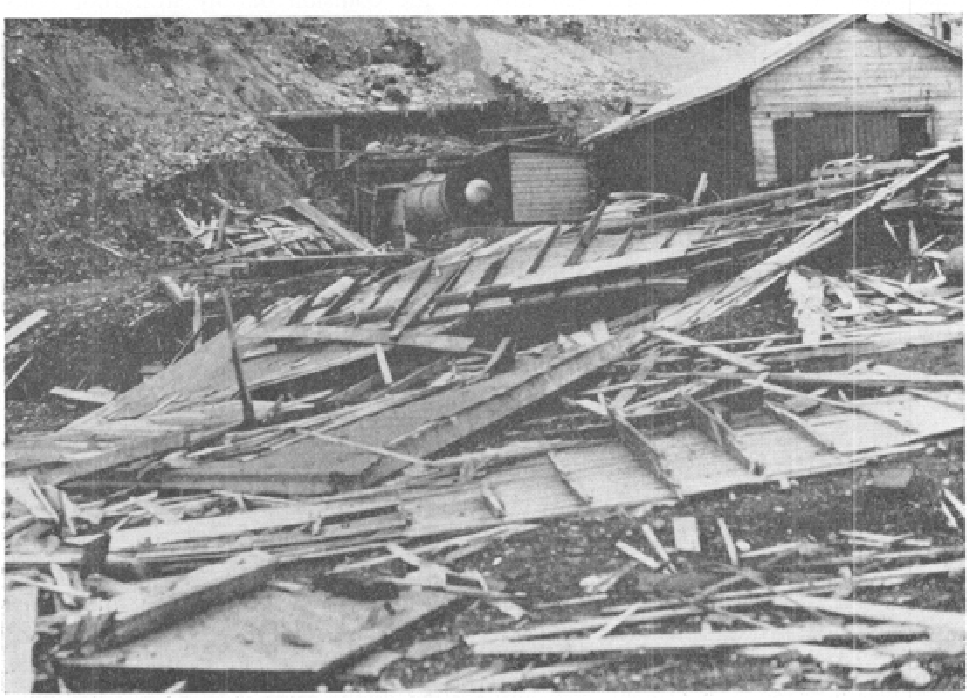

Plate XB. Balmer North mine. Portal of No. 2 or intake tunnel showing wreckage of fan-house. Fan was moved from left of portal to present position to re-establish ventilation.

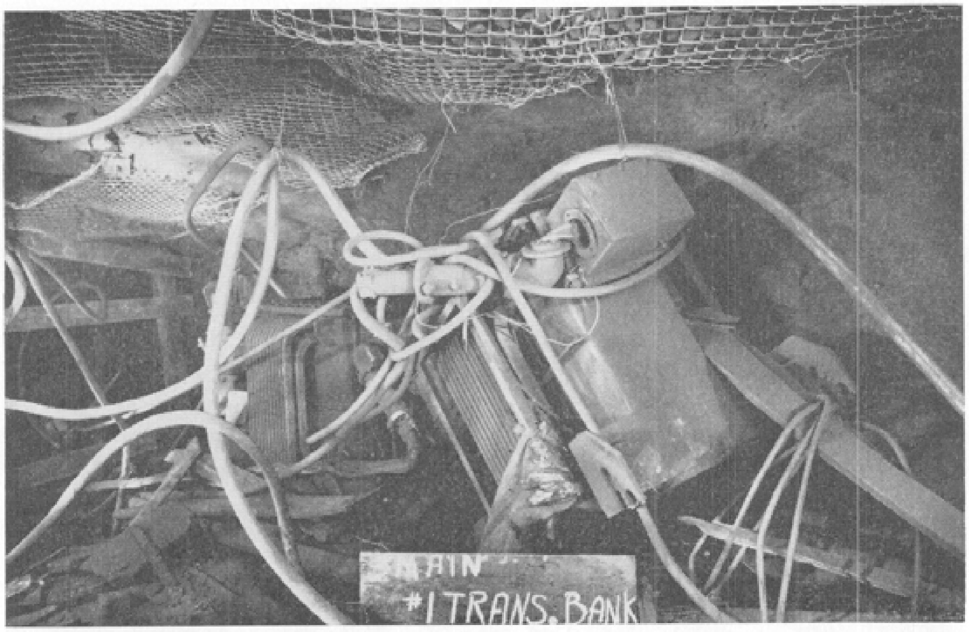


Plate XIIA. Balmer North mine. Transformer bank on No. 3 main showing force of the explosion. (Courtesy of Crows Nest Industries Limited.)

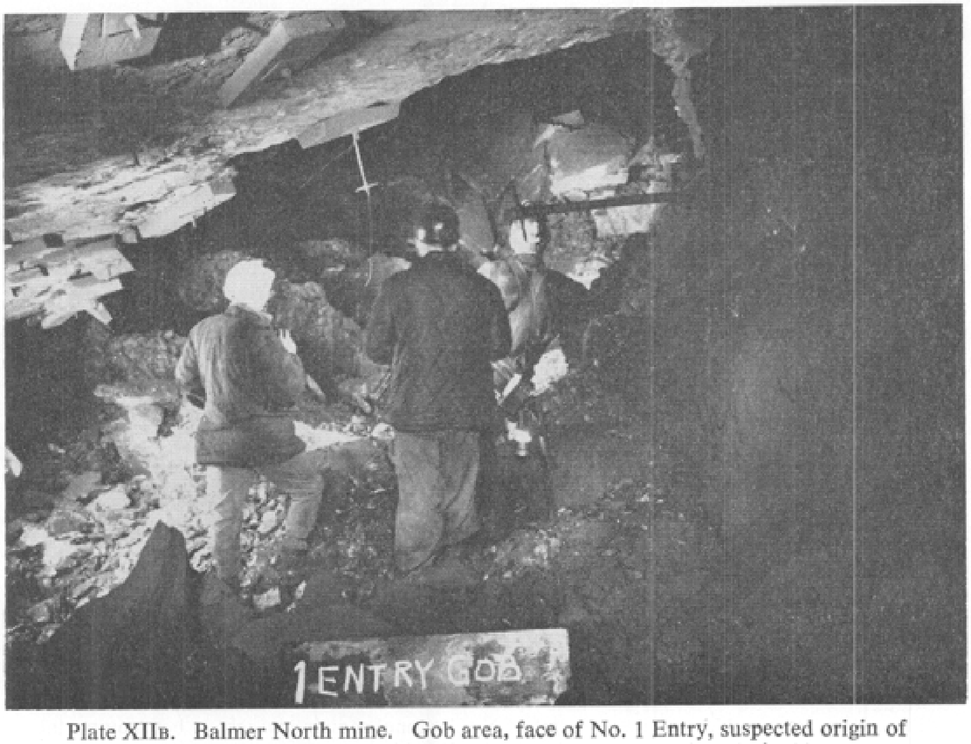


Plate XIIB. Balmer North mine. Gob area, face of No. 1 Entry, suspected origin of methane explosion. (Courtesy of Crows Nest Industries Limited.)

## Report by R. B. Bonar

### *The Mine*

The Balmer North mine, the largest producing mine at the Michel Colliery, Crows Nest Industries Limited, is a recent addition to the Colliery. The two rock tunnels forming the present intake and return were started in September, 1965, and coal production commenced in March, 1966. To date, in 15 months, a total of over 6½ miles of roadway has been driven in coal. The mine, which employed about 115 men underground, had a daily output of about 2,000 tons. The general layout of the underground workings and the ventilating system are shown on Figure 41.

The No. 10 seam in which the Balmer North mine operates is about 40 feet thick and dips at angles varying from 15 to 20 degrees in a southwesterly direction. The roof consists of medium to strong shale and in the main is roof-bolted with 7-foot bolts although timbering is required at a few places where faulting has been encountered or where soft roof conditions have been met with. The seam to date has not been considered to be exceptionally gassy although there are indications that a gassy zone is being encountered at the face of the slopes. The production comes from four continuous mining machines working in the top 12 feet of the seam. Total extraction of the seam has recently been started at the face of Nos. 1, 2, and 3 Entries by driving roads to the bottom of the seam (shown as dotted lines) and then undercutting and caving.

All workmen are equipped with electric cap lamps of approved design, and officials and continuous miner operators are issued Wolf-flame safety lamps for the purpose of detecting methane gas.

### *Investigations*

The first day of my investigation (April 17, 1967), in company with Inspector D. R. Morgan and a company official, was spent in travelling all of the mine roadways to gain an overall picture and to assess the damage to machinery, etc. Senior Electrical Inspector L. Wardman, assisted by Mechanical Inspector V. Dawson, was given the job of checking all electrical equipment. They spent four days on this duty and did not find any defect in the electrical equipment that could possibly have arced or otherwise ignited gas or dust.

The next three days were spent in determining the direction of violence and its effect on the movement and damage to equipment. Samples of dust were collected for signs of microscopic coking and all roadways were scrutinized for signs of visible coking.

The immediate area in which No. 764 continuous miner operated, Nos. 1, 2, and 3 Mains, was not considered to be gassy and as there was little or no damage evident this area can be eliminated as the source of the ignition. There were definite indications, however, that the explosion had travelled inbye along No. 6 Main piling up the belting and ancillary equipment. This wave of the explosion appeared to have stopped rather abruptly at the junction of No. 6 Main belt and in the slant belt-road leading to No. 764 continuous miner. Sections of the floor of No. 6 Main roadway were quite wet inbye No. 106 Slope and this together with the fact that the explosion was approaching a more or less dead-end may have had something to do with the quenching of the explosion in this section of the mine.

Nos. 1, 2, and 3 Entries were next examined. The hatched area at the face of Nos. 2 and 3 Entries shows the extent of the more or less total extraction of the

40-foot coal seam. There was extensive roof caving in this area with the roof of the gob perhaps 30 feet above the roof of No. 1 Entry. The ventilation came in No. 1 Entry, then short-circuited down to where the No. 843 continuous miner was located in the footwall road. This air could only ventilate the outbye area of the gob which could allow methane gas to collect in the remainder of the gob area, especially on the high side.

The electrical equipment on the No. 843 continuous miner and shuttle car, and the cables leading thereto proved, after careful examination, to be non-defective although the power to the miner had been left on.

There were signs of burning, such as severely charred vent-tube and rock-dust bags, in the roadways outbye the gob area as far as the top of the slant belt-road together with visible signs of coking on the roof and sides. Deposits of coked dust, at least one-half inch thick, were found on some of the roof-bolt cap-pieces in the slant belt-road.

Along No. 1 Entry from the slant belt-road mentioned above to No. 106 Slope it was evident that a major force had traversed outbye. Belting and heavy belt equipment were invariably moved outbye, in fact one piece of equipment, a tension pulley and frame, was moved about 30 feet. The explosion apparently moved along Nos. 1, 2, and 3 Entries to the slopes where its force was then able to move in many directions, to the left up to No. 6 Main, through the roadways connecting No. 104 and No. 103 Slopes, and to the right down the slopes to Nos. 4, 5, and 6 Entries where again it was able to spread, to the right along No. 4 Entry and to the left toward No. 101 Slope. The belt in No. 4 Entry was severely damaged for about 200 feet, then moderately damaged for another 200 feet to the tension end. From the tension end towards the face of the entry the explosion force was moderate and apparently died out as it approached the face of the three entries. The apparent movement of equipment was inbye.

Below No. 4 Entry the problem of solving definitely the direction of the explosion wave became more difficult. It is probable that the explosion in this area followed every road it could wherever it could find fuel to sustain the flame. Due to the caving of the coal roof in No. 7 Entry and to the fact that No. 860 continuous miner was under water in the dip place off No. 7 Entry, these places could not be examined at the time of the investigation. The belts in No. 101 Slope from near the bottom of the slope to the intersection of No. 1 Entry were heavily damaged. From No. 1 Entry to No. 4 Main the belt damage was moderate, then it increased down No. 3 Main to No. 1 Rock Tunnel where again the damage would be considered moderate to the portal of the tunnel.

### *Time of Explosion*

The explosion occurred perhaps a few seconds before 3.59 p.m., Mountain Standard Time, on April 3, 1967, as indicated by the time of occurrence of an electrical fault at the Elko generating plant. Subsequent examination of the 66,000-volt power line below the Balmer North mine showed that the fault was probably caused by flying debris from the wooden structures at the mine portals hitting the conductors and causing them to contact one another. A burn mark was visible on the conductor at the point of contact.

### *Conclusions*

The explosion was, without doubt, predominantly one of coal-dust, although the evidence strongly suggests that it was initiated by a prior methane explosion.

There were, in my opinion, only two places in the mine where possibly methane gas could have accumulated in sufficient quantity to be exploded and cause a dust explosion:

1. In the vicinity of No. 765 continuous miner near where two mechanics were killed.
2. In the gob area of the face of Nos. 1 and 2 Entries.

In dealing with the No. 1 place first, I would mention that the two mechanics who were killed had been ordered to change the hydraulic pump on the No. 1 Bridge conveyor which handles the coal from the No. 765 continuous miner onto the No. 6 Main belt. This work was to be done between shifts. They had replaced the pump when the explosion occurred but had not quite finished replacing the covers on the belt drive. They were found a few feet from where they had been working and had been burnt by flame.

There was no power to the bridge conveyor motor and no evidence of any attempt having been made by the two mechanics to switch on power.

The No. 765 continuous miner was being used to connect the No. 103 Slope from the cross-roadway connecting Nos. 104 and 102 Slopes to No. 1 Entry.

The inspection report of Rodger Girou, fireboss, covering this section on the morning shift, 8.00 a.m. to 4.00 p.m. on April 3, 1967, stated that the ventilation in this area was good. I questioned Mr. Girou regarding this report and he stated that his report was correct. Regarding the roadway just inbye No. 765 continuous miner (shown as caved), he stated that a small fan situated inbye on No. 104 Slope provided air to the face of this roadway via vent-tube, and that he had examined this place at about 9.00 a.m. and 1.30 p.m. and found the place to be free of gas.

The dip roadway which the No. 765 continuous miner was driving was inspected by the writer on Thursday, April 20, 1967, and, in spite of having the ventilation disrupted to the face, no indication of gas was found. The writer is of the opinion that there was no accumulation of gas in this area that could have been ignited and started a coal-dust explosion. All the electrical equipment in this area proved to be non-defective although the power was on to the continuous miner and shuttle car.

It is worthy of note that there was evidence of intense flame and coking on the ribs and roof where the No. 765 continuous miner was situated and where the two mechanics were found.

The second place where gas could accumulate was the gob area at the face of Nos. 1 and 2 Entries.

It is the writer's opinion that the short-circuiting of the air from No. 1 Entry to the lower roads wherein the continuous miner and shuttle car were working allowed gas to accumulate in the gob area. This gob area was examined by Inspector D. R. Morgan on April 27th and explosive gas was found by the use of a Wolf safety lamp. The weight of evidence as shown by the movement of equipment outbye on these roads, especially No. 1 Entry, strongly indicates that an explosion had occurred at or near the face of these entries. I am of the opinion that a fall of rock in the gob area, possibly striking a roof-bolt, caused an incendiary spark or sparks that ignited the gas in the gob which in turn initiated the coal-dust explosion.

It is evident from the signs of burning such as charred vent-tube and the coking of coal-dust to a depth of at least one-half inch that an intense flame had occurred in this area especially on the slant belt-road and that such flame had probably lasted several seconds before erupting into a detonation or causing the coal-dust to explode.

The barograph at the Colliery on the day of the explosion shows that the barometric pressure at 8.00 a.m. was 25.85 inches and at 4.00 p.m. was 25.60, a drop of 0.25 of an inch. I do not believe that this drop of 0.25 inch in eight hours would in any appreciable way have contributed to the explosion.

In addition to the visible signs of burning and coking evident at the gob area in No. 1 Entry, and where the two mechanics were found, tests of dust samples taken from the roof and sides of No. 1 Entry showed signs of microscopic coking.

As the explosion occurred approximately at the change of shifts, 13 of the men killed and the 10 injured men had only progressed via the No. 1 Tunnel into the mine varying distances up to about 500 feet. There were no signs that any of the above men had been burnt but were killed or injured by the pioneering blast from the explosion. On Figure 41 the roadway marked A-B and joining Nos. 3 and 4 Mains was used for a sump. It contained water to the depth of about 5 feet. After the explosion it was discovered that the sump had been drained dry. It is quite possible that the advance wave of the explosion had atomized this water and thus quenched the flame of the explosion if it had indeed reached that far. The killed and injured men were just about unrecognizable due to being heavily plastered with coal-dust mud.

It would seem evident that the rapid cooling of the gases in the mine after the explosion would result in a considerable suction of fresh air into the two rock tunnels. This would explain how the killed and injured in No. 1 Tunnel were able to be rescued by men without the use of mine-rescue apparatus.

There were no signs of frictional heating or of fire on any of the belt-roads.

All machinery in the mine was idle except for two fans operating in the vicinity of No. 765 continuous miner, one fan blowing air to No. 860 continuous miner off No. 7 Entry and the No. 1 Belt in No. 1 Rock Tunnel which was started by one of the men going on shift. No other belts were running.

The main fan which delivered about 135,000 cubic feet per minute against a 2½-inch water gauge was running at the time of the explosion but was not damaged due to being offset at the mouth of No. 2 Tunnel.

I would like to express my thanks to the officials of Michel Colliery for their assistance in conducting the investigation, and to my colleagues, L. Wardman, V. Dawson, and D. R. Morgan, whose assistance and constructive criticism was of great help.

*Casualties*

| Name | Age | Occupation |
|---|---|---|
| Killed— | | |
| Guido Venzie | 58 | C.M.[1] mechanic. |
| Delfie Quarin | 38 | C.M. mechanic. |
| Eric Lutzke | 38 | Shuttle car operator. |
| John Brenner | 46 | C.M. operator. |
| Michael Bryan | 64 | Faceman. |
| Hugh Hopley | 36 | Joy loader operator. |
| Ronald Freng | 31 | Faceman. |
| Walter Gibalski | 53 | Faceman. |
| Willie De Lorme | 19 | Supplyman. |
| William Cytko | 41 | C.M. mechanic. |
| August Wojtula | 42 | C.M. mechanic. |
| Anton Capeliaskas | 65 | Faceman. |
| Samuel Tolley | 53 | C.M. mechanic. |
| Eugene Lucky | 27 | C.M. mechanic. |

[1] C.M. means Continuous Miner.

*Casualties*—Continued

| Name | Age | Occupation |
|---|---|---|
| Died from injuries— | | |
| Walter Parker | 27 | C.M. operator. |
| Injured— | | |
| Robert Brown | 35 | Faceman. |
| Irwin Mitchell | 38 | C.M. operator. |
| Herbert Parsons, Jr. | 27 | C.M. operator. |
| Larion Savilow | 61 | C.M. mechanic. |
| Gerald Clarke | 55 | Faceman. |
| Earl Price | 26 | Shuttle car operator. |
| Peter Rotella | 37 | C.M. operator. |
| William Corrigan | 37 | Shuttle car operator. |
| Arthur Parsons | 24 | Faceman. |
| Robert Clegg | 38 | Faceman. |

## FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

### Mines Other than Coal*

Eight fatal accidents and 348 accidents involving a loss of more than three days' time 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 the parts of the body injured. The fourth table lists all fatal and compensable accidents which occurred in lode and coal mines over a 10-year period and relates these accidents to the number of persons employed.

*Accidents Causing Death or Injury Classified as to Cause*

| Cause | Number of Accidents | Percentage of Total |
|---|---|---|
| Atmosphere | 4 | 1.1 |
| Explosives | 3 | 0.9 |
| Falls of ground | 64 | 18.4 |
| Falls of persons | 93 | 26.7 |
| Lifting and handling material | 34 | 9.8 |
| Machinery and tools | 65 | 18.7 |
| Transportation | 48 | 13.8 |
| Miscellaneous | 37 | 10.6 |
| Totals | 348 | 100.0 |

* Except as otherwise noted.

*Accidents Causing Death or Injury Classified as to the Occupation of Those Injured*

| Occupation | Number of Accidents | Percentage of Total |
|---|---|---|
| Underground— | | |
| Chutemen | 2 | 0.6 |
| Haulagemen | 30 | 8.6 |
| Miners | 119 | 34.2 |
| Helpers | 20 | 5.7 |
| Timbermen | 6 | 1.7 |
| Mechanics, electricians, etc. | 24 | 6.9 |
| Miscellaneous | 8 | 2.3 |
| Surface— | | |
| Mechanics, electricians, repairmen | 43 | 12.4 |
| Mill and crusher workers | 24 | 6.9 |
| Carpenters | 12 | 3.5 |
| Miners and drillers | 21 | 6.0 |
| Vehicle-drivers | 16 | 4.6 |
| Miscellaneous | 23 | 6.6 |
| Totals | 348 | 100.0 |

*Accidents Causing Death or Injury Classified as to the Parts of the Body*

| Location | Number of Accidents | Percentage of Total |
|---|---|---|
| Eyes | 20 | 5.7 |
| Head, face, and neck | 26 | 7.5 |
| Trunk | 93 | 26.7 |
| Upper extremities | 84 | 24.1 |
| Lower extremities | 113 | 32.5 |
| General | 12 | 3.5 |
| Totals | 348 | 100.0 |

*Compensable[1] and Fatal Accidents Related to Persons Employed in Coal and Metal Mines*

| Year | Number of Accidents | | Number of Persons Employed | | Frequency per 1,000 Persons | |
|---|---|---|---|---|---|---|
| | Coal | Metal | Coal | Metal | Coal | Metal |
| 1958 | 214 | 396 | 1,086 | 4,353 | 197 | 91 |
| 1959 | 189 | 310 | 1,056 | 4,316 | 179 | 72 |
| 1960 | 235 | 395 | 1,182 | 4,389 | 198 | 90 |
| 1961 | 219 | 338 | 942 | 3,993 | 232 | 85 |
| 1962 | 134 | 429 | 776 | 4,872 | 173 | 88 |
| 1963 | 135 | 521 | 748 | 5,025 | 180 | 104 |
| 1964 | 134 | 547 | 713 | 5,400 | 188 | 101 |
| 1965 | 116 | 559 | 649 | 5,522 | 179 | 101 |
| 1966 | 97 | 739 | 614 | 7,722 | 158 | 96 |
| 1967 | 92 | 688 | 457 | 6,497 | 201 | 106 |

[1] Compensable accident means an injury causing a loss of more than three days' work not including the day of the accident.

## DANGEROUS OCCURRENCES

Forty-three dangerous occurrences were reported as required by section 9 of the *Mines Regulation Act* and were investigated by the Inspectors of Mines. This compares with 33 reported for 1966.

Of these occurrences, 10 involved surface vehicles, six each were connected with fires and with explosives, seven with hoisting, three each with runs of muck and falls of ground, two each with snowslides, electricity, and with pneumatic pressure equipment, and one each with a flood and with the mooring of a placer dredge on the Fraser River.

On January 5, 1967, at a Stewart workshop of Granduc Operating Company, an electrically operated heater burst into flames. The ensuing fire destroyed the workshop and an attached hangar.

On January 14, 1967, at the Tide Lake camp of Granduc Operating Company, two men were buried in snow which slid off the roof of a building on which they were removing snow.

On February 8, 1967, at Summit Lake between Stewart and Tide Lake camp of Granduc Operating Company, a man was buried in a snowslide which had been induced by an Avalauncher.

On February 15, 1967, at the waste dump of Bethlehem Copper Corporation, because of improper driving and dumping procedure a truck mounted the safety berm and rolled 200 feet down the embankment.

On February 16, 1967, at the compressor-house of Zeballos Iron Mines Limited, one man was injured when a rotary compressor inlet-valve casing was shattered by an explosion of overheated oil-laden air within the compressor. The incident was primarily due to a failure in the cooling oil circulation system which allowed the air temperature to rise above normal maximum value.

On March 8, 1967, at Empire Development Company Limited, both skips ran back on a jig-back type aerial tramway when the hauling-rope socket attachment failed.

On March 9, 1967, the cage-track limit switch in the inclined No. 4 shaft at the Britannia mine of The Anaconda Company (Canada) Ltd. failed to function while under test. It was found that the track and hoist limit-switch circuits had both been wired to the backout-switch circuit, which had been placed in neutral position for the test.

On March 30, 1967, at the F.L. mine of Zeballos Iron Mines Limited, two men were injured by an explosion when they apparently drilled into concealed explosives in the face of a drift.

On April 11, 1967, at the Bethlehem mine of Bethlehem Copper Corporation Ltd., a piece of fly-rock from a blast in the mill extension excavation caused minor damage to the lime silo at the west entrance to the mill.

On April 21, 1967, at Empire Development Company Limited, a skip and its carriage jumped off the rope on a jig-back type of aerial tramway just after having dumped its load of ore.

On April 21, 1967, on placer-mining lease No. 726 on the Fraser River, three men were marooned for three days on a partially submerged suction-dredge barge when the strong current overcame the winch controls and swept the barge down the river.

On April 24, 1967, the drum flange of No. 3 shaft at the Reeves MacDonald mine of Reeves MacDonald Mines Limited was damaged when the drum holding the safety sprag was accidentally engaged while the hoist was in motion.

On May 1, 1967, at the mine of Jedway Iron Ore Limited, a truck repair-shed was destroyed by a fire started by an overheated oil stove.

On May 2, 1967, at the Alice Arm property of British Columbia Molybdenum Limited, the operator of a P & H crane was injured as it overturned when he drove it off the road at a corner.

On May 30, 1967, at Empire Development Company Limited, an empty skip and its carriage jumped off the track on a jig-back aerial tramway while making the return trip.

On June 16, 1967, two men working in the Tide Lake tunnel of Granduc Operating Company were injured by a fall of rock from the tunnel back.

On June 27, 1967, at the Texada mine of Texada Mines Ltd., two men were injured by an explosion when they accidentally drilled into concealed explosives in a drift face.

On July 8, 1967, at the Tasu pit of Wesfrob Mines Limited, a 30-ton ore truck backed over the berm and rolled down the waste dump. The driver advised the accelerator pedal had stuck and there was insufficient time to apply the brakes.

On July 16, 1967, the driver of a 30-ton Euclid truck at Jedway Iron Ore Limited received head injuries when he backed the truck over the waste dump as the berm was not sufficiently high to stop the truck.

On July 19, 1967, at the mine of Jedway Iron Ore Limited, a 35-ton Haulpak truck went off the road and overturned when the universal-joint connecting bolts severed, resulting in complete loss of braking as the retarder no longer functioned and the rotating broken end of the drive-shaft severed all air-braking connections.

On July 19, 1967, at the Granisle mine of Granisle Copper Limited, a truck-driver received an electric shock and burns to his right ear lobe when the dump box of the truck on which he was working touched a 4,160-volt overhead line.

On July 21, 1967, at the Tasu mine of Wesfrob Mines Limited, fly-rock from a pit blast hit a conveyor gallery while one rock went through the pit garage.

On July 30, 1967, a large rock fall in the Alice Arm open pit of British Columbia Molybdenum Limited damaged an Airtrac drill.

On July 31, 1967, in No. 8 shaft, Britannia mine of The Anaconda Company (Canada) Ltd., the safety dogs of a descending cage engaged because of slack rope developing when the cage had been retarded by some form of restriction in the shaft guides.

On August 4, 1967, at the Alice Arm mine of British Columbia Molybdenum Limited, extensive damage was caused to a personnel vehicle when it was struck by a falling tree as it was travelling in a power-line slashing area.

On August 10, 1967, at the Endako open-pit mine of Endako Mines Ltd., a truck was damaged by fly-rock from a reblasted hole 1,700 feet away. Three attempts had been made by washing to remove the AN/FO charge prior to re-blasting.

On August 17, 1967, at the Tasu mine of Wesfrob Mines Limited, the driver of a Haulpak truck was injured when it ran over a berm and down a 30-foot-high bench. The driver advised that the engine had stalled and he did not have adequate time to energize the auxiliary power steering before the truck went over the bank.

On September 10, 1967, at the Endako open-pit mine of Endako Mines Ltd., a haulage truck was partially buried and its driver slightly injured when caught in the caving of a wall.

On September 28, 1967, at the Lornex mine of Lornex Mining Corporation Ltd., a fire destroyed the trailer section of the assay laboratory. It is believed the fire was started by spontaneous combustion of perchloric acid fumes in contact with some organic substance.

On October 4, 1967, at the open pit of Cassiar Asbestos Corporation Limited, two men were slightly injured when the loaded ore truck in which they were riding skidded off the road and overturned. The skidding was caused by the application of the Maxi emergency brake when the normal air-braking system had failed because of frozen valves.

On October 12, 1967, at Boss Mountain mine of Brynnor Mines Limited, a miner was lighting a drift round with igniter cord when he was slightly injured by a nearby blast he had initiated immediately prior to lighting the drift round. No satisfactory explanation could be made as to why the shot exploded as soon as it did.

On October 14, 1967, at the Bralorne mine of Bralorne Pioneer Mines Limited, two men received minor injuries when they were partially buried by a run of wet muck when a bulkhead was washed out at the 3500 level loading-pocket.

On October 16, 1967, at the Pride of Emory mine of Giant Mascot Mines Limited, a miner was seriously injured in a run of rock when he ventured into a drawhole shortly after having blasted in it.

On October 23, 1967, at the Alice Arm property of British Columbia Molybdenum Limited, an unattended oil stove exploded and the resulting fire destroyed a combined stores and lunchroom shack at the open pit.

On October 27, 1967, at the Old Sport mine of Coast Copper Company Limited, a workman suffered slight injury when he was buried in muck in an ore-pocket on 5600 level.

On October 31, 1967, following a heavy rain, the townsite at Britannia mine was flooded when Mineral Creek was diverted from its channel by the blocking of a culvert.

On November 21, 1967, a man was slightly injured in the Britannia mill of The Anaconda Company (Canada) Ltd. by the explosion of a pressure vessel while compressed air was being used to fill it with pine oil. The vessel, which had not been constructed in accordance with C.S.A. code standards, ruptured where the flat end plates were attached to the cylindrical body.

On November 22, 1967, at the Alice Arm property of British Columbia Molybdenum Limited, a fire started in a drum of phosphorus pentasulphide as a workman was removing some of the chemical from the drum.

On November 30, 1967, at the Alice Arm property of British Columbia Molybdenum Limited, the driver of a 35-ton Haulpak truck was injured when his truck slid off a slush-covered road and down an embankment.

On December 12, 1967, at the Lornex mine of Lornex Mining Corporation Ltd., the skip froze to the guides at the shaft collar and a kink developed in the slack hoist rope as the empty skip fell.

On December 17, 1967, at the Britannia mine of The Anaconda Company (Canada) Ltd., an electrician received burns to his right hand when, because of poor footing, he lost his balance and touched an energized 6,900-volt circuit in the main switch vault.

On December 17, 1967, at the Endako mine of Endako Mines Limited, an empty ore truck and a D-8 tractor had a head-on collision.

On December 21, 1967, at Tasu mine of Wesfrob Mines Limited, a fire which started in the mill cobbing plant destroyed a considerable amount of conveyor belting in the concentrating and crushing plants.

## Coal

There were no bumps or outbursts in 1967, but four dangerous occurrences were reported as required by section 59 of the *Coal Mines Regulation Act.* One involved a fire, but the other three were due to the use of electricity.

On January 5, 1967, at Balmer No. 1 mine, Michel Colliery, an electric flash occurred from the trailing cable to the continuous miner machine. This shut off the power and the cable was then replaced.

On June 16, 1967, at "C" North mine, Michel Colliery, an electric flash occurred when the trailing cable of a shuttle car jammed between the lever winding device and the cable reel.

On October 5, 1967, at the Balmer North mine, Michel Colliery, open electric sparking occurred when the trailing cable of a shuttle car became jammed between the cable reel and the support frame for the main circuit-breaker enclosure, thus baring one conductor.

On October 9, 1967, at Balmer No. 1 mine, Michel Colliery, abnormal carbon monoxide indications were observed in the return air from the mine workings which extend below the adit level. These workings had been idle for several months and thus spontaneous heating was suspected. The area was sealed by a mine-rescue team and the workings were then flooded.

## PROSECUTIONS

Four prosecutions were instituted under the *Metalliferous Mines Regulation Act* and two under the *Mines Regulation Act*. There were none under the *Coal Mines Regulation Act*.

The manager of Lillooet Mercury Mines Ltd. was charged under section 23, Rules 24 and 28, of the *Metalliferous Mines Regulation Act* for erecting an unapproved explosives magazine and for allowing an explosives magazine to be left unattended and unlocked on a mining property. A hearing was held at Lillooet on January 12, 1967, at which time the defendant pleaded guilty and was fined $10 on each charge.

The manager of the Midnight mine of Cinola Mines Ltd., near Rossland, was charged on February 7, 1967, under section 20 of the *Metalliferous Mines Regulation Act* for failing to provide a certified shiftboss at his property. At the hearing held at Rossland, March 15, 1967, he pleaded guilty and was fined $150.

A diamond-drill operator employed at the Pride of Emory mine of Giant Mascot Mines Limited was charged under section 23, Rule 161, of the *Metalliferous Mines Regulation Act* with failing to have closed the shaft gate on 2600 level after having opened it. At the hearing held at Hope on April 7, 1967, he entered a plea of guilty and was fined $10.

An underground labourer employed at Boss Mountain mine of Brynnor Mines Limited was charged under section 23, Rule 43, of the *Mines Regulation Act* with having attempted to take away explosives from the mine without having written authority to do so. At the hearing held at 100 Mile House on June 26, 1967, he entered a plea of guilty and was fined $75.

A surface labourer employed at Jedway Iron Ore Limited was charged on December 15, 1967, under section 23, Rule 280, of the *Mines Regulation Act* with having been near moving machinery at a mine surface operation while being under the influence of intoxicating liquor. At the hearing held at Sandspit he entered a plea of guilty and was fined $75.

## BLASTING CERTIFICATE SUSPENSIONS

There were seven certificate suspensions made for violations of the explosives and blasting procedure provisions as contained in the *Metalliferous Mines Regulation Act* and the *Mines Regulation Act*. The suspensions were for periods varying from three weeks to six months. The offences included drilling in the socket of a hole in which blasting had been done (three instances), failure to guard the entrances to the scene of a blasting operation (three instances), and failure to use a water spray while blasting.

## ELECTRICAL-MECHANICAL

An Electrical Inspector has directed the inspection of electrical equipment since 1946 in the mining industry and since 1954 in the oil and gas drilling industry. Since 1966 a Mechanical Inspector has assisted in the inspection of all mechanical equipment installed in any type of mine or quarry. Highlights from the report of L. Wardman, Senior Inspector, Electrical-Mechanical, follow.

### Electrical

In 1967 electric power was used by 43 mining companies in operations at 50 lode mines and two collieries. Thirty-eight metallurgical concentrators were operated. Electrical power was used at 24 structural and industrial mineral mines and quarries. Fifty-four drilling rigs were operated.

The following table gives the kilovolt-ampere capacity of mining-company-owned power plants at lode mines and the amount of power generated in 1967:—

| Prime Mover | Generator Kva. Capacity | Kilowatt-hours Generated |
|---|---|---|
| Diesel engines | 45,167 | |
| Hydro | 11,560 | |
| Totals | 56,727 | 152,759,026 |

The electric power purchased from public utilities and from the generating division of Cominco Ltd. amounted to 508,165,663 kilowatt-hours. This amount added to that produced by the privately owned plants makes a total of 660,924,689 kilowatt-hours.

A general breakdown of the connected load at the mines which operated in 1967 is as follows:—

| Equipment | Horsepower |
|---|---|
| Hoists and aerial trams | 7,644 |
| Hoists (scraper) | 9,505 |
| Electric shovels | 4,425 |
| Rock drills | 985 |
| Mucking-machines | 130 |
| Fans (mine ventilating) | 9,463 |
| Pumps (mine) | 5,313 |
| Rectifiers and M.G. sets | 9,023 |
| Air compressors | 23,343 |
| Sink float | 1,517 |
| Crushing equipment | 22,889 |
| Grinding equipment | 57,349 |
| Concentrating equipment | 31,000 |
| Magnetic separators | 2,598 |
| Conveyors | 8,546 |
| Mill pumps | 15,001 |
| Fresh-water pumps | 7,910 |
| Workshops | 3,965 |
| Miscellaneous | 10,728 |
| Total | 231,334 |

In 1967 electric power was used at 24 structural-material and industrial-mineral mines and quarries. Power is produced at two of these operations by company-owned plants, while for the remainder it is purchased. The amount of power produced and purchased is as follows:—

| Prime mover | Produced Kilowatt-hours |
|---|---|
| Diesel—6,801 kva. generating capacity | 21,158,590 |
| Hydro—500 kva. generating capacity | 8,000 |
| Total | 21,166,590 |
| Amount purchased | 10,553,385 |
| Total | 31,719,975 |

A general breakdown of the connected load is as follows:—

| Equipment | Horsepower |
|---|---|
| Hoists and aerial tram | 273 |
| Hoists (scraper) | 405 |
| Fans | 110 |
| Pumps | 800 |
| Rectifiers and M.G. sets | 7 |
| Air compressors | 3,647 |
| Electric shovels | 655 |
| Crushing plants | 5,470 |
| Conveyors | 3,637 |
| Screens | 706 |
| Milling | 3,911 |
| Pumps | 267 |
| Workshops | 422 |
| Miscellaneous | 1,986 |
| Total | 22,296 |

Two collieries were in operation during 1967. The distribution of the connected load was as follows:—

| Surface— | Horsepower |
|---|---|
| Air compressors | 1,800 |
| Ventilation | 400 |
| Hoisting | 51 |
| Conveyors | 55 |
| Crushers | 30 |
| Washing and screening | 2,048 |
| Pumping | 65 |
| Coke production | 1,573 |
| Miscellaneous | 1,261 |
| Total | 7,283 |

| Underground— | Horsepower |
|---|---|
| Ventilation | 200 |
| Pumping | 155 |
| Air compressors | 300 |
| Coal drills | 3 |
| Continuous miners | 1,900 |
| Shuttle cars | 705 |
| Loading | 180 |
| Conveying | 1,295 |
| Hoisting | 125 |
| Total | 4,863 |
| Total for surface and underground | 12,146 |

A total of 22,730,640 kilowatt-hours of electric power was used for mining and coal-processing during the year.

In all types of mines the number of battery and trolley locomotives in use in 1967 totalled 143 and 110 respectively.

## Mechanical

Diesel engines have been allowed underground since 1948. In 1967 a new permit system was introduced which specified the amount of air required to dilute the noxious exhaust gases to a safe concentration. Formerly an arbitrary standard based on horsepower was used. Information from an approved testing-station, such as the United States Bureau of Mines, is accepted, but if this is not available it is necessary to have the engine tested on a suitable dynamometer and the exhaust gases sampled and analysed under varying conditions of load and speed. In 1967 the diesel-powered equipment operating underground totalled 26 locomotives and 77 pieces of trackless machinery.

The use of non-destructive testing to check hoisting-ropes or any other gear was encouraged. The new *Mines Regulation Act* gives incentive in this regard as an extension of rope life beyond the two-year limit is given chiefly on the results of non-destructive testing. In 1967 there were two instruments used for testing hoisting-ropes, the results of which were accepted, these being the McPhar, as widely used in eastern Canada, and the Defectograph, as operated by Wire Rope Industries Limited of Vancouver.

The number of hoists operating in 1967 totalled 30, and, of these, 18 were used at vertical shafts and 12 at inclined shafts of various slopes from 27 to 58 degrees. There were three aerial tramways in operation, two of which transported men.

Open-pit mining was at an all-time high in 1967, and this increased the number of trucks and heavy mobile equipment operating at mines. Two serious oversights in truck construction and maintenance gave cause for concern on steep mining-roads. One of these was the fact that some trucks were incapable of being steered when the hydraulic pressure dropped due to a stalled engine. The other was that the parking-brakes on certain heavy equipment would not hold the unit stationary on an incline even when unloaded. The number of dump trucks in use in 1967 totalled 204, varying in capacity from 6 to 65 tons with a trend toward the larger sizes. The number of pit shovels in use totalled 59, varying in size from 1½ to 8 yards capacity, and here again the trend was toward larger equipment.

## ENVIRONMENTAL CONTROL

The dust and ventilation conditions at the different operations in the mining industry were surveyed by the Environmental Control Inspectors of the Department. Excerpts from the report of the Senior Inspector, S. Elias, follow.

1. A total of 98 surveys of dust conditions was made at 75 operations during 1967. The surveys were made at lode mines, both underground and open pit, rock quarries, gravel pits, and asbestos and coal mines.

2. Threshold limit values for dust concentrations have been established from experience in various countries—England, South Africa, Australia, United States, and Canada. These values are set only as guides to good practice and are not to be considered absolute. However, they do have a definite relationship to the extent of industrial dust exposure. There is reasonable assurance silicosis, asbestosis, or pneumoconiosis will not occur if exposures are kept below these limits. In British Columbia 300 particles per cubic centimetre as determined with the Konimeter dust-sampler is used as a level of dust concentration that can be obtained under good conditions of ventilation and dust control. For asbestos dust, 5 million particles per cubic foot as obtained with the midget impinger sampler is the established maximum allowable concentration. For coal dust other than anthracite, 700 particles per cubic centimetre between 1 and 5 microns on size as measured with the thermal precipitator sampler is the accepted standard.

3. Development drilling headings in underground operations remain areas of definite concern inasmuch as only 29 per cent of all headings examined had dust concentration averages of 300 or less particles per cubic centimetre. This concern is further emphasized by the fact that in the past decade a large portion of development mining has been done by independent contractors whose crews have been employed relatively continuously in this type of work in atmospheres having greater dust concentrations than acceptable. The situation in production drilling locations was better inasmuch as these areas were amenable to improved dust control.

4. An improvement was achieved in the average of dust concentrations at all other locations exclusive of drilling. At these locations the percentage of surveys completed in which the dust concentrations were below 300 particles per cubic centimetre has improved from 71 per cent in 1965 to 80 per cent in 1967.

5. Dust control in crushing plants at mines where the ore is produced underground has shown a steady improvement as operators have become more aware of the necessity of adequate ventilation design, particularly in new installations. The percentage of crushing plants having atmospheres containing less than 300 particles of dust per cubic centimetre has in the past five years risen from 56 to 73 per cent.

6. Dust control at open-pit drilling operations has shown a deterioration in the past two years. In 1965, 64 per cent of surveys showed a dust count below 300 particles per cubic centimetre of air. Crushing plants attached to open-pit mines continue to have higher dust counts than desirable in that only 43 per cent of the surveys made indicate less than 300 particles per cubic centimetre. This is considerably below the 73 per cent achieved in crushing plants at underground mines.

7. In assay grinding-rooms, 69 per cent of surveys gave averages of less than 300 particles per cubic centimetre of air. Improved control practices are indicated here as there has been a steady decline from 1964, when 87 per cent of surveys were below the maximum desirable concentration.

8. Surveys for dust control were made in four rock quarries and 17 gravel pits. At rock quarries the averages of all locations showed that 55 per cent of the operations were below 300 particles per cubic centimetre of air. Drilling operations were all higher than the accepted maximum. At gravel-pit operations, 55 per cent of the surveys were below 300 particles per cubic centimetre.

9. Surveys at the one asbestos-mill indicated that 70 per cent of the samples taken were within the limit for asbestos dust of 5,000,000 particles per cubic foot.

10. A noise-level survey was made at one mine to test the attenuation at drilling-machines equipped with two types of mufflers.

11. Certificates of fitness were checked at the mines, and it was found that more than 97 per cent were in good order.

12. Figures 42 and 43 are graphs showing the median of all averages in various operations in the lode mines obtained each year since 1937.

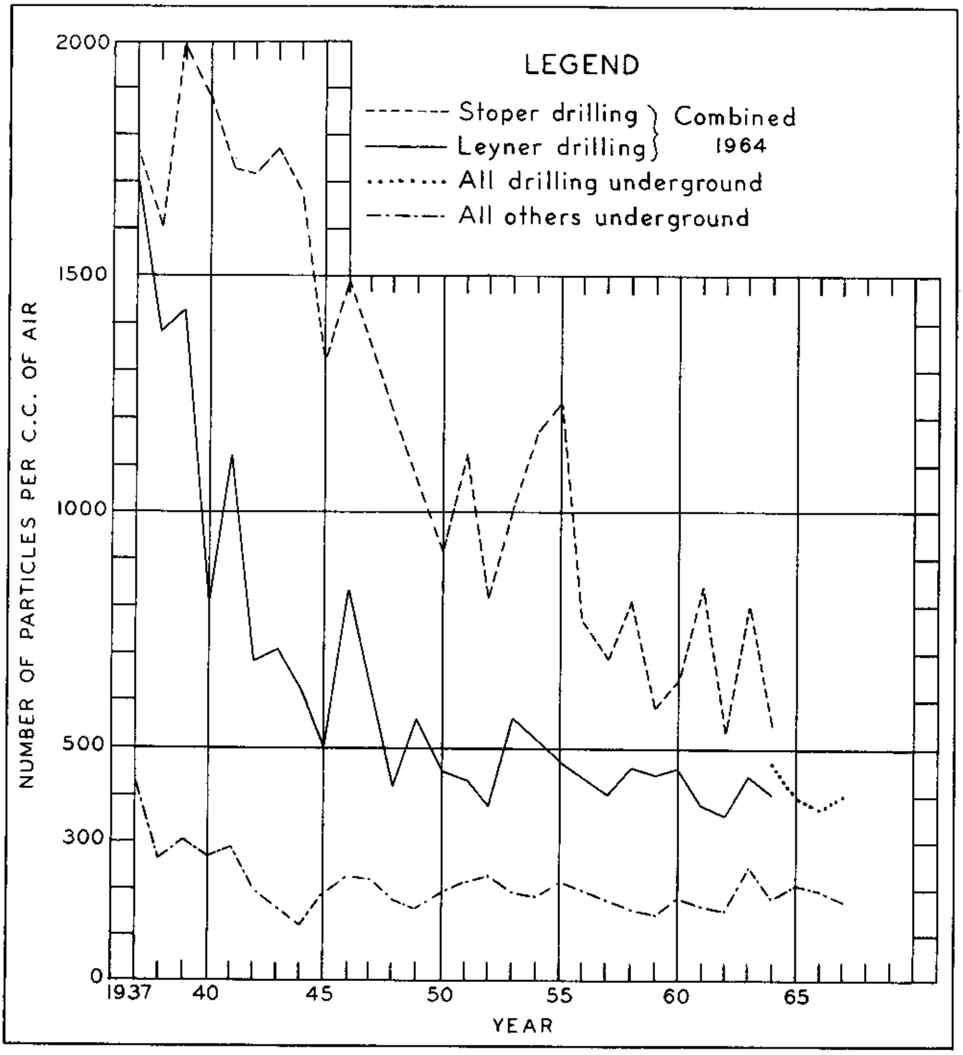


Figure 42. Average underground dust counts.

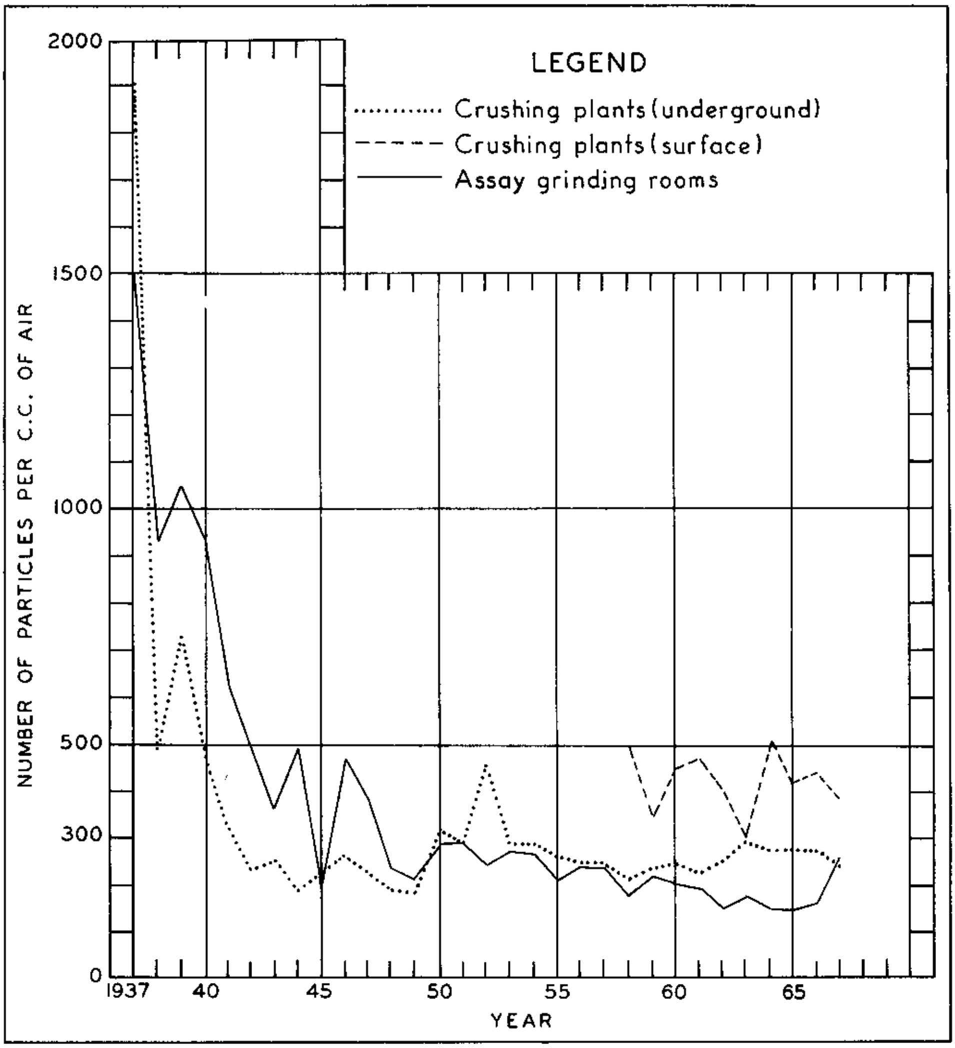


Figure 43. Average crushing and grinding dust counts.

## SHIFTBOSS CERTIFICATES

Section 21 of the *Mines Regulation Act* requires that every person employed underground be under the daily supervision of an official who is the holder of a shiftboss certificate issued under this Act. An applicant for a shiftboss certificate is required to pass an examination on the *Mines Regulation Act* and general safe working practices. He must also be the holder of a mine-rescue certificate and a first-aid certificate. A fee of $5 is charged for the examination.

The Board of Examiners may grant provisional certificates under such conditions as it considers advisable. During 1967, 78 provisional certificates of six months' duration were issued.

Examinations were held at various places throughout the Province, and the following 76 men were successful in qualifying for their permanent certificates:—

*Shiftboss Certificates—1967*

| Cert. No. | Name | Date | Cert. No. | Name | Date |
|---|---|---|---|---|---|
| 406 | Allan Joseph Gannon | 4–1–67 | 444 | William Lawrence Bond | 25–4–67 |
| 407 | James Ernest Smith | 4–1–67 | 445 | William Chernenkoff | 25–4–67 |
| 408 | Daniel M. Kennelly | 4–1–67 | 446 | William Herbert Gray | 25–4–67 |
| 409 | Walter Leszczyszyn | 9–1–67 | 447 | George Fecyk | 25–4–67 |
| 410 | Murray E. Crayston | 9–1–67 | 448 | John Edward Brown | 25–4–67 |
| 411 | Joel P. Ackert | 9–1–67 | 449 | John Thomas Graham | 1–5–67 |
| 412 | Dennis A. Waterstreet | 9–1–67 | 450 | Leonard Brown | 5–5–67 |
| 413 | Walter W. Panagopka | 9–1–67 | 451 | Thomas L. Brown | 5–5–67 |
| 414 | Donald M. Dundas | 9–1–67 | 452 | Arthur Harry Ditto | 19–5–67 |
| 415 | Schyler G. Peters | 9–1–67 | 453 | Edwin Berrington | 19–5–67 |
| 416 | Patrick P. Landy | 9–1–67 | 454 | Robert James MacSporran | 29–5–67 |
| 417 | Kenneth Walter Gordon | 17–1–67 | 455 | Donald Robert Martin | 29–5–67 |
| 418 | Robert Lawrence Harrison | 18–1–67 | 456 | Donald John Michael Farnsworth | 29–5–67 |
| 419 | John Oswald Wolf | 19–1–67 | 457 | Gordon Neil Mackenzie | 29–5–67 |
| 420 | Egon Franzisz | 31–1–67 | 458 | Stanley Steven Snyder | 29–5–67 |
| 421 | Ross C. Roszell | 1–2–67 | 459 | Roy Decker | 30–5–67 |
| 422 | Harold C. Tapp | 31–1–67 | 460 | Milan Frank Vladetich | 31–5–67 |
| 423 | William Clarence Fothergill | 1–2–67 | 461 | Walter Bunka | 2–6–67 |
| 424 | William Cuthbert Robinson | 6–2–67 | 462 | James Norman McLean | 2–6–67 |
| 425 | Rowland Edward Klyne | 10–2–67 | 463 | John Lauzon | 8–6–67 |
| 426 | John C. Black | 13–2–67 | 464 | Royce Gerald Jolie | 14–6–67 |
| 427 | Edmund J. Cops | 23–2–67 | 465 | James M. Rynn | 26–6–67 |
| 428 | John Alexander Coulson | 23–2–67 | 466 | Halldor S. Arnfinnson | 12–7–67 |
| 429 | Robert Inglis | 23–2–67 | 467 | Michael J. Kardynal | 3–8–67 |
| 430 | John A. Thomson | 23–2–67 | 468 | James B. Rannells | 3–8–67 |
| 431 | Berwin Rhys Williams | 23–2–67 | 469 | Gordon Boyd Hardwicke | 25–8–67 |
| 432 | James L. Dixon | 27–2–67 | 470 | John Alexander McWilliam | 18–9–67 |
| 433 | Robert Montgomery | 27–2–67 | 471 | Alfred Krahn | 22–9–67 |
| 434 | Alfred E. Wiegand | 27–2–67 | 472 | Robert Stewart Cram | 22–9–67 |
| 435 | Robert John Young | 27–2–67 | 473 | Hugh McDade | 6–10–67 |
| 436 | Paul Henry Schmidt | 27–2–67 | 474 | Jean Philippe Lessard | 6–10–67 |
| 437 | Hans G. Frech | 3–3–67 | 475 | William Allan McInnes | 6–10–67 |
| 438 | Charles Lind | 8–3–67 | 476 | Sigurd Axel Flodstrom | 28–10–67 |
| 439 | Blake Frederick Kellar | 8–3–67 | 479 | Clinton Aubrey Martindale | 14–11–67 |
| 440 | Jerry J. Krizek | 4–4–67 | 480 | Ronald Alexander Sutherland | 14–11–67 |
| 441 | Harry Badgley Gilleland | 4–4–67 | 481 | Robert Franklyn Gehue | 14–11–67 |
| 442 | Clinton Nicholson | 7–4–67 | 482 | Lorne Andrew Quirk | 14–11–67 |
| 443 | Andrew Pompu | 25–4–67 | 483 | Andrew Wingerak | 15–11–67 |

## CERTIFICATES OF COMPETENCY

Section 14 of the *Coal Mines Regulation Act* makes it unlawful to employ a person as a manager, overman, shiftboss, fireboss, shot-lighter, mine surveyor, or coal-miner unless he is the holder of a certificate of competency issued under this Act. Examinations for these certificates are held as required by the Board of Examiners (*see also* p. A 65).

In 1967 one mine surveyor's certificate was issued and interchanges for two first-class certificates, two second-class certificates, and one third-class certificate were made. Three candidates were also successful in obtaining coal-miners' certificates.

## MINE RESCUE, SAFETY, AND FIRST AID

The expanding mining industry continued to place a heavy demand on mine-rescue and first-aid training services in 1967. Mine-rescue stations were maintained at Nanaimo, Nelson, Kamloops, and Fernie with an instructor qualified in both mine-rescue and first-aid training available at each station. With the exception of Fernie, each station is established as a mobile unit to transport equipment anywhere in that area to be available either for rescue or training services.

Each station is equipped with sufficient self-contained oxygen-supplying apparatus to maintain two mine-rescue teams of six men each should any emergency arise in nearby mines. In addition to this equipment, varying amounts are maintained at the different mines throughout the Province. This equipment is either wholly owned by the mines or on loan from the Department. In 1967 the equipment owned by the Department totalled 58 McCaa two-hour apparatus and 49 Chemox one-hour apparatus, and that owned by industry totalled six Draeger BG-174 two-hour machines, 79 McCaa's, and 58 Chemox's. Each station as well as most mines have auxiliary equipment, such as all-service masks, self-rescuers, gas-detectors, inhalators, and first-aid equipment. District instructors make periodic checks of all this equipment maintained at the mines.

The Nanaimo mobile unit gave mine-rescue and first-aid training at Britannia, Coast Copper (Old Sport), Granduc, Jedway, Tasu, Texada, Western (Lynx, Buttle Lake), and Zeballos (F.L.) mines, the marine service divisions of Ocean Cement Limited at New Westminster and British Columbia Forest Service at Vancouver, and to the students graduating in mining technology at the British Columbia Institute of Technology in Burnaby.

The Nelson mobile unit gave mine-rescue and first-aid training at the Bluebell, Jersey, Highland Bell, Reeves MacDonald, and Phoenix mines, as well as at Nelson, Salmo, Trail, Trout Lake, and Vancouver.

The Kamloops mobile unit provided the same training at Giant Mascot, Granisle, Highmont, Lornex, Pinchi mercury, and Trojan mines.

The mine-rescue station at Fernie is maintained principally to serve the coal mines in the Fernie-Michel area. Mine rescue and first aid were given in these two towns by the Fernie instructor, who also assisted in mine-rescue training at the Sullivan mine at Kimberley.

Instruction in first aid was given to more than 480 persons, and 223 men were trained in mine-rescue work and received the Departmental certificates of competency. They are listed as follows:—

| Cert. No. | Name | Where Trained | Cert. No. | Name | Where Trained |
|---|---|---|---|---|---|
| 4144 | Robert Frederick Mortimer | Craigmont. | 4211 | Robert B. Allan | B.C.I.T. |
| 4145 | David H. Hunt | Craigmont. | 4212 | Lorne G. Alcock | B.C.I.T. |
| 4146 | Albert Armand Deschamps | Craigmont. | 4213 | Ted Lewis Carpenter | Endako. |
| 4147 | Robert Inglis | Craigmont. | 4214 | Willoughby Agar Trythall | Endako. |
| 4148 | Alfred E. Wiegand | Craigmont. | 4215 | Michael Gordon Ekins | Endako. |
| 4149 | Stanley Gregg Johnston | Craigmont. | 4216 | Thomas Alexander Cormack | Endako. |
| 4150 | John Thomas Shaw | Craigmont. | 4217 | William Hocking | Endako. |
| 4151 | John Alexander Coulson | Craigmont. | 4218 | Alton F. Johnson | Endako. |
| 4152 | Joe Jorma Kivimaki | Craigmont. | 4219 | Lloyd Henry Selk | Endako. |
| 4153 | Nick Lanaro | Craigmont. | 4220 | Edward Glen Hunt | Sullivan. |
| 4154 | Allan Craven | Craigmont. | 4221 | Michael Donald John Farnsworth | Sullivan. |
| 4155 | William David Scribner | Craigmont. | 4222 | Royce Gerald Jolie | Sullivan. |
| 4156 | James L. Dixon | Craigmont. | 4223 | John Chrystal Robertson | Sullivan. |
| 4157 | Raymond Preston Finlay | Craigmont. | 4224 | Clarence Edward Coldwell | Sullivan. |
| 4158 | Hans George Frech | Craigmont. | 4225 | Ivan Alfred Christensen | Sullivan. |
| 4159 | James Robert Walmsley | Craigmont. | 4226 | Kenneth Archibald McTeer | Sullivan. |
| 4160 | Edward Eugene Kenney | Craigmont. | 4227 | Richard Harry Wilson | Sullivan. |
| 4161 | Allan Richard Cameron | Craigmont. | 4228 | Robert Walter Daniel Clarke | Sullivan. |
| 4162 | Nelson J. Anderson | Craigmont. | 4229 | Ronald Maurice Evans | Sullivan. |
| 4163 | Adolph Schaper | Britannia. | 4230 | Larry Edwin Shannon | Sullivan. |
| 4164 | John H. Burns | Britannia. | 4231 | Howard Tichauer | Britannia. |
| 4165 | Real Levasseur | Old Sport. | 4232 | Johannes Van Den Hoek | Britannia. |
| 4166 | Robert James Bass Clegg | Michel Colliery. | 4233 | Ronald Lee Baker | Britannia. |
| 4167 | John Neil Gallagher | Michel Colliery. | 4234 | Bruce Husted | Britannia. |
| 4168 | Herman Sehn | Estella. | 4235 | Kenneth Roberts | Britannia. |
| 4169 | James Norman McLean | Estella. | 4236 | Richard Charles Hebert | Britannia. |
| 4170 | Egisto Baldinucci | Estella. | 4237 | Lambertus Van Der Ham | Britannia. |
| 4171 | David Harry Brown | Estella. | 4238 | Arnold Fortier | Britannia. |
| 4172 | Arthur William Lott | Estella. | 4239 | Hans Millahn | Britannia. |
| 4173 | Renato Dalcanale | Estella. | 4240 | Norman G. Aasen | Phoenix. |
| 4174 | Larry Deraps | F.L. | 4241 | William John Fofonoff | Phoenix. |
| 4175 | Robert Stewart Cram | F.L. | 4242 | Walter F. Brown | Phoenix. |
| 4176 | Thomas McKiernan | F.L. | 4243 | William E. Ortis | Phoenix. |
| 4177 | Arthur Erbacker | F.L. | 4244 | John Peter Anderson | Phoenix. |
| 4178 | Mervyn Matthews | F.L. | 4245 | Kay Osachoff | Phoenix. |
| 4179 | Henry Viher | F.L. | 4246 | Paul Papove | Phoenix. |
| 4180 | John H. Salkeld | F.L. | 4247 | Bruno Berticevich | Greenwood. |
| 4181 | Thomas T. Packham | F.L. | 4248 | Orville Maulsby | Lynx. |
| 4182 | Alfred Krahn | F.L. | 4249 | John Lauzon | Lynx. |
| 4183 | Alfons Ditshe | F.L. | 4250 | Clarence Guilderson | Lynx. |
| 4184 | Norman Victor Horsford | F.L. | 4251 | Kenneth Davidson | Lynx. |
| 4185 | Andrew Pompu | Midnight. | 4252 | Roy Manly Finch | Lynx. |
| 4186 | Henry Marasek | Kirsch Silver. | 4253 | Nick Antoniuk | Lynx. |
| 4187 | Eugene Stanford Walsh | Arlington. | 4254 | Anthony Trevor Edwards | Lynx. |
| 4188 | Nick Rollick | Molly Gibson. | 4255 | Graham Turner | Lynx. |
| 4189 | Bertram Arthur McConachie | Mineral King. | 4256 | Alexander Hector James MacCulloch | Pride of Emory. |
| 4190 | John Arthur Thomasson | Minoca. | 4257 | Dennis Edward Zeith | Michel Colliery. |
| 4191 | Edward Kraus | Bethlehem. | 4258 | Robert Gordon Leader | Michel Colliery. |
| 4192 | Mervin John Dehaan | Bethlehem. | 4259 | Roy Decker | Glacier Gulch. |
| 4193 | Thomas Wesley Cleaver | Bethlehem. | 4260 | Robert J. D. Grimsdick | Glacier Gulch. |
| 4194 | Malcolm Clifford Bearman | Bethlehem. | 4261 | Lynn F. Scott | Glacier Gulch. |
| 4195 | Larry William Reaugh | Bethlehem. | 4262 | Laurent L. Leroux | Texada. |
| 4196 | Brinsley T. Nevile | Pride of Emory. | 4263 | Lyle R. Flint | Glacier Gulch. |
| 4197 | Fred C. R. deJong | Pride of Emory. | 4264 | Jack Kennedy Sturgess | Glacier Gulch. |
| 4198 | Donald J. Frazier | Pride of Emory. | 4265 | George H. Bowering | Britannia. |
| 4199 | Erich J. Osterfeld | Pride of Emory. | 4266 | Gerald Dennis Delane | Britannia. |
| 4200 | David L. Cook | Pride of Emory. | 4267 | Ingolf A. Eliassen | Britannia. |
| 4201 | Maurice J. D. Brule | Pride of Emory. | 4268 | David Richard Hinchliffe | Britannia. |
| 4202 | Milan E. Vladetich | Britannia. | 4269 | Phillip King-Jones | Britannia. |
| 4203 | Norman A. Ross | B.C.I.T.[1] | 4270 | George R. Luer | Britannia. |
| 4204 | Ian Douglas Graham | Vancouver. | 4271 | William McCall | Britannia. |
| 4205 | Patrick White | Vancouver. | 4272 | David William Mullen | Britannia. |
| 4206 | Marvin W. Crist | B.C.I.T. | 4273 | Hugh Norman Steenson | Britannia. |
| 4207 | John A. Chapman | B.C.I.T. | 4274 | Marshall Tichauer | Britannia. |
| 4208 | Arthur K. Tisdale | B.C.I.T. | 4275 | John Ross | Britannia. |
| 4209 | Bruce A. Graney | B.C.I.T. | | | |
| 4210 | William Kent Midan | B.C.I.T. | | | |

[1] B.C.I.T.=British Columbia Institute of Technology.
[2] Contractor.

| Cert. No. | Name | Where Trained | Cert. No. | Name | Where Trained |
|---|---|---|---|---|---|
| 4276 | Allan Joseph White | Britannia. | 4319 | Lawrence McGillivray | Jersey. |
| 4277 | Aoltan Witt | Britannia. | 4320 | George William Sinclair | Jersey. |
| 4278 | James G. Owens | Cameron-McMynn.[2] | 4321 | John Stard | Jersey. |
| 4279 | Edward J. Marshall | Lynx. | 4322 | Tony Staresinich | Jersey. |
| 4280 | David Wellington Stewart | Mountain Minerals. | 4323 | John Victor Tully | Jersey. |
| 4281 | John Michael Edgar | Michel Colliery. | 4324 | Gilbert Douglas Wilson | Jersey. |
| 4282 | Thomas Bent Lester | Granduc. | 4325 | Russell B. Docksteader | Granisle. |
| 4283 | James K. Gray | Granduc. | 4326 | Wayne A. Eberle | Granisle. |
| 4284 | Michael Pacan | Granduc. | 4327 | Andrew A. Corden | Granisle. |
| 4285 | Dennis James Rannells | Granduc. | 4328 | Carl Magnus Anderson | Salmo. |
| 4286 | William Doskoch | Granduc. | 4329 | Joseph Philip Branca | Ruth Vermont. |
| 4287 | James Molnar | Granduc. | 4330 | Jack M. Kilpatrick | Ruth Vermont. |
| 4288 | Lief A. Nordell | Granduc. | 4331 | Eloi J. Cormier | Cameron-McMynn.[2] |
| 4289 | Richard E. Hamilton | Granduc. | 4332 | Jacques J. A. Levesque | Cameron-McMynn.[2] |
| 4290 | Dino Zalunardo | Granduc. | 4333 | William P. Ugrai | Cameron-McMynn.[2] |
| 4291 | Herbert Edinger | Granduc. | 4334 | Pius Simon | Cameron-McMynn.[2] |
| 4292 | Lorne A. Quirk | Granduc. | 4335 | George W. Lindsay | Kootenay Eng'ing.[2] |
| 4293 | Hugh H. McDade | Granduc. | 4336 | Alec Uhrynew | Cameron-McMynn.[2] |
| 4294 | Michael Thomas Hamilton | Granduc. | 4337 | George Claxton | Cameron-McMynn.[2] |
| | | | 4338 | Bruce M. Richardson | Cameron-McMynn.[2] |
| 4295 | John Moroz | Granduc. | 4339 | William A. Zelisney | Granisle. |
| 4296 | Gordon W. Kelly | Cameron-McMynn.[2] | 4340 | Gerald Alfred Allcott | Jedway. |
| 4297 | William J. Zenuik | Cameron-McMynn.[2] | 4341 | Gary R. Rice | Jedway. |
| 4298 | Graham Richard Chapman | Cameron-McMynn.[2] | 4342 | John Gordon Conner | Jedway. |
| | | | 4343 | Frederick Robert Collard | Cameron-McMynn.[2] |
| 4299 | Leonard A. Saar | Cameron-McCutcheon.[2] | 4344 | Fred A. Smith | Cameron-McMynn.[2] |
| | | | 4345 | Douglas John MacPherson | Cameron-McMynn.[2] |
| 4300 | Larry William Young | Cameron-McCutcheon.[2] | 4346 | Louis A. Holm | Jedway. |
| 4301 | Victor W. Simpson | Cameron-McMynn.[2] | 4347 | Ronald Bellamy Brown | Jedway. |
| 4302 | Daniel C. Derbyshire | Cameron-McCutcheon.[2] | 4348 | Lloyd Cromwell Griffiths | Jedway. |
| | | | 4349 | Calvin James Flanagan | Jedway. |
| 4303 | James D. Pringle | Cameron-McCutcheon.[2] | 4350 | Fred R. Sjoberg | Jedway. |
| | | | 4351 | Brian A. Holm | Jedway. |
| 4304 | Clifford James Shields | H.B. | 4352 | William S. Browning | Jedway. |
| 4305 | Douglas Stewart | Highland Bell. | 4353 | Walter J. Schlappner | Cameron-McMynn.[2] |
| 4306 | John J. VerBeeck | Highland Bell. | 4354 | Joe J. Fumic | Jedway. |
| 4307 | John Radsma | Highland Bell. | 4355 | Lyle Wayne Campbell | Jedway. |
| 4308 | Albert A. Parrent | Highland Bell. | 4356 | John S. Muncey | Jedway. |
| 4309 | George A. Brisch | Granisle. | 4357 | Stewart J. R. Anderson | Reeves MacDonald. |
| 4310 | Lawrence B. Carlson | Granisle. | 4358 | Allan Albert Bye | Reeves MacDonald. |
| 4311 | George Forrest | Granisle. | 4359 | Thomas Gresiuk | Reeves MacDonald. |
| 4312 | David A. Humes | Granisle. | 4360 | Laird D. Hannah | Reeves MacDonald. |
| 4313 | Harold C. Pennoyer | Granisle. | 4361 | Ronald A. Janni | Reeves MacDonald. |
| 4314 | Henry Adam Batuik | Jersey. | 4362 | Bertrant LeBlanc | Reeves MacDonald. |
| 4315 | Graham Bingham | Jersey. | 4363 | Eugene P. Meyers | Merritt Copper. |
| 4316 | Nick Darychuk | Jersey. | 4364 | John Panagopka | Merritt Copper. |
| 4317 | Gerard Real Duhamel | Jersey. | 4365 | Mike Vanderstarre | Reeves MacDonald. |
| 4318 | Allen Dale Fraser | Jersey. | 4366 | David L. Vulcane | Reeves MacDonald. |

[2] Contractor.

Four mine-safety associations operate in different areas of the Province. They are sponsored by the Department of Mines and Petroleum Resources and are aided by company officials, safety supervisors, Inspectors of Mines, and mine-rescue instructors. These organizations continued to promote mine-rescue, first-aid, and safety education in their various districts.

The Vancouver Island Mine Safety Association held its 53rd annual competition at Nanaimo on May 27th. Five teams competed in the mine-rescue event—two from Britannia mine and one each from Coast Copper (Old Sport), Texada, and Zeballos iron (F.L.) mines. The winning team was from Texada mine and was captained by D. Legault.

The West Kootenay Mine Safety Association held its 21st competition at Nelson on June 3rd. Five teams entered the mine-rescue event—two from the Bluebell mine and one each from the Phoenix, Jersey, and Reeves MacDonald mines. Bluebell No. 1 team, captained by O. Koenig, took first place.

The East Kootenay Mine Safety Association held its 46th annual competition at Fernie on June 10th. Five teams took part in the mine-rescue event—two each from the Sullivan and Michel mines and one from the Mineral King mine. Fernie No. 1 team from Michel, captained by William Milburn, was the winner of the mine-rescue event.

The Central British Columbia Mine Safety Association held its 19th annual competition at Kamloops on June 17th. Four teams competed in the mine-rescue event—one each from Cameron-McMynn contractors, Boss Mountain mine, Bethlehem mine, and Craigmont mine. The Craigmont mine team, captained by G. W. Klein, was the winner of the mine-rescue event.

At all four of the preceding meetings, competitions were held in first aid as well as mine-rescue work. In these competitions, events were held for women and juniors. There were entries in first aid from industries not necessarily connected with mining.

The winners of the four preceding competitions met in the 12th Provincial mine-rescue competition held in Trail on June 24th. The Fernie team, with William Milburn as captain, won the Provincial trophy and silver trays. The Bluebell team won the silver cup which had been donated by the International Union of Mine, Mill and Smelter Workers for annual competition for mine-rescue teams from metalliferous mines. In conjunction with this competition, the Workmen's Compensation Board sponsored the 11th Provincial men's first-aid competition in which the competing teams had won local events at Fernie, Kamloops, Kitimat, Nanaimo, Nelson, Vancouver, and Victoria. The winning team was from the Kitimat Fire Department and was captained by Warren Banks.

On June 26th the 1st Canadian Mine Rescue Championship, in honour of Canada's Centennial and sponsored by the Province of British Columbia, was held in Trail. Competing teams were from Alberta, British Columbia, Saskatchewan, and the Northwest and Yukon Territories. The winning team was from Fernie, British Columbia, and captained by William Milburn. This team, jointly sponsored by the Governments of Canada and British Columbia, entered the United States National Mine Rescue Competition in Louisville, Kentucky, on October 2nd and 3rd. In spite of having to compete under different competition rules, this team made a good showing in placing 12th in a field of 18 competing teams.

During the year a series of evaluation tests was made by the mine-rescue instructional staff on various new types of self-contained oxygen-breathing apparatus in order to determine the most satisfactory equipment to replace the McCaa machines in present use. Five different machines were examined, all of which are of approximately four hours' duration. In two of the machines oxygen is supplied from a high-pressure bottle, and in the other three liquid oxygen was used to supply the gas for breathing. In December an order for 12 Aerorlox liquid-oxygen machines was placed with Siebe Gorman and Company Limited, England.

## JOHN T. RYAN TROPHY

The John T. Ryan safety trophies were established in 1941 to promote safety in coal and metal mines. Administration of the awards is by the Canadian Institute of Mining and Metallurgy. The award for metal mines is presented to the mining company or companies having the least number of compensable accidents per million man-hours. In 1967 the regional trophy for metal mines was won by the Sullivan mine of Cominco Ltd. with an accident frequency of 5.04.

The coal-mine award is presented to the coal-mining company having worked a minimum of 120,000 man-hours and having the least number of compensable accidents. The coal mines of British Columbia are grouped with those in Alberta to form a Western Region. The trophy for this region was won by Charter Coals Ltd., East Coulee, Alberta. The Michel Colliery of Crows Nest Industries Limited had the best accident frequency of all coal mines in Canada but declined to accept an award because of the large number of fatalities which occurred in 1967.

## WEST KOOTENAY MINE SAFETY ASSOCIATION TROPHY

In 1951 the West Kootenay Mine Safety Association donated a safety trophy for annual competition in order to encourage and promote safety in small mines. Entrants were originally restricted to the West Kootenay area, but in 1956 this restriction was removed and entries are accepted from any qualifying mine in the Province.

The award is made to the metal mine having the lowest accident rate and having worked a total of from 2,500 to 30,000 shifts per year, at least one-third of which having been worked underground. An accident is considered as one which involves more than three days' loss of time.

In 1967 the award was won by Antoine Silver Mines Ltd., New Denver. A total of 2,630 man-shifts was worked with a zero accident frequency.

## SAFETY COMPETITION, OPEN-PIT MINES AND QUARRIES

In 1961 the Department of Mines and Petroleum Resources instituted a safety competition for the open-pit and quarry industry and put up awards and a trophy for annual competition for operations having the least number of compensable accidents during the year. In 1965, in order to provide a more equitable competition basis, it was decided to put up a second trophy and to divide the entrants having the largest number of man-hours into two groups—the "A" group, for those operations having from 15,000 to 200,000 man-hours per year, and the " B " group, for those having in excess of 200,000 man-hours per year. A certificate of achievement is awarded to operations amassing 15,000 man-hours without compensable accidents over any continuous time interval.

Because of extremely keen competition of "A" trophy entrants, it has been necessary to further refine the rules by changing the basis of comparison from " compensable " accidents to " lost-time " accidents.

In 1967 the "A" trophy was won jointly by the Beale Quarry Division of Lafarge Cement of North America Ltd. and the Mary Hill sand and gravel producing operation of Ocean Cement Limited. Both operations had zero lost-time accident frequencies.

The " B " trophy was won by Endako Mines Ltd. This company had an accident frequency of 6.1 per million man-hours.

In addition to the foregoing operations, certificates of achievement were won by Brynnor Mines Limited (Kennedy Lake Division), Butler Bros. (Duncan) Limited, Central Sand and Gravel (Ocean Cement Limited, Prince George), Clayburn-Harbison Ltd. (Kilgard), Coquitlam gravel operation of Deeks-McBride Ltd., Dolan's Limited (Port Alberni), Highland Sand and Gravel (Ocean Cement Limited, Langley), Ideal Cement Company (Vananda), Gilley granite quarry (Ocean Cement Limited, Pitt River), and Producers Sand and Gravel (Ocean Cement Limited, Victoria).

# Coal

By D. R. Morgan, Senior Inspector of Mines

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## PRODUCTION

The gross production of coal in short tons in the Province during 1967 was 959,585 tons (*see* Table VIIIb), a decrease of 128,548 tons or 11.8 per cent from 1966. There were 11 mines in operation (including those at Michel Colliery) and 457 men employed. A total of 446,078 tons of coal was produced from the strip mines at Michel Colliery and Bulkley Valley Colliery. Other statistical information is given in Tables VIIIa and VIIIb.

The production of coal from the East Kootenay District was 946,224 tons, a decrease of 112,455 tons or 11 per cent from 1966. The whole production was obtained from the Michel Colliery, but was seriously affected by the disastrous explosion that occurred at the Balmer North mine on April 3rd. Other activities in the district included exploration programmes by Crows Nest Industries Limited, Pacific Coal Limited, Fernie Coal Mines Limited, Canadian Pacific Oil and Gas Limited, McIntyre Porcupine Mines Limited, and Coleman Collieries Limited. These are reported in detail in the district reports.

The production of coal from the Northern District was 12,987 tons, an increase of 92 tons or 8.4 per cent more than in 1966. The whole production was mined from the Bulkley Valley Colliery strip mine near Telkwa. Other activities included the development of the Garraway mine of Northern Coal Mines Limited on Bowron River.

The production of coal from the Vancouver Island District was 374 tons, a decline of 17,105 tons from 1966. Operations were restricted to two small outcrop mines in the Nanaimo area.

There was no production or coal-mining activity in the Nicola-Princeton District.

# NOTES ON COAL MINES

## VANCOUVER ISLAND INSPECTION DISTRICT

By A. R. C. James

The gross output of coal from the Vancouver Island Inspection District was 374 tons. This was produced at two small mines in the Nanaimo area.

### NANAIMO (49° 123° S.W.)

**Undun No. 4 Mine** J. Unsworth, operator and fireboss. This mine is in outcrop pillars left from the former Extension workings in the Wellington seam, and is about 1 mile northwest of Extension. Total production in 1967 was 147 tons with a crew of one. Working conditions were found satisfactory and no accidents were reported.

### NORTH WELLINGTON (49° 124° S.E.)

**Loudon No. 6 Mine** R. B. Carruthers, operator and fireboss. This mine is about 1 mile southeast of Wellington and has been opened up by a flat-dipping slope driven into a small area of outcrop coal in the No. 2 Upper Wellington seam adjacent to the old No. 9 mine workings. Total production in 1967 was 227 tons with a crew of one. Working conditions were found satisfactory and no accidents were reported.

## EAST KOOTENAY INSPECTION DISTRICT

By D. R. Morgan

**Crows Nest Industries Limited** W. R. Prentice, president, Fernie; J. E. Morris, vice-president, Mines, Fernie; N. B. Pepper, secretary-treasurer, Fernie. This company, formerly known as The Crow's Nest Pass Coal Company Limited, has conducted large-scale coal-mining operations in the East Kootenay District since 1897, and its present activities are confined to the Michel Colliery and the surrounding area. The coal is sold on the industrial market, and a large quantity is exported to Japan. A large amount of the fines is also utilized in the making of coke, and the coke is sold in various parts of Western Canada and the United States. The operations are directed from a head office in Fernie.

MICHEL COLLIERY.—(49° 114° N.W.) J. E. Morris, manager; James Anderson, general mine overman.

The colliery is at Michel, 24 miles northeast of Fernie, on the Crowsnest branch of the Canadian Pacific Railway. It is a large colliery, and has been in operation since 1899. The present operations include three underground mines, four stripping operations, and a modern by-product plant which is located on the colliery-site. Other activities also include an extensive exploration programme which is being carried out in conjunction with the Kaiser Steel Corporation, pending a large contract for exporting coal to Japan. The mines are on each side of the valley and, with exception of those in the No. 10 seam, are named according to the seam that is worked and the direction of development. Those in the No. 10 seam are known as the Balmer mines. Most of the mines are developed from the outcrop. They are worked by the room-and-pillar system, and the pillars are generally extracted on the retreat. The mines are highly mechanized, and most of the coal is mined by continuous miners, of which there were seven in operation in 1967. The equipment is chiefly operated by electricity. It is of the flame-proof type and has been approved for use in coal mines. The transportation of the coal at most of the mines is via shuttle cars and fast-moving belts, which carry it to the surface, from where it is trucked to the preparation plant for cleaning and treatment. Diesel and battery locomotives are used at one of the mines.

The colliery employs an average 446 men, of whom 258 are employed underground. The underground operations are under the direct supervision of 4 overmen and 21 firebosses. A brief description of the underground operations follows.

*Balmer North Mine.*—William Davey, overman. This mine, in No. 10 seam, is being worked to develop a large area of virgin coal on the north side of Michel Valley. It is entered by two rock tunnels, each 1,150 feet long, which were started in September, 1965, and reached the seam in February, 1966. The portals are at an elevation of 3,850 feet. They are approximately 1 mile west of the preparation plant, and can be reached by the private road leading to the Baldy strip mine. The seam is 40 feet thick, dips at an angle of 15 to 20 degrees in a southwesterly direction, and is overlain by a fairly strong shale roof. The coal is mined by continuous miners. It is loaded onto shuttle cars and transported from the mine by fast-moving belt conveyors. The workings are described in the 1966 Annual Report, page 387.

The operation was seriously disrupted in 1967 by the disastrous explosion that occurred on April 3rd, resulting in the death of 15 workmen and injury to 10 others, the details of which are given in the Inspection section of this report on pages 420 to 430. The explosion wrecked the ventilation system of the whole mine, including the fan drift, but the surface fan was not damaged. Extensive damage was also done to the belt conveyors and electrical equipment. There were a number of large roof falls on the roadways that were relatively light in comparison with the intensity of the explosion. This is attributed mainly to the fact that most of the roadways were in contact with the hangingwall of the seam and the rock roof is supported by rock bolts. Comparatively little damage was done to the continuous mining machines, which were at the faces of the working-places in various parts of the mine. The electric motors and controls on one machine were extensively damaged by water owing to the machine being trapped and flooded by water while recovery operations were in progress.

The gob area of the pillar extraction at the faces of the Nos. 1, 2, and 3 Entries, where the explosion is believed to have initiated, was immediately sealed following the restoration of the ventilation at the mine, and rehabilitation of the remainder of the workings was carried out on a large scale. Most of the electrical equipment was sent from the mine for examination and repairs, and the conveyors were rebuilt and replaced. One of the continuous miners was placed back in operation in June, approximately six weeks after the explosion, and it was used for driving two additional slopes entering the dip workings to increase the ventilation in that area and to provide a means of dividing the mine workings into three separate ventilation districts. Another continuous miner was placed back into operation a month later and was used to develop a small area of workings in the vicinity of the McKay fault in the upper part of the mine. The operations were confined to the working of the two machines for the remainder of 1967, and at the end of December the mine was averaging a daily production of 1,150 tons with a crew of 66 men. Total development during 1967 was 21,000 feet.

The mine is ventilated by two 100-horsepower electrically driven axivane fans which deliver 157,000 cubic feet of air per minute to the mine workings. One of the fans was installed during the latter part of 1967. It was installed at the same portal and placed in series with the original fan. A direct-fired propane heating unit was also placed at the inlet to the fans to increase the temperature of the air entering the mine during the winter, mainly to prevent the water sprinklers at the transfer points on the conveyors from freezing. The conditions in general were fairly good during the course of inspections. Considerable difficulty was experienced with the ventilation of the slope workings during the latter part of 1967 owing to an increase in the emission of gas from the coal in the slope area. Because of this the rate of development by the continuous miner had to be restricted on several occasions. Methanometers were used in conjunction with flame safety lamps for testing for gas during the operation of the machine, and a recording methanometer was installed for checking the ventilation in the main rock tunnel return airway. Consideration is being given to the sinking of an air shaft to improve the ventilation.

*Balmer No. 1 (South) Mine.*—Arnold Webster, overman. This mine, operating in No. 10 seam, was opened in 1960 to develop a large area of coal on the south side of Michel Valley. The portals are approximately 1 mile west of the preparation plant, and the workings are entered by three levels which have been driven from various elevations on the outcrop, near creek level. The seam is 40 feet thick, dips at an angle of 30 degrees in an easterly direction, and is overlain by a moderately hard shale roof. A description of the workings has been given in past Annual Reports.

The mine averaged a daily production of 535 tons during 1967 with a crew of 39 men. There were two continuous miners in operation, and most of the activities were directed to the extraction of pillars in the No. 1 Incline district and the development of a new panel of workings above the main haulage level. The pillars in the No. 1 Incline district were extracted by the caving system, the extraction roadways being driven on the footwall of the seam, and the top coal allowed to cave while on the retreat. The whole operation at both districts was carried out by continuous miners, the coal being loaded onto shuttle cars and fast-moving belts and transferred to various loading points on the main level, where it was loaded into 10-ton capacity bottom-dumping cars and taken from the mine by diesel and battery locomotives. At the surface, the coal is dumped into a large storage bin and later trucked to the preparation plant. The total development at the mine during 1967 was 6,200 feet.

The mine is ventilated by a 100-horsepower electrically driven fan which delivers 51,840 cubic feet of air per minute to the mine workings with a 3.25-inch water gauge. Small auxiliary fans and synthetic tubing are used with each of the continuous miners during development work. The conditions in general were found to be satisfactory during the course of inspections, with the exception of indications of gob heating in the No. 1 slope district, that was abandoned in 1966. Details of the heating are given in more detail under "Dangerous Occurrences." One workman was also fatally injured in the No. 1 Incline district, and is reported in more detail under "Fatal Accidents."

*No. 1 South Mine.*—Henry Eberts, overman. This mine, which was opened in September, 1966, to develop a small area of No. 1 seam coal between the old No. 1 seam mine and the outcrop, was abandoned in November, 1967, owing to geological disturbances and depletion of coal reserves. The continuous miner and other equipment were withdrawn from the mine, and the workmen transferred to the other mines. During its operation the mine averaged a daily production of 550 tons with a crew of 26 men. Total development was 3,750 feet. A description of the workings is given in the 1966 Annual Report, page 388.

*"A" North Mine.*—John Whittaker, overman. This mine, which was opened in 1951 to develop a large area of workings in the "A" seam on the north side of the Michel Valley, was abandoned in October, 1967, owing to geological disturbances and economic reasons.

*"C" North Mine.*—Henry Eberts, overman. This mine, which was opened in November, 1966, is being worked to develop an area of workings in the top section of the "C" seam on the north side of the Michel Valley. The portals are at an elevation of 5,200 feet and are accessible from a private road leading from the preparation plant. The mine is entered by three levels which have been driven from the outcrop by a continuous miner, and follow the strike of the seam. Two other roadways have also been connected to the surface from the inner workings. The coal is 7 feet thick, dips at an angle of 12 degrees in a southwesterly direction, and is overlain by a strong shale roof.

The mine averaged a daily production of 645 tons during 1967 with a crew of 31 men. Most of the activities were directed to the development of the levels, and the extraction of pillars in a panel of workings below the main level. Some difficulty was experienced with geological disturbances on the levels, and at the end of 1967 three roadways were in process of developing a large area of workings on the upper or north side of the levels. The coal was mined by a continuous miner, and taken from the mine by shuttle car and fast-moving belts, and later trucked to the preparation plant. All the roadways are supported by rock bolts. Total development during 1967 was 13,300 feet.

The small fan that was used for ventilating the mine in its initial stage was replaced in August, 1967, and the mine at present is ventilated by a 100-horsepower electrically driven axivane fan which delivers 112,500 cubic feet of air per minute to the mine workings at 0.9-inch water gauge. No indications of methane have been reported in the mine workings to date. The general conditions were found to be satisfactory during the course of inspections.

*Prospect Tunnels and Exploration.*—Louis Sclippa, fireboss. This work is part of an extensive exploration programme that is being conducted by the company in conjunction with the Kaiser Steel Corporation to prospect and develop a large area of coal lands owned by the company in the vicinity of Michel pending the signing of a contract agreement for the export of large annual amounts of coking-coal to Japan. The 1967 programme was carried out on a large scale and covered a wide area. It included the opening of 12 adit tunnels from the outcrops of three seams for a distance of 2,437 feet (drifting and raising) and drilling 85 rotary and rotary-percussion non-core holes, totalling 26,110 feet, from widely separated points on the mountainside on Natal Ridge and Baldy Mountain. There were nine large bulldozers in operation, and more than 34 miles of access roads was built to the various adits, drill-sites, and outcrop exposures. Five large test-pits were opened along the outcrop of the No. 10 or Balmer seam, and large bulk samples were sent for coking tests, washability studies, petrographic and proximate analyses, etc. There were 62 men employed, and the work was under the direction of J. J. Crabb, exploration manager. The exploration work continued during the winter months.

During 1967, 12,092 pounds of Monobel No. 4, 10,282 pounds of CXL-ite, and 12,341 electric detonators were used at the colliery for coal and rock blasting. No misfired shots were reported.

A total of 1,825 tons of limestone dust was used for the application of inert dust over the roadways at the various mines to minimize the coal-dust hazard, sealing workings, and tamping shots. Monthly dust samples were taken at all the mines and analysed. The samples were found to be above the minimum requirements needed for incombustible content.

Monthly examinations of workings were made at all the mines by the miners' inspection committees, and regular safety meetings were held each month at the colliery office. The various reports kept at the mines in compliance with the *Coal Mines Regulation Act* were examined periodically and found to be in order.

*Baldy Strip Mine.*—George Lancaster, foreman. This mine is on Baldy Mountain, 4 miles northwest of Michel. It is at an elevation of 5,000 feet and can be reached by means of a private road leading from the preparation plant. The coal is 40 to 60 feet thick and dips at an angle of 25 to 30 degrees in an easterly direction. The seam is believed to be the No. 10 seam. It can be traced for miles, and the company has operated several open pits along the outcrop since 1948. The present pit is known as the No. 4B pit. It was opened in 1960 and is worked on a contract basis. Removal of overburden was completed in 1961.

The mine was idle for most of 1967 and was only operated for one very short period, during which time a total of 2,620 tons of coal was produced with a crew of four men.

*No. 7 Seam Strip Mine.*—J. Whittaker, foreman. This mine is on Natal Ridge, approximately 2 miles southwest of Michel, and was opened in September, 1966, to develop an area of No. 7 seam coal outcropping on the mountainside. The mine is at an elevation of 4,800 feet and can be reached by means of a private road leading from the preparation plant. The seam is 31 feet thick but contains a 6-foot rock parting approximately 6 feet above the footwall. It dips at an angle of 15 to 20 degrees in a southwesterly direction. The coal is mined by bulldozers, and blasting is restricted to rock work. A large area of the overburden is removed, then the top coal is pushed into the bottom of the pit prior to the removal of the rock parting between the two seams. The coal is then loaded by a front-end loader and power-shovel and trucked to the preparation plant. The work was carried out on a contract basis. The total production during 1967 was 348,192 tons with a crew of 15 men.

*"C" Seam Strip Mine.*—This mine, which was opened in November, 1965, to operate an area of Upper and Lower "C" seam coal on Natal Ridge, 2 miles northeast of Michel, was inactive during 1967 owing to the high moisture content in the coal.

*No. 3 Seam Strip Mine.*—J. Whittaker, foreman. This mine was opened in the spring of 1967, and is being operated to develop an area of No. 3 seam coal outcropping on Natal Ridge, approximately 2½ miles northwest of Michel. The mine is at an elevation of 5,000 feet, and can be reached by a 3½-mile private road leading from the preparation plant. The seam is approximately 30 feet thick but contains two rock partings totalling 12 to 15 feet. It is mined in a similar manner to the No. 7 seam strip mine. Total production during 1967 was 67,903 tons with a crew of nine men.

*Balmer South Strip Mine.*—George Lancaster, foreman. This mine was opened in October, 1967, to develop an area of No. 10 seam coal outcropping on Sparwood Ridge, approximately 2½ miles southwest of Michel. It is at an elevation of 5,000 feet and can be reached by a 3½-mile private road leading from the preparation plant. The coal is 40 to 50 feet thick and dips 30 degrees in an easterly direction. Most of the activities were directed to removal of overburden, and 14,376 tons of coal was produced in December. There were 14 men employed.

*Preparation Plant.*—George Lancaster, superintendent. The preparation plant is on the colliery-site near the entrances to the old rock tunnels on the south side of the valley. It was built in 1936 but has been considerably modernized since then.

*By-product Plant.*—Ian Dufour, superintendent. The by-product plant adjoins the preparation plant. Present operations are confined to the Curran-Knowles ovens. Sixty men were employed. The plant produced 144,147 tons of coke, 15,060 tons of breeze (coke fines), and 915,451 gallons of tar during 1967.

**Coleman Collieries Limited** (49° 114° N.W.) Meno Bianchini, mine foreman. The coal-mining activities of this company in the East Kootenay District are confined to a large stripping operation on the interprovincial boundary on Tent Mountain, near Corbin. Most of the operation is on the Alberta side, but large quantities of coal have been produced from the British Columbia side for the last 16 years where the seams extend into this Province. The present operation is confined to the No. 4 pit, which is at an elevation of 7,000 feet, and can be reached by means of a private road leading from the No. 3 highway at the Crowsnest Lakes. The road is on the Alberta side, and all the production is taken to the company's preparation plant at Coleman. The pit has been in operation since 1954.

There was no production of coal from the British Columbia side. An extensive programme of rock work continues to be carried out to widen the pit, thus exposing a greater area of coal and enabling the seam to be worked to a greater depth. It is calculated that 209,247 cubic yards of rock was removed in 1967, leaving a balance of approximately 2,000,000 cubic yards to be removed in the widening process. On completion of the rock work, it is estimated there will be 1,272,170 tons of coal left in the pit, approximately one-third of which will be loaded from the British Columbia side.

**Pacific Coal Limited** (49° 114° S.W.) Registered office, 1001 Bank of Canada Building, 400 West Hastings Street, Vancouver 1. This company has conducted a coal exploration programme on Crown land in the Morrissey and Flathead area, southeast of Fernie, since 1964. The main activities in 1967 were on Flathead Ridge, where a crew of 15 men opened eight adit levels along the outcrops of two seams for a total distance of 893 feet, and drilled four holes, totalling 3,310 feet, from a high elevation on the mountainside. More than 8 miles of access roads was built by bulldozer, and the outcrops of two seams were trenched for a distance of 7 miles. Approximately 60 tons of coal samples was loaded from the adit tunnels and shipped for testing. The men were employed for a period of five months. The exploration work was directed by D. D. Campbell and K. Harada.

## FERNIE BASIN

By A. Sutherland Brown

Interest in coal exploration has been increasing gradually for a number of years and increased sharply in 1967. This is particularly true of exploration for coal in the Kootenay Formation of the Fernie Basin and its northern extension along Elk River and Fording River. Crows Nest Industries Limited accelerated its programme on Baldy Mountain and Natal Ridge, and large new programmes were started by Canadian Pacific Oil and Gas Limited on Fording River and by McIntyre Porcupine Mines Limited on Line Creek. In addition, licences were taken out and some work was done by Scurry-Rainbow Oil Limited on Fording River and Royal Canadian Ventures Ltd. near Flathead. Pacific Coal Limited and Fernie Coal Mines Limited in the Morrissey and Michel Ridge areas respectively continued their programmes, and Cominco Ltd. did some geological mapping in its block of Crown-granted claims on the Elk River adjacent to Canadian Pacific Oil and Gas Limited licences. Figure 44 is a sketch showing these various properties in relation to the distribution of the Kootenay Formation.

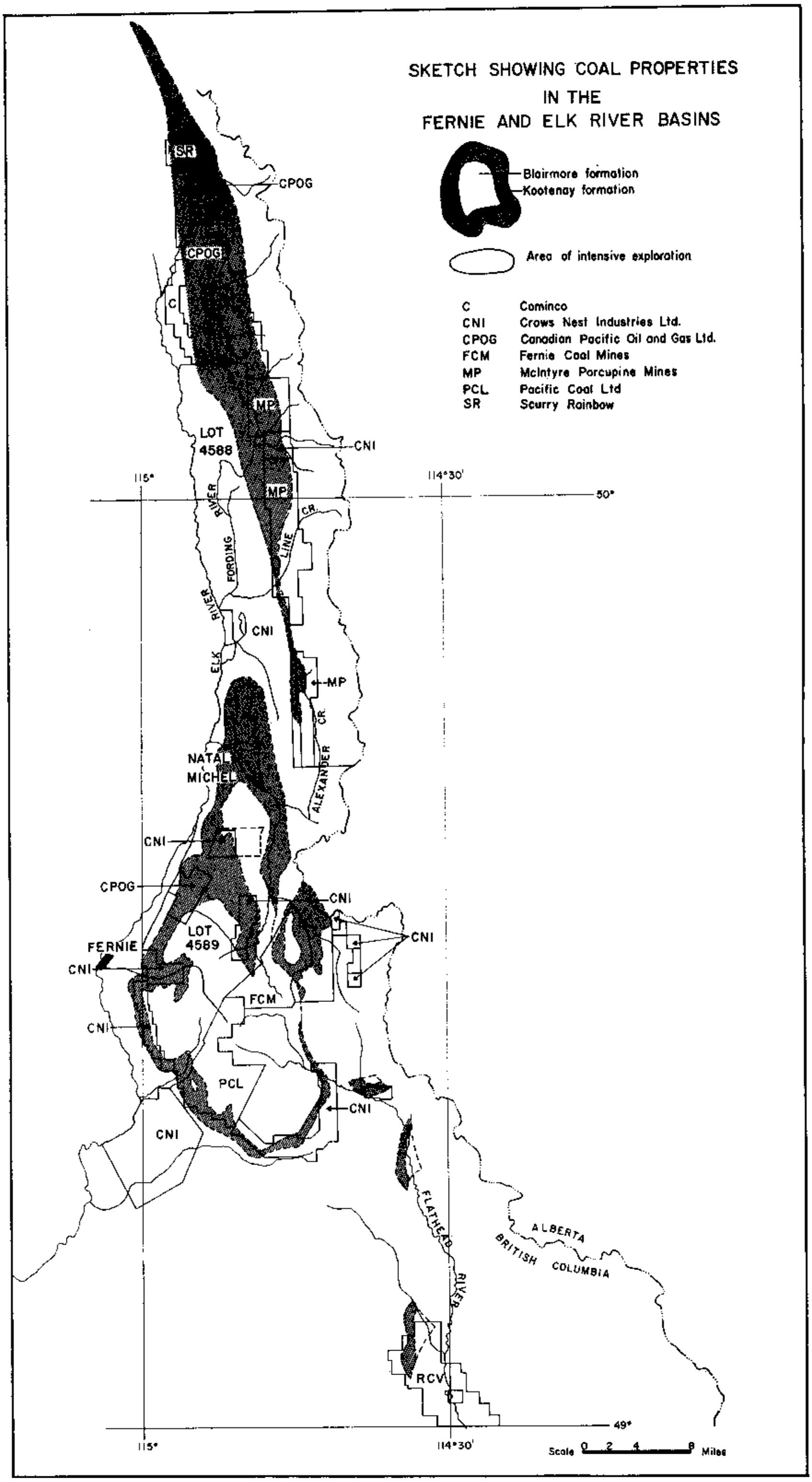


Figure 44. Sketch showing coal properties in the Fernie and Elk River basins.

**Crows Nest Industries Limited** (49° 114° N.W.) Thomas F. Gleed, president, 2000 Washington Building, Seattle, Wash. J. E. Morris, W. R. Prentice, and J. L. Cleeve, vice-presidents respectively for mines, sales and executive, and finance, all at the company operations office at Fernie. The company holds a large block of land extending from Elko to Fording Mountain and consisting principally of two blocks (Lots 4588 and 4589) received as a subsidy for a railway building, but also including a large number of Crown-granted lots and coal leases. The company, then called The Crow's Nest Pass Coal Company Limited, started active mining in 1897. It currently operates only the Michel colliery, with production from four underground mines and four strip mines, and totalling about 800,000 tons per year. During 1967 the company continued its exploration programme directed by J. J. Crabb, exploration manager, and under an option agreement with Kaiser Steel Corporation considerably expanded the programme with the intention of proving enough reserves of high-quality coking-coal so that production may be expanded to 2 to 3 million tons per year. In February, 1968, an agreement was reached between Kaiser Steel Corporation and Crows Nest Industries Limited that gave the former company the latter's coal resources. This was followed by an announcement of a 15-year contract with Mitsubishi Shoji Kaisha to supply 45 million long tons of coal.

Exploration during the year involved the use of three rotary drills and nine large bulldozers. Work was concentrated in the vicinity of the surface trace of No. 10 seam, the lowest commercial seam. This seam, which is about 55 feet thick, has been traced around the north end of Baldy Mountain for about 10 miles. During the year, work included 6 miles of trenching, driving 11 adits with a total length including crosscuts of 2,437 feet, and 85 drill-holes totalling 26,110 feet.

**Canadian Pacific Oil and Gas Limited** (50° 114° S.W.) J. M. Taylor, vice-president and general manager; J. G. Matthews, manager, mining division. Company office, 205 Ninth Avenue Southeast, Calgary, Alta. This company holds coal licences Nos. 314 to 364, totalling 26,980 acres, chiefly in a block extending from Chauncey Creek to the Elk River at Mosquito Flats. The south end of the block is 30 miles north of Michel.

During 1967 an exploration programme was conducted involving geological reconnaissance of the lower Kootenay Formation, 2,528 feet of diamond drilling in four holes, and driving a prospect adit and raise for a total of 158 feet. Detailed geology and extensive bulldozer tracing of seams were concentrated on Eagle Mountain and to a lesser degree on Castle Mountain, where a large number of continuous seams occur in a favourable structural situation. Several of the seams are potentially of economic importance.

**McIntyre Porcupine Mines Limited** (49° 114° N.W. and 50° 114° S.W.) Company exploration office, 25 King Street West, Toronto, Ont. J. D. Barrington, president. Exploration in British Columbia is directed by J. W. MacLeod, 409 Granville Street, Vancouver 2. This company held 60 coal licences in 1967 in the Line Creek and Alexander Creek areas. During the year a programme of bulldozer stripping was carried out in both areas. The Alexander Creek area proved to be highly disturbed with a minimum section of Kootenay Formation, but on Line Creek stripping outlined a number of potentially economic seams in areas where structure and topography are favourable.

## NICOLA-PRINCETON INSPECTION DISTRICT

By David Smith

There was no coal production in 1967 in the Nicola-Princeton District. Imperial Metals and Power Ltd. continued intermittent tests using local coal. A fire destroyed the old tipple of Coldwater No. 2 mine but was confined to the immediate area with no material loss involved.

## NORTHERN INSPECTION DISTRICT

By David Smith, Except as Noted

The coal mines of the Northern District produced a total of 12,987 tons of coal in 1967. The output is sold entirely on the domestic market, which limits all operations to seasonal work.

No serious accidents and no dangerous occurrences were reported in this district in 1967.

### Peace River (56° 122° S.E.)

The King Gething mine on Lot 1039, 12 miles west of Hudson Hope, owing to lack of markets, remained closed in 1967.

### Telkwa (54° 127° N.E.)

**Bulkley Valley Collieries Limited**
By A. Sutherland Brown

Company office, Telkwa. J. D. Carnahan, general manager. This property on Goathorn (Goat) Creek, 7 miles southwest of Telkwa, consists of six Crown-granted lots (Nos. 388 to 392 and 401). Underground mining by the company ceased in March, 1966, but strip mining began in September, 1966, and continued intermittently since. On August 1st operations were taken over by the Luscar Sales Ltd., of Edmonton, on a royalty basis with S. Housdorff as manager. Production for the year totalled 12,987 tons.

The general geology was described by J. M. Black in the 1951 Annual Report of the Minister of Mines. Bedrock is not well exposed in the vicinity, with the result that neither the stratigraphy, age, nor affiliation of the coal-bearing unit is known with certainty. Black described a minimum of 650 feet of strata in the southeast part of the property, of which 200 feet are coal bearing. In the northwest, part of the unit overlies volcanic rocks of the Hazelton Group with unconformity and appears to be thinner with fewer coal seams. Most of the section is composed of soft, friable grey silty mudstone to very fine sandstone that is indistinctly bedded. Some of these rocks contain abundant 3- to 4-inch-diameter ellipsoidal calcareous concretions, in some of which poorly preserved small thin-shelled pelecypods are common. Also present are coarser rusty-weathering grey to brown sandstone and minor grey clay beds. Correlation of the coal beds in the various workings and old drill-holes has not been found possible because of a lack of marker beds, lenticularity of the seams, and block faulting. The sequence as a whole, however, almost certainly is part of the Bowser Group of post-Oxfordian (Late Jurassic) and Early Cretaceous age.

Since 1951 both No. 3 mine, which had just been started, and No. 4 mine, which was developed at creek level in area A of Black's map (Fig. 20), have been mined out. New prospect entries were driven just south of No. 4 mine on the same seam, but a new mine was not developed. Instead a flat seam on a bench 120 feet above the creek and 1,000 feet north of No. 4 mine was developed by surface stripping. Here a 5½- to 6-foot seam of bright hard coal is overlain by 18 feet of grey concretionary siltstone and 14 feet of till. Stripping is done entirely by D-9 caterpillar, and the coal is broken by a D-7 with minor blasting. If this seam is the same one mined in No. 4 mine, it has been raised by faults about 200 feet. Several significant faults are visible on the road up the slope to the strip. No drilling was done prior to mining, and reserves are conjectural.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 291–297.]

## Bowron River

**Northern Coal Mines Limited** (53° 121° N.W.) Registered office, 285—17th Street, West Vancouver. This property consists of three coal licences, Nos. 163, 162, and 148, covering respectively Lots 9591, 9592, and 9593. Applications for licences on many of the adjacent lots have been made by the company. The property is on the lower Bowron River about 4 miles south of Purden Lake and 32 miles east of Prince George.

By A. Sutherland Brown

In 1967 the company continued its programme of surface diamond drilling, with four holes totalling 3,900 feet. About 1,000 feet north of the southeast corner of Lot 9592 an inclined entry was started that bears west at minus 12 degrees. It entered the upper coal seam at about 100-foot depth, then turned and followed the coal down at the same slope. To the end of 1967, 570 feet of advance had been made. This entry, No. 2 mine, is about 3,500 feet northwest of the earlier development, No. 1 mine, on Lot 9591, which is planned to be used for ventilation. In October, 1967, Intercoal Resources Ltd. relinquished its option, and the company is proceeding with development on its own.

The Bowron River coal measures were described in some detail in the Annual Report of the Minister of Mines in 1948 (pp. 233–240), and a geological sketch-map was included that would not be changed much in the light of recent work. Therefore, this report attempts only to summarize some new information.

The Bowron River coal occurs near the base of an unnamed sedimentary unit more than 2,000 feet thick. Preliminary examination of spores from these rocks indicates to Professor Glenn Rouse, of the University of British Columbia, a probable Mid-Tertiary age. The rocks occupy a lineal basin oriented northwesterly and possibly 15 miles long by 1½ miles across. The basin is bordered on both sides by greenstones and minor chert and limestone of the Slide Mountain Group of Mississippian age (*see Geol. Surv., Canada,* Paper 68-1). Structurally the basin appears to be an asymmetrical trough in which the southwestern margin is a normal sedimentary uncomformity, but the northeastern one is a down-dropped fault, possibly active during deposition. Natural exposures of the sedimentary rocks occur sparingly along the Bowron River, so that knowledge of them depends largely on drill core. Drill-holes extend a maximum of 2,000 feet into the basin from the southwest contact. The beds strike northwest, dip about 45 degrees northeast near the contact, but flatten rapidly, so that 1,500 feet or so from the contact dips are of the order of 10 to 20 degrees. Dips indicated by bedding attitudes in core may be in slight error because of possible deviation of the holes from vertical and because abundant slump structures throughout the section may indicate high initial dips (or active movement on the northeast boundary fault). Continuity of coal beds between drill-holes can be taken to indicate true dips of 10 degrees at depth. Although the continuity between drill-holes is good, there is an indication of a few steep normal faults striking north 10 to 20 degrees west and dropping the eastern block.

At the time of the writer's visit, diamond-drill hole WL-7 was the deepest hole drilled, and the following generalized description of the sedimentary section is based on it. This hole was drilled 2,100 feet north and 430 feet west of the southeast corner of Lot 9591 on the west bank of the river. The thicknesses shown are approximate true thicknesses from the top of the sedimentary section.

| Feet | |
|---|---|
| 0– 100 | Pebbly sandstone and mudstone. |
| 100– 160 | Mostly pebbly sandstone. |
| 160– 300 | Subangular pebble conglomerate, with limestone, greenstone, shale, chert, green schist pebbles in a calcareous matrix, minor sandstone. |
| 300– 400 | Sequence of graded beds, fine pebble conglomerate to laminated siltstone and shale, bed average about 3 feet thick—slump structures common, indicating down-dip movement. |
| 400– 525 | Similar sequence of graded beds with pebble beds rarer—slumps and sharpstone conglomerates common. |
| 525– 625 | Similar sequence of graded beds—with very rare pebbly sandstones and more laminated grey siltstone and brown shale—minor coal stringers. |
| 625– 700 | Brown shale with some black carbonaceous sandstone and laminated shale and siltstone, minor light-brown bentonitic shale at 690 feet. |
| 700–1,225 | Mostly a sequence of graded beds, mostly fine sandstone with laminated shale and siltstone, some massive shale beds and rare thick medium sandstone beds. |
| 1,225–1,335 | Mainly massive shale with minor laminated shale-siltstone, minor laminæ of bentonite at about 1,228, shale grey below 1,300 varies from carbonaceous black shale. |
| 1,335–1,400 | Dark-grey and buff calcareous shale and siltstone with interbedded sandstones with coal fragments and carbonaceous laminæ. |
| 1,400–1,416 | Mostly hard coal with lower 6 feet interbedded coal, sandstone, and shale. |
| 1,416–1,448 | Interbedded angular pebble conglomerate, coal, amber-bearing shale, and black carbonaceous sandstone, thickest coal seam 3 feet. |
| 1,448–1,460 | Black and white pebble-sized sedimentary breccia. |

Most of the drill-holes show three separate coal beds in the basal 200 feet of section with thicknesses of from 8 to 12 feet. A constant constituent of the coals and some of the adjacent shales are black and amber resin lenses a couple of millimetres to 2 centimetres long and 1 centimetre thick. Considerable work would need to be done to evaluate both methods of recovery and the value of the resins. The company is concentrating on proving up tonnage of coal of coking quality. The fusibility index is reported to be increasing rapidly with penetration below the zone of oxidation. In a report to the company, J. M. Black calculated reserves currently of 25 million tons of indicated and probable coal.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1948, pp. 233–240; *Geol. Surv., Canada*, Paper 68-1, pp. 14–19.]

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