Minister of Mines and Petroleum Resources

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

for the Year Ended December 31

1968

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1969

BRITISH COLUMBIA DEPARTMENT OF MINES AND PETROLEUM RESOURCES

VICTORIA, BRITISH COLUMBIA

HON. FRANK RICHTER, *Minister.*

K. B. BLAKEY, *Deputy Minister.*

J. W. PECK, *Chief Inspector of Mines.*

S. METCALFE, *Chief Analyst and Assayer.*

M. S. HEDLEY, *Chief, Mineralogical Branch.*

R. H. MCCRIMMON, *Chief Gold Commissioner.*

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

R. E. MOSS, *Chief Commissioner, Petroleum and Natural Gas.*

Colonel the Honourable J. R. NICHOLSON,
P.C., O.B.E., Q.C., LL.D.,
Lieutenant-Governor of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mineral Industry of the Province for the year 1968 is herewith respectfully submitted.

FRANK RICHTER,
Minister of Mines and Petroleum Resources.

Minister of Mines and Petroleum Resources Office,
March 31, 1969.

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ANNUAL REPORT OF THE MINISTER OF MINES AND PETROLEUM RESOURCES, 1968

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 1968 value of British Columbia's mineral industry established a new record for the seventh successive year. For the first time the annual production exceeded 400 million dollars, an increase of almost 22 million dollars, or 5.7 per cent, above the total for 1967. The all-time total value reached 6,696 million dollars.

The figures for the four main classes of products are shown below, with the percentage changes from 1967. A significant adjustment made in the 1967 published figure for structural materials is discussed below.

	1967	1968	Change (Per Cent)
Metals	$235,865,318	$251,252,418	+6.52
Industrial minerals	29,364,065	26,056,782	−11.26
Structural materials	44,011,488	45,189,476	+2.67
Fuels	74,141,627	82,870,204	+11.77
Totals	$383,382,498	$405,368,880	

The value of metal production showed a satisfactory increase. This was largely the result of enhanced prices for copper, at an all-time high average of 54.216 cents per pound for the year, and for silver, at an all-time high average of 231.049 cents per ounce for the year. It was due also to an increase in production of lead and zinc, although the prices for lead and zinc were both the lowest in five years.

The largest increase in value among the metals was some 6 million dollars in silver, with only a moderate increase in output compared with 1967. Copper was still the most valuable commodity in the entire industry; there was only a slight reduction in value in spite of a marked drop in production, which was due largely to the changeover from open pit to underground mining at Craigmont. An increase in rate of molybdenum production was largely offset by the effect of a three-month strike at Endako.

The decrease in value of industrial minerals was due to a reduced production of asbestos. This was occasioned by the fact that Cassiar Asbestos Corporation Limited reduced production at Cassiar when they brought their Yukon (Clinton Creek) property into production.

Structural materials showed little change from the 1967 total figure. The figure for cement has been amended downward from that published in the 1967 Annual Report by about 3⅓ million dollars. It was found that ambiguity in the form used for data collection had led for some years to the inclusion of transportation charges as part of the cost of cement. Elimination of these charges reduces the value of cement to a statistically more correct figure.

The fuels category, consisting 95 per cent of petroleum products, showed a lower percentage gain than in the past three years. This was because the gain in 1968 was a function of production alone and was not due to an appreciable increase in unit price as well. The price for British Columbia light crude oil was reduced, but this reduction was balanced by an increase in price for the heavier oils. The unit price for natural gas was essentially unchanged from 1967.

Metal mining contributed 62 per cent of the value of the industry. The percentage contribution has been slowly decreasing with the steady climb in petroleum products, but the next few years will see some changes in the pattern of growth. The production of copper will expand greatly, and of molybdenum substantially. At the same time, there will be a huge increase in coal production.

Expansions brought the milling capacity at Endako to 28,000 tons per day and at Bethlehem to 14,000 tons per day. The actual average output of 33 milling operations was 78,000 tons per calendar day. Two iron mines closed, at Kennedy Lake and at Jedway, but the loss in production was almost equalized by the output at Tasu. The Pinchi Lake mercury mine of Cominco Ltd. reopened at a rate of 800 tons per day, after being inactive for 25 years.

The Trail smelter treated 17,006 tons of crude ore and 301,236 tons of concentrates from British Columbia as well as a large tonnage of concentrates, ore, and scrap from sources outside the Province. A total of 2,508,852 tons of concentrates was shipped to foreign smelters. Of the total value of metal production of the Province, concentrates representing 8.7 per cent of the total were shipped to American smelters and concentrates representing 44.4 per cent of the total were shipped to Japanese smelters.

DESTINATION OF BRITISH COLUMBIA CONCENTRATES

Smelters	Gold-Silver	Lead	Zinc	Copper	Nickel-Copper	Iron
	Tons	Tons	Tons	Tons	Tons	Tons
Trail	4,444	135,082	161,710	.....	.....	.....
United States	.....	14,021	83,801	14,753	.....	.....
Japan	.....	.....	21,267	262,065	18,200	2,094,745

Most molybdenum was marketed in the form of concentrate, largely to Europe. About one-fifth of the Provincial production was converted to molybdic oxide and ferromolybdate by Endako Mines Ltd.

The Granduc tunnel from Tide Lake to the mine workings broke through in December at 10.3 miles. This is the world's longest drive from one heading, and in the course of it records were set for a single day's and a week's advance. The 8,000-tons-per-day mill at Tide Lake was under construction, and a number of residences were built at Stewart. The Brenda Mines Ltd. property came under full scale development for production at 24,000 tons per day of copper-molybdenum ore in 1969.

Other properties under investigation with promise of eventual production included copper and molybdenum deposits that had not yet been declared as mines. By the close of 1968 work had ceased on copper deposits of Stikine Copper (Galore Creek), Lornex, and Ingerbelle (Princeton), and on the Glacier Gulch molybdenum deposit at Smithers. Feasibility studies were being conducted on these properties to determine whether or not they would soon be put into production. Extensive work was done on several other large low-grade deposits of copper and copper-molybdenum. Of these the Bay property (later Island Copper) on Rupert Inlet reached an advanced stage of investigation and the Valley Copper deposit in Highland Valley attracted a great deal of attention. At least 10 other properties must be classed as potential producers of large low-grade ore zones.

The discovery late in 1967 of significant mineralization on the Valley Copper ground in Highland Valley may lead to the quickest development of what appears to be the largest " porphyry copper " deposit with associated molybdenum yet discovered. It is also the first major discovery in an area of no outcrop or surface indication of mineralization whatever, and was found as the result of geological deduction.

Exploration was maintained at a high level throughout the Province, with chief emphasis on copper and copper-molybdenum deposits in the central and western regions. It is difficult to generalize concerning this work, or to make comparisons

with previous years, but all measures of activity were high, and it appears that more work was done on mining properties than ever before. Claim-staking was high, as was the amount of assessment work, and the footage of exploratory drilling (core and percussion) set a record. About 275 geological, geochemical, and geophysical reports per year are accepted by the Department as assessment work, involving in 1968 about $1,200,000 in work done on the ground.

The task of reporting on the activities of the mining industry, a task that has been the responsibility of this Annual Report for a great many years, has grown with the industry. Adequate reporting has overtaxed the existing staff and the rapid increase in volume of data relating to all phases of the industry has overtaxed the facilities for recording it. The Mineralogical Branch now recognizes the work of maintaing data files in readily usable form to be a full-time occupation for at least one geologist with adequate support. Machine processing of data has not yet been attempted, but it is under consideration. Availability of data is vital to the best use and conservation of exploration funds, which now amount to tens of millions of dollars annually.

Nine staff geologists of the Mineralogical Branch did geological field work ranging from revisions of mapping in old camps to property examinations in active areas. The results of this work are published in this Annual Report or will appear in forthcoming bulletins. Seven resident engineers of the Inspection Branch contributed property write-ups to this Annual Report.

Airborne magnetometer surveying under a cost-sharing agreement with the Geological Survey of Canada was continued in the west central Interior. Flying was completed under a three-year contract involving 114 1-mile map sheets. Publication of the finished sheets of this contract has started, and 4-mile compilations will also be available. Following release of maps, the basic data are on file with the Geological Survey in Ottawa.

The Geological Survey of Canada reported 31 projects involving fieldwork, some of which extended beyond the Province.

The over-all statistics of exploration and development in the industry are presented, without analysis, as they were collected for the second year on revised Dominion Bureau of Statistics forms. They do not include similar figures for petroleum and natural gas. In large part the expenditures were incurred in the search for and development of new sources of metals.

EXPLORATION AND DEVELOPMENT EXPENDITURES, 1968

	Physical Work	Land Costs	Head Office, Administration, Etc.
Exploration—prospecting and undeclared mines—389 companies	$27,186,000	$1,012,000	$6,467,000
Exploration on or near declared mines—17 operating companies	$6,425,000	1,000	594,000
Development on declared or operating mines—			
Five development companies	$58,363,000		
Nineteen operating companies	10,565,000		
	$68,928,000	33,000	2,553,000
Totals	$102,539,000	$1,046,000	$9,614,000
Grand total, $113,199,000.			

The foregoing represent minimum figures, but the response by the industry is sufficiently complete to show that the figures are substantially correct. Explora-

tion includes all work up to the stage that a company decides definitely to proceed to production. Thus in 1968 the Brenda property was declared as a mine and the Lornex property was not. No division can uniformly be made between preliminary and advanced stages of drilling or other physical investigation until such time as production is assured.

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 forms of work, including diamond-drilling, stripping, tunnelling, and various sorts of surveys. Of the combined total of $113,199,000, the sum of $56,316,000 was paid to contractors. The contractors' work force was approximately equal to the companies' work force.

The Department's work records show a total of some 11,800 man-months worked by contractor's and company employees on the finding, exploration, and investigation of new mineral deposits. This total is not comparable with that in Table 10, which shows the total company figures reported on Dominion Bureau of Statistics forms.

Total expenditures in the mining, mineral, and structural materials industry are given below. These are over-all figures.

Major expenditures by the industry, 1968, were as follows:—

Mining operations—metals, minerals, coal	$121,988,595
Structural materials operations	12,645,962
Capital expenditures	33,561,949
Repair expenditures	19,572,665
Exploration and development	113,199,000
Total	$300,968,171

Capital and repair expenditures are listed separately because of difficulties in maintaining consistency. Actually, most of the repair expenditures apply to operations, and most of the capital expenditures apply to exploration and development.

In February, 1968, Kaiser Coal Ltd. (changed to Kaiser Resources Ltd. in 1969) acquired the coal rights on 108,000 acres of land from Crows Nest Industries Limited. The basis of this transaction was the signing of a sales agreement with Mitsubishi Metal Mining Co. Ltd. to supply Japanese interests with 45 million long tons of coal over a 15-year period at a price of $12.85 (U.S.) per long ton, f.o.b. spout-trimmed at the Roberts Bank terminal. In December, 1968, Kaiser announced additional sales to Japan, involving 2 million long tons per year for 1970, 1971, and 1972, with a buyer's option on an additional 2 million tons in 1973 and 1974. The agreements were made possible by availability of cheaply mined coal, marked reduction in freight rate to the coast, and facilities for cheaply loading large vessels.

Sales under the first agreement amount to approximately 42 million dollars (Can.) annually. The second agreement represents nearly 28 million dollars, bringing the total sales to approximately 70 million dollars (Can.), f.o.b. Roberts Bank.

A transportation subvention on British Columbia coal has existed since 1931, but was only applicable to westward shipment of Crowsnest coal (including Alberta) from 1957. Coal began to move to Japan in substantial amounts in 1959 when the subvention was at a maximum of $4.50 per ton. It was $2.73 per ton in 1968 and will be progressively reduced to zero by March 31, 1971. The new contract could, in the absence of subventions, be filled only by reducing the freight rate, which is to be lowered from more than $5.00 to $3.50 per short ton. The Canadian

Pacific Railway will install unit trains so that one train a day of 11,000 tons capacity can deliver coal to a loading-dock being built at Roberts Bank. Work started to prepare a major open-pit mine on Harmer Ridge, to modernize plant facilities at Sparwood, and to construct the first phase of the deep-sea port. Shipments are to begin by April 1, 1970.

There was other exploration activity in the general Crowsnest region, chiefly on the upper Elk River, but no additional agreement for marketing coal had been reached by the end of 1968.

The 1968 value of the petroleum industry exceeded $75 million, marking a substantial rise for the fourth successive year. Crude oil, worth $50 million, was second only to copper in the entire industry.

Much of a 13-per-cent gain in oil production resulted from secondary recovery schemes. The increase in natural-gas production resulted from the newly productive Clarke Lake South, Kotcho, and Yoyo fields in the Fort Nelson area to which the gas-gathering system was extended. The throughput of the Clarke Lake gas plant was approximately doubled as these important gas reserves were tapped.

A $27.8-million gas transmission-line was completed from Prince George to Prince Rupert. Major consumers will include the Celgar plant at Prince Rupert, and forest industry plants planned or under construction at Kitimat, Houston, Fort St. James, and elsewhere.

Offshore drilling continued from the Sedco 135-F drilling-vessel. Four holes were drilled west of Vancouver Island on the continental shelf, two were drilled in Queen Charlotte Sound, and four in Hecate Strait. The aggregate depth of the 10 holes was 100,702 feet. The deepest hole, 15,656 feet, was drilled in Hecate Strait.

A land play based on a geological prospect occurred in the region known as the Bowser Basin, east of the Coast Mountains, and drained by the Nass River. Twenty-three companies were involved in an area of 13 million acres.

Net cash expenditures by the petroleum industry, 1968, follow:—

Exploration, including land acquisition and drilling	$54,522,000
Development drilling	10,762,000
Capital expenditures	10,486,000
Natural-gas plants operations	3,367,000
Field, well, and pipe-line operations	6,491,000
General (excluding income tax)	14,889,000
Total	$100,517,000

Direct revenue to the Government from the entire mineral industry, 1968, is as follows:—

Free miners' certificates, recording fees, lease rentals, assessment payments, etc.	$1,232,454
Royalties on iron concentrates	144,229
Payments on industrial minerals and structural materials	266,090
Ten-per-cent mineral tax (received during 1968)	3,402,000
Coal licences	61,650
Petroleum and natural-gas rentals, fees, etc.	10,621,696
Sale of Crown reserves	15,077,020
Royalties on oil, gas, and processed products	10,945,394
Miscellaneous	17,955
Total	$41,768,488

Statistics

The statistics of the mineral industry are collected and compiled and tabulated for this Report by the Economics and Statistics Branch, 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 collecting 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.

As 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 because 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; and 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 a 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 published in earlier reports as additional data became available or errors become known.

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 custom 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 lbs.), and troy ounces. Barrels are 35 imperial gallons.

METALS

Gross and Net Content

The gross content of a metal in ore, concentrate, or bullion is the amount of that metal calculated from an assay of the material, and the gross metal contents

are the sum of individual metal assay contents. 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 gold and copper produced was calculated by using their true average prices and, in addition, for copper the smelter loss 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.

It is these percentages of the average price that 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 the valuation of current and past metal production are shown in the table on page A 24.

The price of gold used is the average Canadian Mint buying-price for fine gold. In 1968 this was $37.711 per ounce.

The price used for placer gold was originally established arbitrarily at $17 per ounce, when the price of fine gold was $20.67 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.

Prior to 1949 the prices used for silver, copper, lead, and zinc were the average prices of the markets indicated in the table on page A 24, converted into Canadian funds. The abreviations in the table are Mont.=Montreal; N.Y.=New York; Lond.=London; E. St. L.=East St. Louis; and U.S.=United States.

Latterly the prices of the principal metals, silver, copper, lead, and zinc are 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 values for industrial minerals and structural materials approximate the amounts 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 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 mill tailings from the old Silver Giant mine. *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. At present there are two producers, Ocean Cement Limited at Bamberton with a capacity of 4.8 million barrels and Lafarge Cement of North America Ltd. on Lulu Island with an annual capacity of 3.5 million barrels. 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. In 1953 the last large mines in the Nanaimo coalfield closed and the closure of the small Loudon mine in 1968 marks the end of production from this once important and historic coalfield.

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 had 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 Economics and Statistics Branch, 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 21 separate fields, of which the Boundary Lake, Peejay, and Milligan Creek fields are currently the most productive, accounting for 75 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 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 tables 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. At present, siliceous gravel from the Kimberley Iron Smelter is quarried near Marysville; siliceous rock from waste dumps in the Sheep Creek area is shipped to the Trail smelter; and limestone from Texada Island is shipped to smelters in the United States. 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-mining camps in order of production have been Bridge River, Rossland, Portland Canal, Hedley, Wells, and Sheep Creek. 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 mining divisions was: Atlin, 1898; Cariboo, 1859; Liard, 1873; Lillooet, 1858; 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 from a few bedrock occurrences and as alluvial boulders from the Fraser River, the Bridge River and its tributaries Marshall, Hell, and Cadwallader Creeks, O'Ne-ell, Ogden, 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 about 85 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. In 1968 the Pinchi Lake mine was reopened and production of mercury began in August. *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 700,000,000 cubic feet per day (*see* Table 24). In 1968 there were 30 separately producing gasfields (*see* Table 27).

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).

Full details of gross well output, other production, delivery, and sales are given in tables 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 tables 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 lead-zinc, copper, 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 Clinton area and 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 $3,180,828 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 Boulder 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. Other production has come or is coming from mines at Portland Canal, Tulsequah, Britannia, and Buttle Lake. The greatest zinc mine is the Sullivan, which has contributed about 75 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[1] USED IN VALUING PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, AND COAL

Year	Gold, 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 ,,	11.280 ,,	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.	19.978 ,,	15.800 U.S.	13.247 U.S.	6.51
1950	31.29	38.05	80.635 ,,	23.428 ,,	14.454 ,,	15.075 ,,	6.43
1951	30.30	36.85	94.550 ,,	27.700 ,,	18.400 ,,	19.900 ,,	6.46
1952	28.18	34.27	83.157 ,,	31.079 ,,	16.121 ,,	15.874 ,,	6.04
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 ,,	7.48
1963	29.31	37.75	137.965 ,,	30.646 ,,	12.012 ,,	13.178 ,,	7.38
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
1968	29.21	37.71	231.049 ,,	54.216 ,,	14.153 ,,	14.546 ,,	7.91

[1] *See* page A 16 for detailed explanations.

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

Products[1]	Total Quantity to Date	Total Value to Date	Quantity 1967	Value 1967	Quantity 1968	Value 1968
Metals		$		$		$
Antimony lb.	51,019,786	15,268,697	1,267,686	671,874	1,159,960	614,779
Bismuth lb.	6,551,832	12,633,552	142,507	572,878	207,783	868,533
Cadmium lb.	37,341,068	64,966,737	994,365	2,784,222	1,341,437	3,823,095
Chromite tons	796	32,295				
Cobalt lb.	1,730	420				
Copper lb.	3,879,890,994	875,857,153	172,739,548	88,135,172	160,993,338	87,284,148
Gold—placer oz.	5,234,518	96,931,492	891	25,632	670	19,571
„ —lode oz.	16,808,191	495,702,507	126,157	4,763,688	123,896	4,672,242
Iron concentrates tons	22,352,001	201,588,236	2,154,443	20,820,765	2,094,745	21,437,569
Lead lb.	15,403,404,756	1,279,150,916	208,131,894	31,432,079	231,627,618	32,782,257
Magnesium lb.	204,632	88,184				
Manganese tons	1,724	32,668				
Mercury[2] lb.	4,171,110	10,447,358	380	2,600		
Molybdenum lb.	61,760,936	103,840,452	17,517,543	31,183,064	19,799,793	32,552,722
Nickel lb.	35,294,173	29,373,682	4,180,842	3,946,715	3,317,160	3,372,225
Palladium oz.	749	30,462				
Platinum oz.	1,407	135,008				
Selenium lb.	731	1,389				
Silver oz.	472,990,369	330,033,075	6,180,739	10,328,695	7,130,866	16,475,795
Tin lb.	17,632,840	15,307,158	437,804	621,682	358,191	497,885
Tungsten (WO_3) lb.	16,019,324	38,663,751				
Zinc lb.	13,848,801,088	1,299,134,672	262,830,908	39,248,539	299,396,264	43,550,181
Others		13,245,630		1,327,713		3,301,416
Totals		4,882,465,494		235,865,318		251,252,418
Industrial Minerals						
Arsenious oxide lb.	22,019,420	273,201				
Asbestos tons	758,089	148,526,884	92,192	18,273,220	74,667	14,833,891
Barite tons	297,710	3,283,237	23,466	176,882	21,968	164,206
Bentonite tons	791	16,858				
Diatomite tons	7,442	175,325	2,819	14,096	856	17,159
Fluorspar tons	35,682	795,950	80	2,464	39	1,117
Fluxes tons	4,028,363	7,387,454	48,052	221,212	40,259	157,679
Granules tons	332,523	4,827,933	31,283	305,655	30,237	436,928
Gypsum and gypsite tons	3,534,131	12,925,237	230,044	691,592	246,374	689,847
Hydromagnesite tons	2,253	27,536				
Iron oxide and ochre tons	18,108	155,050				
Jade lb.	307,460	238,779	20,160	24,341	49,015	105,670
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	6,609,918	87,751,184	314,490	9,654,603	320,521	9,650,285
Talc tons	1,805	34,871				
Volcanic ash tons	30	300				
Totals		267,016,364		29,364,065		26,056,782
Structural Materials						
Cement tons	11,556,576	183,718,076	709,977	13,581,850	656,363	13,634,166
Clay products		68,426,669		3,945,207		4,388,505
Lime and limestone tons		47,265,202	1,645,253	2,822,138	2,016,892	3,337,277
Rock tons		42,436,849	2,287,407	2,967,195	3,385,712	3,524,439
Sand and gravel tons		205,182,520	23,210,746	20,643,673	22,665,961	20,271,723
Stone tons	1,159,702	9,165,002	3,577	51,425	1,654	33,366
Not assigned		5,972,171				
Totals		562,166,489		44,011,488		45,189,476
Fuels						
Coal tons	141,592,706	609,906,721	908,790	7,045,341	959,214	7,588,989
Crude oil bbl.	108,618,906	231,998,594	19,656,799	44,748,477	22,151,353	50,082,837
Field condensate bbl.	215,904	477,848	40,570	92,357	54,163	122,408
Plant condensate bbl.	8,856,448	5,147,755	1,016,045	267,941	960,252	247,455
Nat'l gas to pipe-line M s.c.f.	1,363,463,063	134,866,514	198,626,177	21,667,136	224,233,203	24,531,445
Butane bbl.	4,256,743	1,362,157	588,118	188,197	527,546	168,814
Propane bbl.	2,628,100	840,989	413,058	132,178	400,800	128,256
Totals		984,600,578		74,141,627		82,870,204
Grand totals		6,696,248,925		383,382,498		405,368,880

[1] *See* notes on individual products listed alphabetically on pages A 17 to A 23.
[2] Excludes 1968 production, which is confidential.

TABLE 2.—TOTAL VALUE OF MINERAL PRODUCTION, 1836–1968

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 MINERAL PRODUCTION, 1836–1968—*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	208,664,003	22,865,324	43,780,272	60,470,406	335,780,005
1967	235,865,318	29,364,065	44,011,488	74,141,627	383,382,498
1968	251,252,418	26,056,782	45,189,476	82,870,204	405,368,880
Totals	4,882,465,494	267,016,364	562,166,489	984,600,578	6,696,248,925

TABLE 3.—MINERAL PRODUCTION FOR THE 10 YEARS 1959 TO 1968

Description	1959		1960		1961		1962		1963	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Metals		$		$		$		$		$
Antimony lb.	1,657,797	540,276	1,651,786	538,482	1,331,297	469,948	1,931,397	748,223	1,601,253	624,489
Bismuth lb.	181,843	345,502	213,009	419,628	283,363	637,567	228,601	507,494	157,099	348,760
Cadmium lb.	1,695,821	2,170,651	1,778,866	2,525,990	907,432	1,451,891	2,086,692	3,839,513	1,981,004	4,754,410
Copper lb.	16,233,546	4,497,991	33,064,429	9,583,724	31,692,412	8,965,149	108,979,144	33,209,215	118,247,104	36,238,007
Gold—placer, crude oz.	7,570	208,973	3,847	107,418	3,416	99,884	3,315	96,697	4,620	135,411
„ —lode, fine oz.	173,146	5,812,511	205,580	6,979,441	159,821	5,667,253	158,850	5,942,101	154,979	5,850,458
Iron concentrates tons	849,248	6,363,848	1,160,355	10,292,847	1,335,068	12,082,540	1,793,847	18,326,911	2,060,241	20,746,424
Lead lb.	287,423,357	33,542,306	333,608,699	38,661,912	384,284,524	42,313,569	335,282,537	34,537,454	314,974,310	37,834,714
Molybdenum lb.	———	———	9,023	9,500	———	———	———	———	———	———
Nickel lb.	1,061,532	743,072	3,779,878	2,645,915	4,180,677	3,194,037	3.476,467	2,902,850	3,699,402	3,107,498
Platinum oz.	———	———	———	———	———	———	5	375	2	150
Silver oz.	6,198,101	5,421,417	7,446,643	6,600,183	7,373,997	6,909,140	6,189,804	7,181,907	6,422,680	8,861,050
Tin lb.	747,443	627,852	621,718	522,243	1,119,350	727,578	650,941	442,640	927,062	648,943
Zinc lb.	402,342,850	44,169,198	403,399,319	50,656,726	387,951,190	45,370,891	413,430,817	51,356,376	402,863,154	53,069,163
Others ———	———	632,933	———	760,364	———	676,327	———	535,537	———	633,389
Totals ———	———	105,076,530	———	130,304,373	———	128,565,774	———	159,627,293	———	172,852,866
Industrial Minerals										
Asbestos tons	33,883	7,878,947	40,748	9,482,923	45,113	8,648,503	55,133	10,297,360	63,215	11,681,337
Barite tons	23,142	187,368	23,573	279,716	15,478	151,388	6,511	57,062	8,207	69,588
Diatomite tons	5	100	44	1,430	214	8,817	211	10,228	458	16,030
Fluorspar tons	———	———	———	———	———	———	———	———	———	———
Fluxes (quartz, limestone) tons	70,570	248,913	83,370	294,559	53,335	190,500	62,743	228,477	60,490	223,012
Granules (quartz, limestone, granite) tons	19,072	254,251	19,063	257,067	17,463	253,015	18,251	311,902	19,444	348,543
Gypsum and products tons	112,223	282,030	107,900	337,200	153,300	459,900	147,900	443,700	160,954	482,862
Jade lb.	15,000	5,000	50,300	10,325	69,751	20,876	56,935	20,760	16,000	15,529
Mica lb.	———	———	122,000	3,186	250,000	8,025	———	———	———	———
Sulphur tons	251,552	3,253,677	264,705	3,095,696	242,377	3,207,284	239,191	2,934,725	254,197	3,673,997
Totals ———	———	12,110,286	———	13,762,102	———	12,948,308	———	14,304,214	———	16,510,898
Structural Materials										
Brick—common No.	385,810	11,954	2,262,653	187,673	244,532	14,809	1,179,165	54,849	1,086,688	63,499
„ —other ———	———	966,666	———	766,956	———	911,315	———	949,889	———	1,050,543
Clays tons	6,250	17,001	8,003	22,671	7,908	28,396	8,105	30,027	2,573	33,151
Structural and drain tile ———	———	830,085	———	700,700	———	732,751	———	935,573	———	877,578
Pottery and other clay products ———	———	127,812	———	395,708	———	679,193	———	537,100	———	799,812
Cement tons	427,181	7,049,638	384,853	6,432,752	417,336	7,122,046	397,435	7,112,890	476,071	8,546,768
Lime and limestone tons	519,580	1,481,292	565,945	1,602,019	758,882	1,864,315	559,028	1,513,579	907,203	1,723,796
Rubble, riprap, crushed rock tons	1,169,854	1,128,353	1,148,305	1,075,373	1,539,640	1,016,086	1,897,272	1,284,301	1,913,906	1,259,002
Sand and gravel tons	11,349,121	7,342,698	12,355,955	7,597,278	11,424,958	7,439,710	17,757,391	8,862,767	17,387,026	9,514,095
Stone tons	13,710	69,710	4,328	48,859	5,400	70,300	8,023	85,290	1,827	13,946
Totals ———	———	19,025,209	———	18,829,989	———	19,878,921	———	21,366,265	———	23,882,190
Fuels										
Coal tons	690,011	5,472,064	788,658	5,242,223	919,142	6,802,134	825,339	6,133,986	850,541	6,237,997
Crude oil bbl.	864,750	1,573,227	867,873	1,531,049	1,015,568	1,900,104	8,904,938	16,827,118	12,515,137	24,900,381
Field condensate bbl.	———	———	———	———	159	297	9,621	18,184	13,671	27,205
Plant condensate bbl.	895,784	367,797	750,848	459,741	813,565	737,761	837,824	674,644	841,740	536,193
Natural gas delivered to pipe-line M s.c.f.	64,525,633	3,928,839	80,115,399	7,101,949	95,967,110	8,818,891	108,699,997	10,226,323	105,525,373	10,719,298
Butane bbl.	207,029	66,249	293,368	93,878	321,706	102,946	387,558	124,019	409,087	130,908
Propane bbl.	96,925	31,016	125,091	40,029	163,079	52,185	216,995	69,438	205,162	65,651
Totals ———	———	11,439,192	———	14,468,869	———	18,414,318	———	34,073,712	———	42,617,633
Grand totals ———	———	147,651,217	———	177,365,333	———	179,807,321	———	229,371,484	———	255,863,587

Description	1964		1965		1966		1967		1968	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Metals		$		$		$		$		$
Antimony lb.	1,591,523	700,270	1,301,787	689,947	1,405,681	745,011	1,267,686	671,874	1,159,960	614,779
Bismuth lb.	213,428	480,213	144,630	446,907	47,435	198,848	142,507	572,878	207,783	868,533
Cadmium lb.	1,864,255	6,040,186	466,586	1,297,110	1,169,570	3,017,491	994,365	2,784,222	1,341,437	3,823,095
Copper lb.	115,554,700	38,609,136	85,197,073	32,696,081	105,800,568	56,438,255	172,739,548	88,135,172	160,993,338	87,284,148
Gold—placer, crude oz.	1,842	55,191	866	25,053	1,535	44,632	891	25,632	670	19,571
„ —lode, fine oz.	138,487	5,227,884	117,124	4,419,089	119,508	4,506,646	126,157	4,763,688	123,896	4,672,242
Iron concentrates tons	2,002,562	20,419,487	2,165,403	21,498,581	2,151,804	20,778,934	2,154,443	20,820,765	2,094,745	21,437,569
Lead lb.	268,737,503	39,402,293	250,183,633	43,149,171	211,490,107	34,436,934	208,131,894	31,432,079	231,627,618	32,782,257
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	17,517,543	31,183,064	19,799,793	32,552,722
Nickel lb.	3,398,560	2,854,790	3,322,000	2,790,480	3,187,712	2,731,869	4,180,842	3,946,715	3,317,160	3,372,225
Platinum oz.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Silver oz.	5,269,642	7,348,938	4,972,084	6,929,793	5,549,131	7,729,939	6,180,739	10,328,695	7,130,866	16,475,795
Tin lb.	352,350	535,572	377,207	735,554	710,752	1,130,096	437,804	621,682	358,191	497,885
Zinc lb.	400,796,562	58,648,561	311,249,250	48,666,933	305,124,440	47,666,540	262,830,908	39,248,539	299,396,264	43,550,181
Others	.....	533,897	.....	1,339,389	.....	1,632,747	.....	1,327,713	.....	3,301,416
Totals	.....	180,926,329	.....	177,101,733	.....	208,664,003	.....	235,865,318	.....	251,252,418
Industrial Minerals										
Asbestos tons	67,460	11,714,494	85,851	14,491,195	88,771	15,718,741	92,192	18,273,220	74,667	14,833,891
Barite tons	10,588	119,370	17,466	182,931	21,888	176,240	23,466	176,882	21,968	164,206
Diatomite tons	1,143	64,555	82	4,420	70	3,755	2,819	14,096	856	17,159
Fluorspar tons	.....	.....	70	2,419	152	4,986	80	2,464	39	1,117
Fluxes (quartz, limestone) tons	73,021	237,298	59,231	240,076	23,913	112,314	48,052	221,212	40,259	157,679
Granules (quartz, limestone, granite) tons	19,289	397,639	29,033	447,954	23,956	424,667	31,283	305,655	30,237	436,928
Gypsum and products tons	188,303	581,873	207,858	602,788	206,026	576,873	230,044	691,592	246,374	689,847
Jade lb.	11,537	13,804	7,129	9,249	11,633	13,225	20,160	24,341	49,015	105,670
Sulphur tons	278,385	3,860,436	341,873	4,428,617	342,478	5,834,523	314,490	9,654,603	320,521	9,650,285
Totals	.....	16,989,469	.....	20,409,649	.....	22,865,324	.....	29,364,065	.....	26,056,782
Structural Materials										
Brick—common No.	614,288	49,826	582,305	27,662	288,234	16,956	45,879	2,628	26,546	1,734
„ —other	.....	872,166	.....	1,329,849	.....	1,816,845	.....	1,817,289	.....	2,229,767
Clays tons	1,853	38,585	454	18,234	1,282	34,861	444	18,668	526	23,391
Structural and drain tile	.....	1,102,341	.....	1,361,227	.....	1,063,333	.....	892,485	.....	828,734
Pottery and other clay products	.....	945,240	.....	1,162,662	.....	1,168,197	.....	1,214,137	.....	1,304,879
Cement tons	537,396	10,040,776	601,878	11,199,607	707,519	12,918,301	709,977	13,581,850	656,363	13,634,166
Lime and limestone tons	1,211,320	2,055,195	1,420,085	2,482,451	1,483,949	2,696,011	1,645,253	2,822,138	2,016,892	3,337,277
Rubble, riprap, crushed rock tons	1,449,449	1,285,318	2,715,411	1,938,088	1,590,189	1,890,992	2,287,407	2,967,195	3,385,712	3,524,439
Sand and gravel tons	17,708,225	10,013,970	20,936,994	12,686,959	24,320,013	21,959,733	23,210,746	20,643,673	22,665,961	20,271,723
Stone tons	846	25,522	2,252	118,975	76,720	215,043	3,577	51,425	1,654	33,366
Totals	.....	26,428,939	.....	32,325,714	.....	43,780,272	.....	44,011,488	.....	45,189,476
Fuels										
Coal—sold and used tons	911,326	6,327,678	950,763	6,713,590	850,821	6,196,219	908,790	7,045,341	959,214	7,588,989
Crude oil bbl.	11,525,476	23,396,716	13,470,757	28,693,662	16,638,181	36,268,683	19,656,799	44,748,477	22,151,353	50,082,837
Field condensate bbl.	26,367	63,436	31,782	70,874	39,571	86,265	40,570	92,357	54,163	122,408
Plant condensate bbl.	922,211	587,685	947,429	576,107	974,564	312,360	1,016,045	267,941	960,252	247,455
Natural gas delivered to pipe-line M s.c.f.	118,959,880	12,192,816	138,814,144	14,493,255	161,264,334	17,339,587	198,626,177	21,667,136	224,233,203	24,531,445
Butane bbl.	461,759	147,763	477,990	152,956	500,973	160,312	588,118	188,197	527,546	168,814
Propane bbl.	244,804	78,337	358,776	114,808	334,315	106,980	413,058	132,178	400,800	128,256
Totals	.....	42,794,431	.....	50,815,252	.....	60,470,406	.....	74,141,627	.....	82,870,204
Grand totals	.....	267,139,168	.....	280,652,348	.....	335,780,005	.....	383,382,498	.....	405,368,880

TABLE 4.—MINERAL PRODUCTION OF BRITISH COLUMBIA—VALUE, 1887–1968

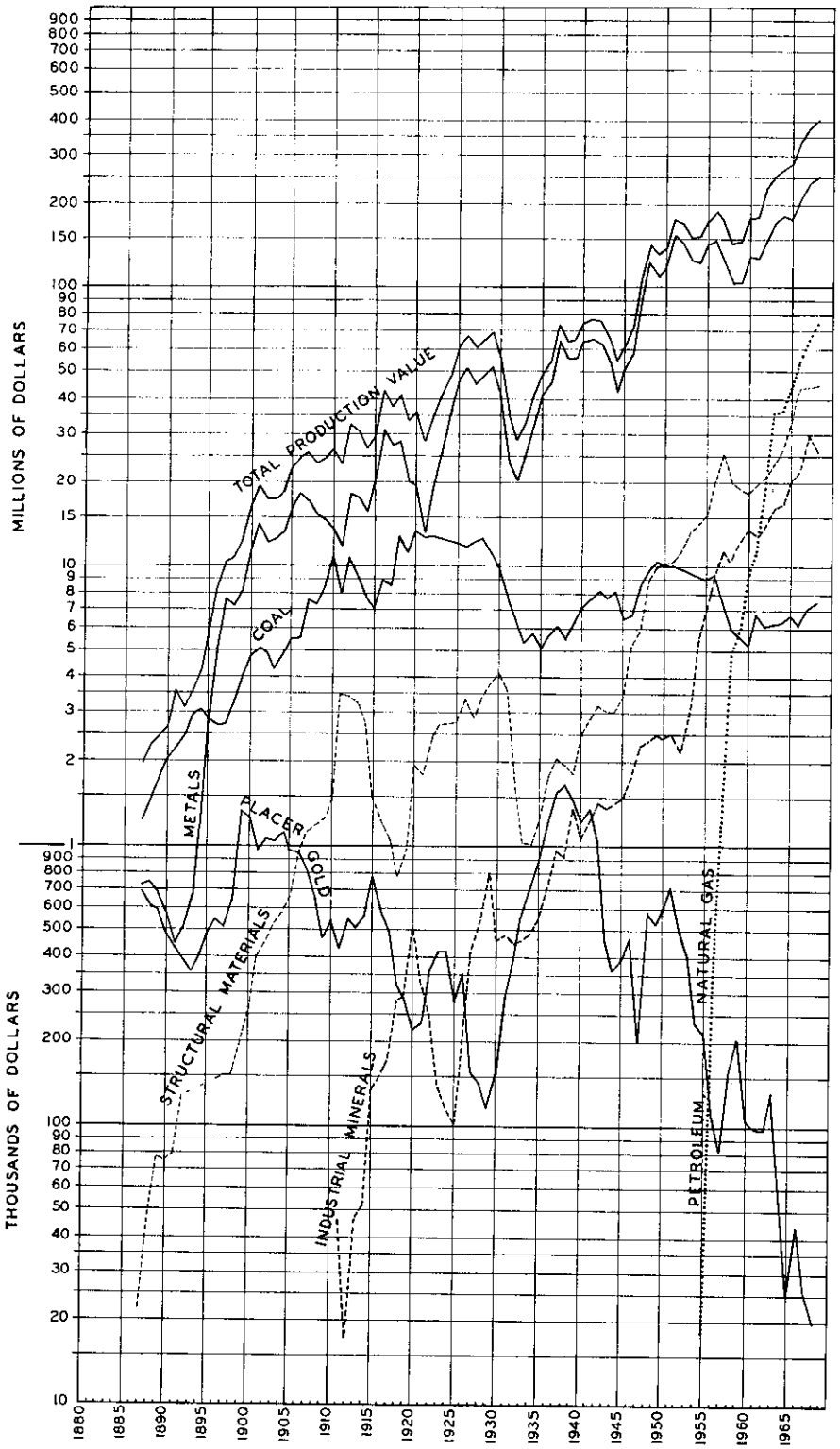


TABLE 5—MINERAL PRODUCTION OF BRITISH COLUMBIA—QUANTITY, 1897–1968

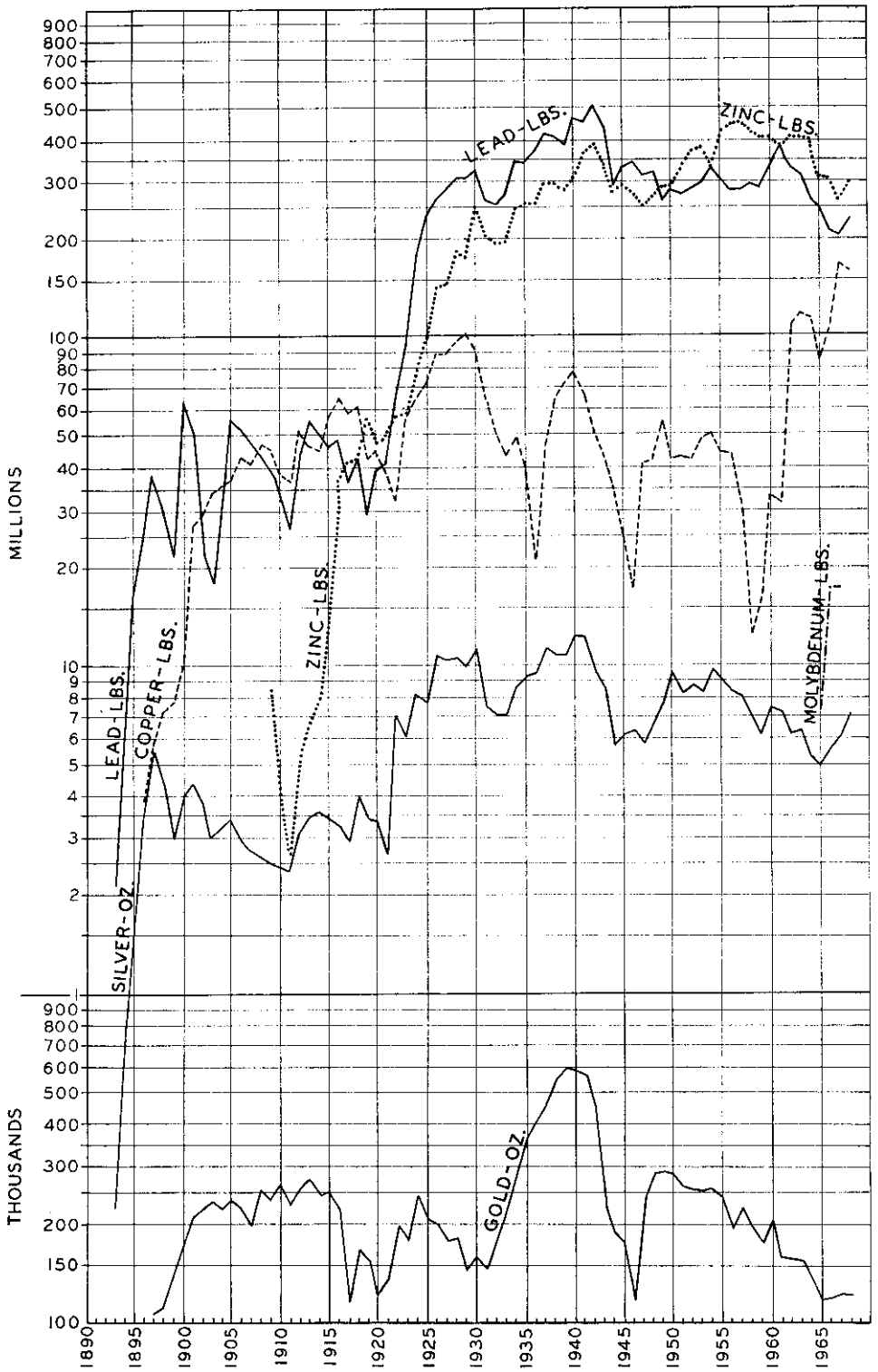


TABLE 6.—PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, MOLYBDENUM, AND IRON CONCENTRATES, 1858–1968

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
1968	670	19,571	123,896	4,672,242	7,130,866	16,475,795	160,993,338	87,284,148
Totals	5,234,518	96,931,492	16,808,191	495,702,507	472,990,369	330,033,075	3,879,890,994	875,857,153

TABLE 6.—PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, MOLYBDENUM, AND IRON CONCENTRATES, 1858–1968—*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	17,517,543	31,183,064	2,154,443	20,820,765
1968	231,627,618	32,782,257	299,396,264	43,550,181	19,799,793	32,552,722	2,094,745	21,437,569
Totals	15,403,404,756	1,279,150,916	13,848,801,088	1,299,134,672	61,760,936	103,840,452	22,352,001	201,588,236

TABLE 7A.—MINERAL PRODUCTION BY MINING

Division	Period	Placer Gold		Metals	Industrial Minerals	Structural Materials
		Quantity (Crude)	Value			
		Oz.	$	$	$	$
Alberni	1967	.....	.....	12,878,212	.....	417,822
	1968	.....	.....	**17,836,888**	.....	**252,147**
	To date	1,617	33,253	83,610,356	9,398	2,519,796
Atlin	1967	85	2,529	22	.....	12,844
	1968	**33**	**905**	**39**	.....	.....
	To date	735,746	17,387,104	38,047,172	20,325	330,891
Cariboo	1967	613	17,478	5,500,559	14,096	856,015
	1968	**564**	**16,404**	**4,207,167**	**17,159**	**1,641,598**
	To date	2,609,728	54,144,484	61,198,524	318,805	11,787,964
Clinton	1967	.....	.....	.....	.....	515,846
	1968	.....	.....	.....	.....	**908,130**
	To date	10,171	243,069	848,377	162,427	1,668,321
Fort Steele	1967	.....	.....	49,837,128	3,293,298	335,094
	1968	.....	.....	**51,913,572**	**3,125,430**	**556,966**
	To date	20,531	468,450	2,036,052,731	16,884,299	6,855,037
Golden	1967	.....	.....	1,710,318	868,474	141,842
	1968	.....	.....	**1,198,872**	**854,053**	**191,951**
	To date	469	11,268	61,568,607	9,582,294	2,643,809
Greenwood	1967	.....	.....	7,249,851	.....	207,946
	1968	.....	.....	**6,669,642**	.....	**172,082**
	To date	5,074	115,662	163,583,243	2,323,897	1,493,219
Kamloops	1967	.....	.....	20,466,017	.....	1,236,825
	1968	.....	.....	**28,771,845**	**5,257**	**1,098,440**
	To date	27,595	604,785	90,768,420	6,533,565	14,987,857
Liard	1967	.....	.....	.....	20,403,509	520,891
	1968	.....	.....	.....	**16,545,342**	**1,767,941**
	To date	50,184	1,248,151	6,522	162,427,529	6,355,162
Lillooet	1967	118	3,661	1,856,414	4,627	52,038
	1968	**68**	**2,111**	**1,994,521**	**83,899**	**85,430**
	To date	92,938	1,925,432	144,221,480	187,375	2,625,340
Nanaimo	1967	.....	.....	17,479,327	110,057	8,212,674
	1968	.....	.....	**14,469,272**	**65,175**	**3,677,117**
	To date	866	19,300	166,688,872	1,209,532	52,844,732
Nelson	1967	1	38	8,339,265	.....	427,580
	1968	.....	.....	**11,393,570**	**197,831**	**553,065**
	To date	3,586	89,026	322,565,774	683,690	5,206,136
New Westminster	1967	14	189	4,803,044	62,000	8,819,722
	1968	.....	.....	**4,025,552**	**60,000**	**10,069,041**
	To date	31,279	593,762	35,156,352	1,337,256	122,443,095
Nicola	1967	.....	.....	29,968,349	.....	124,980
	1968	.....	.....	**16,214,155**	.....	**108,142**
	To date	234	4,764	137,385,663	10,050	934,398
Omineca	1967	10	302	37,709,824	.....	1,625,385
	1968	.....	.....	**32,973,465**	**19,646**	**1,099,803**
	To date	56,289	1,499,482	136,071,011	35,506	8,907,136
Osoyoos	1967	.....	.....	743,805	357,134	256,824
	1968	.....	.....	**2,563,608**	**267,251**	**168,656**
	To date	240	5,466	54,447,898	6,186,822	2,194,317
Revelstoke	1967	.....	.....	7,173	.....	492,331
	1968	.....	.....	.....	.....	**344,454**
	To date	7,582	164,477	11,244,631	.....	2,377,238
Similkameen	1967	.....	.....	.....	.....	116,968
	1968	.....	.....	.....	.....	**264,621**
	To date	45,507	878,204	120,195,258	18,558	3,518,553
Skeena	1967	.....	.....	7,079,491	.....	928,616
	1968	.....	.....	**21,338,011**	.....	**629,842**
	To date	4,603	105,569	256,369,845	1,229,400	10,658,715
Slocan	1967	.....	.....	7,873,945	.....	84,101
	1968	.....	.....	**8,082,963**	.....	**195,400**
	To date	366	9,397	245,846,445	.....	1,537,876
Trail Creek	1967	.....	.....	1,204,469	.....	228,604
	1968	.....	.....	**649,615**	.....	**105,734**
	To date	851	24,260	86,351,048	.....	2,745,671
Vancouver	1967	.....	.....	6,669,215	122,640	8,857,119
	1968	.....	.....	**7,706,930**	**93,829**	**8,659,515**
	To date	182	5,306	246,884,289	6,826,982	96,788,312
Vernon	1967	.....	.....	10,695	.....	659,442
	1968	.....	.....	**47,271**	.....	**646,140**
	To date	2,732	72,885	256,501	3,978	4,679,987
Victoria	1967	.....	.....	1,523,437	140	8,420,756
	1968	.....	.....	**1,242,611**	**210**	**9,059,352**
	To date	628	15,680	16,687,533	189,001	165,266,520
Not assigned	1967	50	1,435	12,929,126	4,128,090	5,459,723
	1968	**5**	**151**	**17,932,978**	**4,721,700**	**2,944,111**
	To date	1,525,520	17,262,256	269,477,450	50,835,675	80,796,407
Totals	1967	891	25,632	235,839,686	29,364,065	44,011,488
	1968	**670**	**19,571**	**251,232,847**	**26,056,782**	**45,189,476**
	To date	5,234,518	96,931,492	4,785,534,002	267,016,364	562,166,489

DIVISIONS, 1967 AND 1968, AND TOTAL TO DATE

Fuels								
Coal		Crude Oil and Condensates		Natural Gas Delivered to Pipe-line		Butane and Propane		Division Total
Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
Tons	$	Bbl.	$	M S.C.F.	$	Bbl.	$	$
								13,296,084
								15,089,035
								86,172,808
								15,395
								944
								55,785,492
								6,888,148
								5,862,226
290	1,100							127,450,877
								515,846
								808,180
								2,922,194
895,429	6,989,184							60,404,704
945,726	7,449,598							63,059,566
59,115,687	274,061,286							2,334,321,303
								2,720,634
								2,244,276
								73,805,978
								7,457,797
								6,841,724
								167,516,021
								21,702,842
								29,875,542
15,087	59,765							112,954,392
		20,713,414	45,108,775	198,626,177	21,667,186	1,001,176	820,875	88,020,686
		22,165,708	50,452,700	224,233,203	24,531,445	928,346	297,070	93,534,498
99,433	699,521	117,691,258	287,624,197	1,568,468,063	134,866,514	6,884,848	2,203,146	545,430,742
								1,916,740
								2,166,261
								148,959,627
374	5,862							20,807,420
93	1,494							12,218,088
74,824,471	801,144,744							521,907,180
								8,766,883
								12,144,466
								328,544,626
								13,684,955
								14,154,598
								159,530,465
								30,093,329
								16,322,297
2,929,584	11,080,836							149,415,711
12,987	100,795							89,486,806
13,895	128,897							24,216,611
489,554	3,800,620							149,813,765
								1,357,268
								2,999,515
1,122	5,008							62,889,511
								499,504
								344,454
								18,786,346
								116,968
								264,621
4,617,442	19,553,725							144,164,298
								8,008,107
								21,967,553
86	116							268,363,645
								7,958,046
								8,278,363
								247,393,718
								1,433,073
								755,349
								89,120,979
								15,648,974
								19,460,274
								850,504,889
								670,187
								993,411
								5,013,851
								9,944,388
								10,302,173
								182,158,734
								22,518,374
								25,593,940
								368,371,788
908,790	7,045,841	20,713,414	45,108,775	198,626,177	21,667,186	1,001,176	820,875	883,382,498
959,214	7,583,989	22,165,768	50,452,700	224,233,203	24,531,445	928,346	297,070	406,366,860
141,592,706	609,906,721	117,691,258	287,624,197	1,568,468,063	134,866,514	6,884,848	2,203,146	6,696,248,925

TABLE 7B.—PRODUCTION OF LODE GOLD, SILVER, COPPER, LEAD, AND ZINC BY MINING DIVISIONS, 1967 AND 1968, AND TOTAL TO DATE

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	1967	10,902	411,660	402,095	671,945	8,120,718	4,148,353	795,547	120,144	24,168,908	3,609,143	8,956,245
	1968	14,412	543,490	510,881	1,130,335	10,289,624	5,632,839	1,049,235	148,498	43,007,530	6,255,875	13,761,037
	To date	329,072	12,320,175	1,075,674	1,931,403	20,802,859	10,120,630	1,966,126	274,661	67,176,505	9,865,026	34,511,345
Atlin	1967			13	22							22
	1968			17	39							39
	To date	344,197	12,126,732	3,377,116	2,895,648	24,777,661	8,160,266	23,765,211	3,487,907	91,067,749	10,864,497	37,485,050
Cariboo	1967	5,481	206,963	1,044	1,744							208,707
	1968			86	199							199
	To date	1,202,251	43,347,296	146,764	108,991	2,852	929	24,560	3,724	505	19	43,460,950
Clinton	1967											
	1968											
	To date	28,390	827,328	31,586	14,237	57,548	5,905	193	7			847,477
Fort Steele	1967	162	6,117	3,073,682	5,135,458			157,039,209	23,716,075	121,470,665	18,139,214	46,996,864
	1968	162	6,100	3,116,675	7,291,047			194,786,582	23,323,832	126,942,014	18,465,073	48,886,161
	To date	7,187	222,876	230,903,686	155,374,712	28,592	6,198	12,895,594,209	1,029,212,157	9,600,734,725	822,271,603	2,007,087,541
Golden	1967			51,266	85,671			3,527,550	532,781	6,892,277	1,029,224	1,647,626
	1968			11,532	26,045			428,437	59,504	7,203,395	1,047,806	1,133,355
	To date	170	4,882	4,132,716	3,532,207	1,171,455	367,261	253,871,121	25,261,027	324,599,511	31,283,996	60,449,373
Greenwood	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
	1968	13,001	492,543	640,524	1,480,617	8,414,867	4,562,204	566,395	80,162	342,663	49,344	6,665,270
	To date	1,277,395	29,707,922	39,617,878	29,351,798	516,779,068	100,229,696	21,979,479	2,103,964	22,459,718	2,021,899	163,415,279
Kamloops	1967	1,627	61,436	159,158	250,931	39,499,922	20,153,650					20,466,017
	1968	2,897	105,855	189,914	433,794	52,064,328	28,227,196					28,771,845
	To date	60,400	2,081,266	1,045,462	1,429,631	191,755,126	86,942,542	538,097	45,030	438,023	29,826	90,528,295
Liard	1967											
	1968											
	To date	114	4,120	587	507	56	22	10,421	1,776	115	18	6,443
Lillooet	1967	48,711	1,839,327	8,669	14,487							1,853,814
	1968	52,324	1,973,190	9,362	21,631							1,994,821
	To date	4,079,351	143,447,170	969,372	685,620	400	41	62,518	2,548	15	2	144,135,381
Nanaimo	1967	17,614	665,105	141,749	286,878	14,181,288	7,235,577					8,137,560
	1968	15,369	580,335	83,901	216,957	11,521,712	6,244,011					7,041,303
	To date	202,201	6,361,201	1,485,989	1,682,317	119,435,527	45,150,030					53,193,548
Nelson	1967	1,378	52,063	111,865	186,939			13,629,659	2,058,352	36,404,669	5,486,220	7,783,544
	1968	1,700	66,598	126,260	291,722			18,036,196	2,552,663	52,077,732	7,575,227	10,486,210
	To date	1,339,417	41,930,868	9,164,518	6,407,974	14,915,405	1,689,196	474,245,092	59,526,441	1,253,024,133	163,919,201	273,473,680
New Westminster	1967			1	2	1,678,348	856,327					856,329
	1968					1,205,045	653,327					653,327
	To date	4,466	114,164	15,115	7,722	15,106,742	5,659,184	28,425	1,119	12,755	481	5,782,670
Nicola	1967	7	264	854	1,427	58,732,068	29,966,276	2,375	359	154	23	29,968,349
	1968					29,906,567	16,214,155					16,214,155
	To date	8,548	235,745	276,458	135,632	348,897,698	136,912,027	2,241,499	91,282	323,889	10,977	137,385,663
Omineca	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
	1968	11,906	448,227	142,227	228,753	21,377,460	11,800,004	352,107	49,294	68,249	9,927	12,537,505
	To date	54,350	1,878,621	9,955,854	8,327,554	53,733,334	26,277,727	29,090,638	3,714,186	32,579,446	4,060,006	44,258,094

		Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Osoyoos	1967	892	33,682	413,715	691,363	....	....	39,609	5,982	85,567	12,778	743,805
	1968	2,713	102,310	1,046,612	2,418,187	....	....	201,810	28,562	100,919	14,549	2,563,908
	To date	1,659,338	50,449,469	2,060,212	3,509,551	2,843,616	417,190	382,184	41,752	201,750	28,916	54,446,878
Revelstoke	1967	....	....	1,223	2,044	....	....	30,894	4,666	3,103	463	7,173
	1968	....	....	....	....	....	....	....	....	....	....	....
	To date	37,200	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	1967	....	....	....	....	....	....	....	....	....	....	....
	1968	....	....	....	....	....	....	....	....	....	....	....
	To date	184,016	6,327,410	4,219,558	2,582,429	601,197,638	111,187,983	382,677	13,376	78,094	4,874	120,666,072
Skeena	1967	4,341	163,916	101,871	170,238	1,192,867	608,625	....	....	....	....	942,779
	1968	3,571	134,[illegible]	105,960	244,538	9,572,044	5,139,965	968	140	3,389	493	5,539,792
	To date	2,430,521	61,592,782	69,164,619	44,728,514	699,872,054	103,824,683	60,001,216	5,438,349	17,198,235	2,541,689	218,125,917
Slocan	1967	28	1,485	362,646	606,621	....	....	21,367,338	3,226,895	25,307,760	3,779,208	7,613,559
	1968	174	6,562	547,904	1,295,294	....	....	21,373,720	3,025,023	24,236,453	3,525,239	7,322,106
	To date	16,259	473,276	75,304,081	51,368,589	13,662	1,861	1,052,384,278	95,620,517	874,209,648	93,492,669	240,957,912
Trail Creek	1967	13	490	2	3	....	....	....	....	....	....	498
	1968	340	12,822	242	559	....	....	2,366	335	855	124	13,940
	To date	2,984,901	63,352,846	3,673,314	2,103,068	122,561,782	18,245,404	148,787	12,628	134,426	16,366	83,730,310
Vancouver	1967	3,128	118,113	44,818	74,396	12,459,529	6,357,101	8,664	1,308	729,494	108,935	6,666,353
	1968	3,663	139,073	50,088	115,723	12,953,234	7,023,078	....	....	2,730,240	393,451	7,676,335
	To date	497,369	16,115,495	5,183,600	3,466,710	1,087,203,505	193,391,487	18,552,603	1,880,670	237,486,734	30,838,186	245,692,548
Vernon	1967	....	....	1,876	3,185	....	....	3,752	416	44,282	6,612	10,163
	1968	7	294	17,702	40,990	....	....	32,734	4,693	10,196	1,474	47,271
	To date	5,227	176,572	82,593	52,378	654	100	61,413	8,147	65,520	9,277	246,469
Victoria	1967	460	17,370	3,224	5,238	2,941,240	1,500,679	....	....	....	....	1,523,487
	1968	540	20,304	6,923	15,996	2,224,399	1,209,251	....	....	....	....	1,262,811
	To date	42,120	980,533	923,207	575,564	55,966,545	14,792,228	210,097	19,848	3,568,769	283,923	16,652,096
Not assigned[1]	1967	749	26,282	315,591	527,387	373,727	199,682	10,420,166	1,573,653	46,684,248	6,971,858	9,201,362
	1968	1,099	[illegible]	514,096	1,137,814	[illegible]	[illegible]	24,703,123	3,596,971	[illegible]	[illegible]	[illegible]
	To date	18,621	554,448	6,215,668	6,991,163	52,559,079	12,473,490	531,336,315	48,582,368	1,296,813,807	124,279,376	192,880,845
Totals	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
	1968	123,[illegible]	4,872,242	7,130,366	16,475,796	160,[illegible]	87,[illegible]	231,627,618	32,732,257	299,396,264	43,550,181	184,704,623
	To date	16,368,191	495,702,507	472,990,369	330,033,075	3,879,890,994	875,857,158	15,403,404,756	1,279,150,916	13,848,801,088	1,299,134,672	4,279,878,328

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

TABLE 7C.—PRODUCTION OF MISCELLANEOUS METALS BY MINING DIVISIONS, 1967 AND 1968, AND TOTAL TO DATE

Division	Period	Antimony		Bismuth		Cadmium		Chromite		Iron Concentrates		Manganese		Mercury[2]	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		Lb.	$	Lb.	$	Lb.	$	Tons	$	Tons	$	Tons	$	Lb.	$
Alberni	1967					83,852	284,786			383,035	3,687,181				
	1968					142,053	404,851			349,672	3,670,950				
	To date					225,905	639,637			4,602,884	48,459,374				
Atlin	1967														
	1968														
	To date					319,212	561,762								
Cariboo	1967														
	1968														
	To date														
Clinton	1967														
	1968														
	To date							126	900						
Fort Steele	1967					189,896	581,709			172,418	1,686,873				
	1968					[illegible]	[illegible]			146,120	1,737,685				
	To date					1,635,694	4,750,278			875,169	8,819,570				
Golden	1967					22,590	62,692								
	1968					22,778	64,917								
	To date	40,062	14,906			544,155	1,104,328								
Greenwood	1967					3,345	9,366								
	1968					1,499	4,272								
	To date					67,047	136,569	670	31,395						
Kamloops	1967														
	1968														
	To date									21,167	95,851			10,987	5,795
Liard	1967														
	1968														
	To date														
Lillooet	1967														
	1968													380	2,600
	To date	18,466	4,321											9,231	41,304
Nanaimo	1967									954,735	9,341,767				
	1968									666,404	7,425,269				
	To date									18,523,832	113,495,824				
Nelson	1967					216,329	605,721								
	1968					318,372	907,360								
	To date					7,375,109	15,173,405								
New Westminster	1967														
	1968														
	To date														
Omineca	1967					1,739	4,869								
	1968					158	445								
	To date	104,489	15,217			268,806	536,582								
Osoyoos	1967													4,150,892	10,400,259
	1968														
	To date											16			

		Lb.	$	Lb.	$	Lb.	$	Tons	$	Tons	$	Tons	$	Lb.	$
Revelstoke	1967														
	1968														
	To date	9,394	3,455			103,612	176,102								
Similkameen	1967														
	1968														
	To date														
Skeena	1967									644,260	6,104,944				
	1968									930,545	8,603,755				
	To date					141,890	316,764			3,328,399	30,716,192				
Slocan	1967					92,995	260,386								
	1968					91,528	260,955								
	To date	31,865	8,133			2,396,720	4,873,140					541	8,160		
Trail Creek	1967														
	1968														
	To date					115	210			550	1,925				
Vancouver	1967					3,165	8,862								
	1968					10,735	30,505								
	To date					562,726	1,191,741								
Vernon	1967					190	582								
	1968														
	To date					190	582								
Victoria	1967														
	1968														
	To date					7,090	10,929					1,167	24,508		
Not assigned[1]	1967	1,267,686	671,874	142,507	572,878	380,464	1,065,299								
	1968	1,159,960	614,779	207,783	368,533	515,007	1,467,769								
	To date	50,826,510	15,222,665	6,551,832	12,633,552	23,692,887	35,494,758								
Totals	1967	1,267,686	671,874	142,507	572,878	984,365	2,794,292			2,154,443	20,820,765			880	2,600
	1968	1,159,960	614,779	207,783	368,533	1,341,437	3,823,095			2,004,745	21,467,509				
	To date	51,019,786	15,268,697	6,551,832	12,633,552	37,341,068	64,966,787	796	32,295	22,352,001	201,588,236	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.

[2] Excludes 1968 production which is confidential.

TABLE 7C.—PRODUCTION OF MISCELLANEOUS METALS BY MINING DIVISIONS, 1967 AND 1968, AND TOTAL TO DATE—*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	1967														3,921,967
	1968														4,676,201
	To date														49,099,011
Atlin	1967														
	1968														
	To date														
Cariboo	1967	3,106,460	5,291,352									292	360		562,122
	1968	2,428,539	4,206,998												5,291,352
	To date	10,685,115	17,713,844					59	2,299			27,698	21,431		4,206,998
Clinton	1967														17,737,574
	1968														
	To date														
Fort Steele	1967														900
	1968									437,804	621,682				2,840,264
	To date									356,191	497,885				2,917,411
Golden	1967									17,682,840	15,307,158			88,1841	28,985,190
	1968														62,692
	To date														64,917
Greenwood	1967														1,119,284
	1968														9,366
	To date														4,272
Kamloops	1967														167,964
	1968														
	To date	93,995	138,479												240,125
Liard	1967														
	1968														
	To date							2	79						79
Lillooet	1967														2,600
	1968														
	To date	1,469	2,440					3	113			32,853	37,921		86,099
Nanaimo	1967														9,341,767
	1968														7,425,369
	To date														113,495,324
Nelson	1967														605,721
	1968														907,200
	To date	15,035	18,378												49,092,994
New Westminster	1967			4,180,842	3,946,715							13,789,939	33,906,811		3,946,715
	1968			3,317,160	3,372,225										3,372,225
	To date			35,294,173	29,373,682										29,373,682
Omineca	1967	13,716,016	24,655,468												24,660,337
	1968	12,016,709	20,545,215												20,545,990
	To date	44,585,539	76,162,575					3	154			2,210,892	4,697,710	4202	91,812,917
Osoyoos	1967														
	1968														
	To date	612	1,020												1,020

		Lb.	$	Lb.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	$	$
Revelstoke	1967														
	1968														
	To date											7,784	5,687		185,244
Similkameen	1967														
	1968														
	To date							1,287	129,186						129,186
Skeena	1967	16,249	31,768												6,136,712
	1968	4,989,712	7,164,464												[illegible]
	To date	5,018,774	7,209,252									866	881	1,889[3]	28,242,928
Slocan	1967														[illegible]
	1968														[illegible]
	To date														4,889,432
Trail Creek	1967	678,818	1,203,976												1,203,976
	1968	304,333	685,775												685,775
	To date	1,359,983	2,584,964			749	30,462	53	3,177						2,629,738
Vancouver	1967														3,862
	1968														30,595
	To date														1,191,741
Vernon	1967														592
	1968														
	To date	5,414	9,500												10,032
Victoria	1967														
	1968														
	To date														35,487
Not assigned	1967													1,827,718	8,627,794
	1968													3,301,416	6,252,497
	To date													13,245,639	76,590,695
Totals	1967	17,517,542	31,130,064	4,130,942	3,016,715					497,394	691,632			1,827,718	61,021,513
	1968	19,790,793	32,552,722	3,317,160	3,372,225					358,191	407,965			3,301,416	66,408,224
	To date	61,760,936	108,840,452	85,294,173	29,373,682	749	30,462	1,407	185,008	17,632,840	15,307,158	16,019,324	38,668,751	13,335,623	505,655,679

[1] Magnesium, page A 21. [2] Cobalt, page A 18. [3] Selenium, page A 22.

TABLE 7D.—PRODUCTION OF INDUSTRIAL MINERALS BY

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	1967										
	1968										
	To date										
Atlin	1967										
	1968										
	To date										
Cariboo	1967					2,819	14,096				
	1968					356	17,159				
	To date					7,442	175,825			48	168
Clinton	1967										
	1968										
	To date										
Fort Steele	1967										
	1968										
	To date			8	80						
Golden	1967			23,466	176,882						
	1968			21,998	164,206						
	To date			297,702	3,288,157			3,259	12,612		
Greenwood	1967										
	1968										
	To date							1,790,502	1,540,819		
Kamloops	1967										
	1968									250	5,257
	To date									250	5,257
Liard	1967	92,122	18,273,220								
	1968	74,667	14,833,861								
	To date	758,089	148,526,884								
Lillooet	1967										
	1968										
	To date										
Nanaimo	1967							21,886	50,057	3,300	60,000
	1968							21,293	59,330	3,500	5,845
	To date							823,226	1,074,901	10,383	184,631
Nelson	1967										
	1968									7,000	107,891
	To date							7,601	8,174	28,758	619,615
New Westminster	1967									8,700	62,000
	1968									8,000	60,000
	To date									95,547	1,387,256
Nicola	1967										
	1968										
	To date										
Omineca	1967										
	1968										
	To date										
Osoyoos	1967							26,202	171,015	24,288	183,655
	1968							18,945	98,139	16,397	167,695
	To date							802,611	3,699,081	168,240	2,155,320
Similkameen	1967										
	1968										
	To date										
Skeena	1967										
	1968										
	To date										
Vancouver	1967							601,019	1,050,722		
	1968										
	To date										
Vernon	1967									29,692	418,606
	1968										
	To date										
Victoria	1967										
	1968							14	140		
	To date							21	210		
Not assigned	1967							145	1,695	9,605	157,080
	1968										
	To date										
Totals	1967	92,122	18,273,220	23,466	176,882	2,819	14,096	48,052	221,212	81,283	805,655
	1968	74,667	14,833,861	21,998	164,206	356	17,159	40,259	157,679	30,897	436,923
	To date	758,089	148,526,884	297,710	3,288,237	7,442	175,825	4,028,868	7,887,454	332,523	4,827,933

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.

MINING DIVISIONS, 1967 AND 1968, AND TOTAL TO DATE

Gypsum and Gypsite		Jade		Mica		Sulphur		Other, Value	Division Total
Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value		
Tons	$	Lb.	$	Lb.	$	Tons	$	$	$
								9,8987	9,898
								20,3256	20,325
									14,096
									17,159
				10,013,800	148,013			30012	318,805
873	6,286							156,1914 6 10	162,427
						109,777	3,293,298		3,293,298
						104,191	3,125,430		3,125,430
						866,485	16,568,501	16,8949	16,884,299
112,878	296,824								868,474
230,044	691,592								854,053
246,874	688,847							1,2765 11	9,582,294
2,170,805	6,285,249								
								783,5788	2,828,897
									5,257
1,246,918	6,823,178			424,700	2,075			203,0556 10	6,533,565
		14,920	19,714			59,160	2,110,578		20,403,509
		1,810	2,125			50,450	1,709,826		16,545,342
		27,223	32,487			603,609	18,868,158		162,427,529
		5,240	4,627						4,627
		42,065	33,899						33,899
		272,927	182,246					5,12911	187,375
									110,057
									65,175
									1,209,582
									197,831
								55,9015	683,690
									62,000
									60,000
									1,337,256
2,407	10,050								10,050
		5,110	19,648						19,648
		7,810	24,046					11,4601 8	35,506
								2,4643	357,134
								1,1173	267,251
				1,588,800	25,988			806,5331 8 6	6,186,822
250	1,700							16,8582	18,558
						41,624	178,678		1,229,400
						7,950	122,640		122,640
						8,500	93,829		93,829
				684,250	10,815	663,399	6,800,172	97,8895	6,826,982
				160,800	3,978				3,978
									140
									210
								30,22611	189,001
						137,603	4,128,090		4,128,090
						157,890	4,721,700		4,721,700
						4,484,801	50,885,675		50,885,675
230,044	691,592	20,160	24,341			814,490	9,654,603	2,464	29,864,065
246,874	688,847	49,015	105,670			320,521	9,050,295	1,117	28,056,782
3,543,131	12,925,287	807,460	238,779	12,822,050	185,818	6,609,918	87,751,184	1,714,518	267,016,864

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

TABLE 7E.—PRODUCTION OF STRUCTURAL MATERIALS BY

Division	Period	Cement	Lime and Limestone	Building-stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel
		$	$	$	$	$
Alberni	1967				46,100	371,722
	1968				14,220	227,267
	To date				295,491	2,224,305
Atlin	1967					12,844
	1968					
	To date		1,108		98,478	231,305
Cariboo	1967		44,616		82,251	673,248
	1968		103,440		180,250	1,300,697
	To date		161,556		1,555,804	9,920,817
Clinton	1967				173,446	342,400
	1968				456,496	449,634
	To date				640,320	1,028,001
Fort Steele	1967				92,207	242,887
	1968				216,312	340,153
	To date		43,878	71,941	1,817,912	4,005,398
Golden	1967					114,012
	1968					184,951
	To date		1,000	50,840	126,139	2,369,215
Greenwood	1967			29,646	69,764	108,536
	1968			13,122	30,386	128,574
	To date		42,560	96,136	271,469	961,771
Kamloops	1967				337,545	899,280
	1968			1,050	174,157	923,233
	To date		12,000	19,050	6,988,722	7,950,706
Liard	1967				80,292	490,599
	1968				219,175	1,538,766
	To date				397,390	5,957,772
Lillooet	1967				29,352	22,686
	1968				50,750	34,860
	To date		100	2,000	761,514	1,861,726
Nanaimo	1967		2,359,595		121,299	731,780
	1968		2,902,586		246,859	527,675
	To date		41,155,622	8,450,785	1,308,089	5,751,344
Nelson	1967		72,601	8,611	5,762	345,606
	1968		98,801	2,994	9,852	442,013
	To date		278,546	422,585	519,441	3,963,590
New Westminster	1967		321,495		701,405	4,359,718
	1968		206,772		1,197,593	5,000,682
	To date		2,528,849	20,074	11,884,488	58,140,161
Nicola	1967				28,855	101,625
	1968					108,142
	To date			8,000	156,696	769,702
Omineca	1967				358,194	1,267,191
	1968				302,884	797,269
	To date		8,077		1,787,912	7,110,878
Osoyoos	1967			18,168	10,500	227,656
	1968		9,980		1,250	156,716
	To date		48,774	38,018	210,648	1,906,877
Revelstoke	1967				18,556	478,775
	1968				46,022	298,482
	To date		1,000	5,575	408,822	1,961,841
Similkameen	1967				2,280	114,688
	1968				15,000	249,621
	To date	10,500	11,571	24,000	633,049	2,826,078
Skeena	1967		11,127		612,885	304,654
	1968				258,556	371,486
	To date		1,645,300	144,000	2,709,368	6,146,798
Slocan	1967					84,101
	1968					105,400
	To date		1,000	115,148	118,584	1,803,199
Trail Creek	1967				1,800	226,804
	1968				1,442	104,282
	To date		82,500	85,520	227,666	2,899,985
Vancouver	1967	6,572,434			147,049	2,137,686
	1968	6,473,238			17,104	2,169,172
	To date	46,201,694	40,885	4,012,560	8,122,418	37,322,168
Vernon	1967				28,678	680,764
	1968			16,500	9,165	623,175
	To date		46,499	97,852	283,224	4,091,158
Victoria	1967	7,009,416	12,704		4,428	969,840
	1968	7,160,927	12,688		8,897	1,231,229
	To date	137,505,882	899,384	55	472,630	18,950,478
Not assigned	1967				75,102	5,384,621
	1968				68,452	2,375,659
	To date		315,498	505,018	695,630	20,127,262
Totals	1967	13,581,850	2,822,188	51,425	2,967,195	20,843,673
	1968	13,634,166	3,337,277	33,366	3,524,439	20,271,723
	To date	188,718,076	47,265,202	9,165,002	42,436,849	205,182,520

Mining Divisions, 1967 and 1968, and Total to Date

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
$	$	$	$	$	$	$	$	$	$
									417,822
									252,147
									2,519,796
									12,344
									330,391
							85,900		856,015
							45,000		1,041,[illegible]
1,198	164	4,651	15,307				127,952		11,787,964
									515,846
									906,780
									1,662,821
									385,024
									[illegible]
7,800							8,118		6,855,087
							27,880		141,862
							37,000		191,851
							96,565		2,644,309
									207,946
									172,062
114,361			6,922						1,498,919
									1,286,695
									1,088,440
72,379									14,987,557
									820,891
									1,757,941
									6,855,162
									52,098
									85,430
									2,695,340
									3,212,474
									8,677,117
1,104,295	38,989		35,756						52,544,732
									427,520
									[illegible]
19,110	2,364								5,206,186
2,698	1,048,988	768,851	18,668	86,247	856,288	28,029	678,005		8,819,722
1,784	1,500,220	729,587	23,391	18,972	909,762	27,222	580,146		10,069,041
1,829,758	9,562,184	16,728,217	1,047,869	8,048,121	17,616,788	484,944	4,526,802		122,448,095
									124,980
									106,142
									934,898
									1,625,885
									1,099,906
5,274									3,907,136
									256,324
									162,[illegible]
									2,194,817
									492,881
									344,454
									2,877,289
									116,968
									264,[illegible]
		1,868					11,992		3,518,553
									928,616
									628,842
			4,925				8,824		10,658,715
									84,101
									195,400
									1,587,876
									228,604
									105,784
									2,745,671
									3,957,119
									3,659,515
142,208	241,216	580,778	12,724			28,862	88,804		96,788,812
									659,442
									646,140
181,467	6,202	1,011	5	18,224	4,825		20		4,679,987
							424,878		8,420,756
							645,511		9,059,852
1,814,647	29,552	119,980	1,050	705,821	1,072,846	186,504	3,558,246		165,266,520
									5,459,728
									2,944,111
							3,180,828	5,972,171	80,796,407
2,628	1,048,988	768,851	18,668	86,247	856,288	28,029	1,136,108		44,011,488
1,784	1,500,220	729,587	23,391	18,972	909,762	27,222	1,277,057		45,189,479
5,242,487	9,911,091	17,429,587	1,125,928	8,772,166	18,698,454	644,810	11,607,151	5,972,171	562,166,489

TABLE 8A.—PRODUCTION OF COAL, 1836–1968

Year	Quantity[1] (Short Tons)	Value	Year	Quantity[1] (Short Tons)	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	253,760	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	1,573,372	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	1968	959,214	7,588,989
1913	2,713,535	9,197,460			
1914	2,237,042	7,745,847	Totals	141,592,706	$609,906,721

[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 AND DISTRIBUTION BY COLLIERIES AND BY MINING DIVISIONS, 1968

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					
Fort Steele Mining Division	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	$
Coleman Collieries Ltd.	10,129	3,582	6,547	———	———	6,547	———	———	———	6,547	6,547	35,021
Crows Nest Industries Ltd.—Michel Colliery	142,919	———	142,919	2,727	34,269	11,728	47,958	———	60,867	120,553	157,549	1,221,179
~~Kaiser Coal Ltd.—Michel Colliery~~	~~964,210~~	~~207,605~~	~~746,605~~	~~12,326~~	~~201,313~~	~~55,011~~	~~123,342~~	~~660~~	~~388,978~~	~~567,991~~	~~781,630~~	~~6,207,398~~
Totals	1,107,258	211,187	896,071	15,053	235,582	73,286	171,300	660	449,845	695,091	945,726	7,463,598
Nanaimo Mining Division												
Loudon No. 6 Mine	93	———	93	———	———	93	———	———	———	93	93	1,494
Omineca Mining Division												
Forestburg Collieries Ltd.—Bulkley Valley Colliery	13,395	———	13,395	———	———	13,316	79	———	———	13,395	13,395	123,897
Grand totals for Province	1,120,746	211,187	909,559	15,053	235,582	86,695	171,379	660	449,845	708,579	959,214	7,588,989

TABLE 9.—PRINCIPAL ITEMS OF EXPENDITURE, REPORTED FOR OPERATIONS OF ALL CLASSES

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
Metal-mining	$67,101,430	$9,782,218	$32,969,808
Exploration and development	18,962,308		
Coal	2,974,408	250,148	1,210,664
Petroleum and natural gas (exploration and production)	3,471,312		
Industrial minerals	4,940,681	1,043,891	1,715,347
Structural-materials industry	7,039,509	2,742,069	2,864,384
Totals, 1968	$104,489,648	$13,818,326	$38,760,203
Totals, 1967	94,523,495	13,590,759	34,368,856
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.—EMPLOYMENT IN THE MINERAL INDUSTRY, 1901–68

Year	Lode Metals							Coal Mines			Structural Materials				
	Placer	Mines		Exploration and Development	Concentrators	Smelters	Total	Under	Above[1]	Total	Quarries and Pits	Plants	Industrial Materials	Petroleum and Natural-gas Exploration and Development	Total
		Under	Above												
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	4,718	1,705	6,418	.....	.....	.....	.....	9,672
1910	.....	2,472	1,237	.....	.....	.....	3,709	5,903	1,855	7,758	.....	.....	.....	.....	11,467
1911	.....	2,485	1,159	.....	.....	.....	3,594	5,212	1,661	6,873	.....	.....	.....	.....	10,467
1912	.....	2,472	1,364	.....	.....	.....	3,836	5,276	1,855	7,130	.....	.....	.....	.....	10,966
1913	.....	2,778	1,505	.....	.....	.....	4,278	4,950	1,721	6,671	.....	.....	.....	.....	10,949
1914	.....	2,741	1,433	.....	.....	.....	4,174	4,267	1,465	5,732	.....	.....	.....	.....	9,906
1915	.....	2,709	1,435	.....	.....	.....	4,144	3,708	1,283	4,991	.....	.....	.....	.....	9,135
1916	.....	3,357	2,036	.....	.....	.....	5,393	3,694	1,366	5,060	.....	.....	.....	.....	10,453
1917	.....	3,290	2,198	.....	.....	.....	5,488	3,760	1,410	5,170	.....	.....	.....	.....	10,658
1918	.....	2,626	1,764	.....	.....	.....	4,390	3,658	1,769	5,427	.....	.....	.....	.....	9,817
1919	.....	2,518	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	.....	2,858	1,680	.....	.....	.....	4,038	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	1,785	.....	808	2,461	7,610	3,757	1,565	5,322	498	324	134	.....	14,172
1927	415	2,671	1,916	.....	854	2,542	8,398	3,646	1,579	5,225	647	185	122	.....	14,880
1928	555	2,707	2,469	.....	911	2,748	9,390	3,814	1,520	5,334	412	868	120	.....	15,424
1929	341	2,926	2,052	.....	966	2,948	8,893	3,676	1,353	5,028	492	544	268	.....	15,565
1930	425	2,816	1,260	.....	832	2,197	7,605	3,389	1,256	4,645	848	344	170	.....	14,032
1931	688	1,468	884	.....	581	2,157	6,035	2,957	1,125	4,082	460	526	880	.....	12,171
1932	874	1,355	900	.....	542	2,256	4,525	2,623	980	3,603	536	329	344	.....	10,524
1933	1,134	1,756	1,335	.....	581	2,486	6,095	2,241	853	3,094	376	269	403	.....	11,369
1934	1,122	2,796	1,729	.....	681	2,890	8,046	2,050	848	2,898	377	187	360	.....	12,985
1935	1,291	2,740	1,497	.....	907	2,771	7,915	2,145	826	2,971	586	270	754	.....	13,787
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	1,305	3,849	2,266	.....	919	3,158	10,199	2,088	874	2,962	900	295	869	.....	16,021
1939	1,252	3,905	2,050	.....	996	3,187	10,188	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	1,828	.....	1,025	3,072	9,821	2,229	494	2,723	766	418	422	.....	15,084
1942	489	2,920	1,504	.....	960	3,555	8,989	1,892	468	2,360	842	378	262	.....	13,270
1943	212	2,894	1,699	.....	891	2,885	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	.....	12,814
1945	209	1,988	1,750	.....	822	2,884	7,389	1,927	503	2,430	921	335	586	.....	11,820
1946	847	1,918	1,817	.....	672	2,819	7,229	1,773	532	2,305	827	555	679	.....	11,933
1947	360	3,024	2,288	.....	960	3,461	9,633	1,694	731	2,425	977	585	869	.....	14,899
1948	348	3,148	2,429	.....	1,128	3,384	10,533	1,594	872	2,466	1,591	656	754	.....	16,897
1949	303	3,084	2,724	.....	1,208	3,763	10,732	1,761	545	2,306	2,120	542	626	.....	16,621
1950	327	3,899	2,415	.....	1,259	3,759	10,859	1,745	516	2,261	1,916	616	660	.....	16,612
1951	205	3,785	3,695	.....	1,307	4,044	12,881	1,462	463	1,925	1,788	628	491	.....	17,868
1952	230	4,171	3,923	.....	1,516	4,120	13,780	1,280	401	1,681	1,580	557	529	.....	18,257
1953	132	3,145	2,589	.....	1,371	3,901	11,006	1,154	396	1,550	1,909	559	684	.....	15,790
1954	199	2,644	2,520	.....	1,129	3,119	9,412	1,076	358	1,434	1,861	688	584	.....	14,128
1955	103	2,564	2,558	.....	1,091	3,204	9,519	1,100	378	1,478	1,646	641	723	.....	14,102
1956	105	2,687	2,827	.....	1,043	3,339	9,846	968	398	1,366	1,598	770	854	.....	14,589
1957	67	2,893	2,447	.....	838	3,323	9,008	1,020	360	1,380	1,705	625	474	.....	13,257
1958	75	1,919	1,809	.....	625	3,031	7,484	826	260	1,086	1,488	677	446	.....	11,201
1959	99	1,987	1,761	.....	618	3,008	7,324	765	291	1,056	1,357	484	459	.....	10,779
1960	86	1,782	1,959	.....	648	3,084	7,428	894	288	1,182	1,704	557	589	.....	11,541
1961	74	1,785	1,582	.....	628	3,112	7,111	705	237	942	1,828	508	571	.....	11,084
1962	85	1,677	1,978	270	949	3,356	8,225	548	228	776	1,525	481	517	.....	11,560
1963	48	1,718	2,012	450	850	3,289	8,264	501	247	748	909	460	528	.....	10,952
1964	5	1,839	1,967	772	822	3,281	8,683	446	267	713	1,293	444	509	.....	11,645
1965	2	1,752	2,019	786	965	3,529	9,053	405	244	649	1,079	422	639	441	12,283
1966	2	2,006	2,296	1,294	1,014	3,654	10,266	347	267	614	1,269	393	582	478	14,202
1967	.....	1,928	2,532	1,264	992	3,435	10,151	260	197	457	1,309	372	584	507	13,380
1968	.....	1,923	2,369	2,107	1,072	3,263	10,654	195	358	553	1,207	380	582	400	14,329

[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, 1968

	Tons		Days Operating Mill	Average Number Employed[1]					
	Mined	Milled		Administrative, Etc.	Mine		Mill	Others	Total
					Surface	Underground			
The Anaconda Co. (Canada) Ltd. (Britannia)	605,292	608,976	255	83	66	235	35	—	419
Bethlehem Copper Corporation Ltd. (Bethlehem)	5,205,569	5,095,759	366	23	160	—	152	—	335
Braiorne Pioneer Mines Ltd. (Braiorne)	100,660	100,660	201	32	29	104	12	—	177
Brimont Mining Ltd. (Ottawa)	4,415	—	—	2	3	3	—	—	8
British Columbia Molybdenum Ltd. (British Columbia Molybdenum)	2,207,860	2,147,994	356	32	100	—	52	40	224
Brynnor Mines Ltd. (Boss Mountain)	497,836	497,836	366	43	73	71	28	—	215
Brynnor Mines Ltd. (Kennedy Lake)	235,293	206,188	120	10	13	—	4	—	27
Canadian Exploration Ltd. (Jersey)	516,154	506,220	366	58	32	116	12	—	218
Cerna Copper Mines Ltd. (Sunloch, Gabbro)	152,543	152,543	220	15	—	75	20	—	110
Coast Copper Co. Ltd. and Cominco Ltd. (Old Sport and Independent)	268,916	268,916	366	35	50	124	9	—	218
Cominco Ltd. (Bluebell)	251,497	251,497	348	38	28	146	15	2	229
Cominco Ltd. (Pinchi Lake) (confidential)	—	—	—	—	—	—	—	—	—
Cominco Ltd. (Sullivan)	2,155,749	2,533,024	258	199	77	371	127	—	774
Craigmont Mines Ltd. (Craigmont)	1,764,230	1,764,230	355	104	7	173	184	—	468
Endako Mines Ltd. (Endako)	8,194,430	6,597,000	257	116	192	—	60	—	368
Giant Mascot Mines Ltd. (Pride of Emory)	338,340	338,340	243	35	—	100	21	30	186
Granby Mining Co. Ltd. (Phoenix)	650,050	698,796	366	22	84	—	54	—	160
Granisle Copper Ltd. (Granisle)	2,230,210	2,230,210	366	31	34	—	43	41	149
Jedway Iron Ore Ltd. (Jessie, Adonis, Rose)[2]	105,321	117,270	60	6	21	2	4	—	33[2]
Mastodon-Highland Bell Mines Ltd. (Highland-Bell)	41,042	37,519	343	10	6	33	13	—	62
Northwestern Midland Development Co. Ltd. (Silver Standard)	761	560	100	1	—	3	1	—	5
Red Mountain Mines Ltd. (Coxey)	210,644	196,396	340	11	6	—	24	—	41
Reeves MacDonald Mines Ltd. (Reeves MacDonald)	309,311	309,311	285	27	25	59	14	—	125
Texada Mines Ltd. (Texada)	1,188,710	1,180,099	366	23	78	112	37	—	250
Utica Mines Ltd. (Horn Silver)	128,000	128,000	225	23	13	65	12	—	113
Wesfrob Mines Ltd. (Tasu)	1,731,300	1,731,300	304	59	41	—	114	—	205
Western Mines Ltd. (Lynx)	330,223	330,223	363	21	25	19	23	—	88
Zeballos Iron Mines Ltd. (F.L.)	278,577	278,577	222	12	2	12	2	29	57
Total number employed	—	—	—	—	—	—	—	—	5,264

[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 February 29, 1968. Average number employed estimated.

TABLE 11B.—EMPLOYMENT AT COLLIERIES, 1968

Colliery	Average Number Employed[1]		
	Underground	Above[2]	Total
Coleman Collieries Ltd.—Tent Mountain	----	2	2
Crows Nest Industries Ltd.—Michel Colliery	42	46	88
Kaiser Coal Ltd.—Michel Colliery	152	302	454
Forestburg Collieries Ltd.—Bulkley Valley Colliery	----	8	8
Louden No. 6	1	----	1
Totals	195	358	553

[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] Does not include employment in by-product plants.

TABLE 12.—METAL PRODUCTION IN 1968

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
Alberni Mining Division				Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Brynnor Mine	Kennedy Lake	103	Brynnor Mines Ltd., Kennedy Lake Division	206,188	Iron concentrates, 200,121 tons						
F.L.	Zeballos	102	Zeballos Iron Mines Ltd.	278,577	Iron concentrates, 149,551 tons						
Lynx Mine	Buttle Lake	105	Western Mines Ltd.	330,223	Copper concentrates, 22,955 tons; zinc concentrates, 43,403 tons	14,412	521,307	11,747,652	5,302,313	52,827,597	282,933
Atlin Mining Division											
Lucky	Atlin	23	T. O. Conolly and Union Mountain Mines Ltd.	1	Crude ore		11		6	3	
Cariboo Mining Division											
Boss Mountain Mine	Big Timothy Mountain	152	Brynnor Mines Ltd., Boss Mountain Division	497,836	Molybdenite concentrates, 2,125 tons containing 2,428,539 lb. of molybdenum						
Clinton Mining Division											
Nil											
Fort Steele Mining Division											
Midas, Big Chief	Pebble Creek	269	Boulder Creek Mines Ltd.	10	Crude ore		22		1,773		
Sullivan Mine	Kimberley	268	Cominco Ltd.	2,533,024	Lead concentrates, 117,567 tons; zinc concentrates, 135,126 tons; tin concentrates, 203 tons containing 358,191 lb. of tin; iron sinter, 148,124 tons	141	3,180,281	533,800	176,018,487	145,708,682	341,870
Golden Mining Division											
Mineral King Mine	Windermere		Aetna Investment Corporation Ltd.		Lead concentrates, 228 tons; zinc concentrates, 7,441 tons; and crude ore, 16 tons shipped after the closure of the mine in December, 1967		11,768	19,593	543,519	8,007,296	32,540
Greenwood Mining Division											
Highland-Bell Mine	Beaverdell	224	Mastodon-Highland Bell Mines Ltd.	37,519	Lead concentrates, 2,121 tons; zinc concentrates, 291 tons; jig concentrates, 194 tons	487	562,622		584,157	524,762	2,142
Midway	Midway		D. Moore, H. Fritz, F. Letkemen	22	Crude ore	3	285		16	17	
Phoenix Mine	Phoenix	231	The Granby Mining Co. Ltd., Phoenix Copper Division	698,796	Copper concentrates, 16,789 tons	12,571	90,996	8,582,757			
Kamloops Mining Division											
Bethlehem Mine	Highland Valley	179	Bethlehem Copper Corporation Ltd.	5,095,759	Copper concentrates, 75,966 tons	2,807	193,790	52,813,700			
Victor	Highland Valley	188	SMI Processes Ltd.	11	Copper concentrates from leaching operations			10,602			

				Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Liard Mining Division											
Nil											
Lillooet Mining Division											
Bralorne Mine	Bridge River	162	Bralorne Pioneer Mines Ltd.	100,669	Bullion	52,324	9,352				
Nanaimo Mining Division											
Bob (Bonanza Mine)	Bonanza Lake	100	M.B.H. Development	2,265	Crude ore		1,323	161,293			
Copper Road Mine	Quadra Island	100	Ribco Leasing Ltd.	2,035	Crude ore	5	1,170	151,111			
Copper Hills, Copper Bell, Colleen	Quadra Island	100	Quadra Mining Co. Ltd.	2	Copper concentrates from leaching operations			1,232			
Independent	Benson Lake		Cominco Ltd.	27,453	Copper concentrates, 1,856 tons	394	4,818	837,520			
Old Sport Mine	Benson Lake	98	Coast Copper Co. Ltd.	241,463	Copper concentrates, 9,434 tons; iron concentrates, 75,138 tons	12,930	33,826	6,063,060			
Texada Mine	Texada Island	101	Texada Mines Ltd.	1,180,099	Iron concentrates, 591,266 tons; copper concentrates, 10,812 tons	2,065	55,850	4,702,344			
Nelson Mining Division											
Howard	Ymir	241	Salmo Mining Exploration	32	Crude ore	2	13		380	507	
Jersey Mine	Salmo, Iron Mountain	243	Canadian Exploration Ltd.	506,220	Lead concentrates, 8,407 tons; zinc concentrates, 31,910 tons		46,009		13,588,721	37,381,606	315,852
New Arlington	Salmo, Erie Creek	242	G. D. Fox, Trail	5,722	Crude ore	681	2,993		43,811	59,791	
Reeves MacDonald Mine	Nelway	245	Reeves MacDonald Mines Ltd.	309,311	Lead concentrates, 5,130 tons; zinc concentrates, 19,127 tons		44,815	20,162	5,639,543	21,060,973	138,966
Silver Dollar	Salmo, Erie Creek	242	Silver Dollar Mines Ltd.	4,093	Crude ore	1,083	35,007		71,125	83,325	
New Westminster Mining Division											
Pride of Emory Mine	Hope	76	Giant Mascot Mines Ltd.	338,340	Nickel-copper concentrates, 18,200 tons; nickel content, 3,769,500 lb.			1,417,700			
Nicola Mining Division											
Craigmont Mine	Merritt	197	Craigmont Mines Ltd.	1,764,230	Copper concentrates, 59,085 tons			30,497,437			
Omineca Mining Division											
Emerald Glacier Mine	Tahtsa Lake	140	Pine Glacier Mines Ltd.		Lead concentrates, 250 tons	3	13,287		324,730	55,452	
Endako Mine	Endako	142	Endako Mines Ltd.	6,597,000	Molybdenite concentrates, 7,823 tons; molybdenum trioxide, 2,792 tons. Total content 12,016,709 lb. of molybdenum						
Granisle Mine	Babine Lake	132	Granisle Copper Ltd.	2,230,210	Copper concentrates, 33,134 tons	11,853	104,862	21,708,800			

TABLE 12.—METAL PRODUCTION IN 1968—*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
Omineca Mining Division—Continued				Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Pinchi Lake Mine	Pinchi Lake	145	Cominco Ltd.	(1)	Mercury						
Silver Standard Mine	Hazelton	111	Northwestern Midland Development Co. Ltd.	560	Lead concentrates, 49 tons; zinc concentrates, 25 tons; crude ore, 201 tons	50	27,042		44,627	49,432	223
Osoyoos Mining Division											
Horn Silver Mine	Keremeos	221	Utica Mines Ltd.	128,000	Silver concentrates, 5,000 tons	2,713	1,067,971		205,929	200,037	
Revelstoke Mining Division											
Nil											
Similkameen Mining Division											
Nil											
Skeena Mining Division											
B.C. Molybdenum Mine	Alice Arm	63	British Columbia Molybdenum Ltd.	2,147,994	Molybdenite concentrates, 4,162 tons containing 4,989,712 lb. of molybdenum						
Blue Grouse	Stewart	51	John Lehto, Stewart	8	Crude ore		877		1,874	3,593	
Jessie, Adonis, Rose	Moresby Island	70	Jedway Iron Ore Ltd.	117,270	Iron concentrates, 112,589 tons						
Silbak Premier Mine	Stewart	50	Silbak Premier Mines Ltd.	4	Hand picked material from stockpile	51	728		103	172	
Tasu Mine	Tasu Harbour	70	Westrob Mines Ltd.	1,731,300	Iron concentrates, 817,956 tons; copper concentrates, 25,099 tons	3,520	106,416	9,823,631			
Slocan Mining Division											
Antoine	McGuigan Creek	254	Antoine Silver Mines Ltd.	6,670	Lead concentrates, 241 tons; zinc concentrates, 359 tons	3	73,578	2,232	364,505	418,063	3,127
Arlington	Springer Creek	249	Arlington Silver Mines Ltd.	836	Crude ore	1	13,501		35,046	25,198	
Bluebell Mine	Riondell	261	Cominco Ltd.	251,497	Lead concentrates, 14,983 tons; zinc concentrates, 26,839 tons	60	345,896	339,600	22,017,400	26,498,600	127,308
Crown	Ainsworth	258	D. H. Norcross, Nelson	30	Crude ore		511		608	243	
Enterprise	Slocan	250	Enterprise Silver Mines Ltd.	60	Crude ore		2,033		9,205	15,691	
Freddy	Silverton	251	V. C. Hanson and D. Lyon, New Denver	63	Crude ore	6	3,147		561	564	
Homestake	Slocan	249	R. V. Smigaj and R. R. Grove, Slocan	45	Crude ore	53	7,012				

[1] Details confidential.

				Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Joyce	Silverton	249	C. Thickett, Slocan	76	Siliceous ore	37	5,970				
Little Tim	Slocan	249	N. Bjeg and M. Nebor, Slocan	21	Crude ore		2,978		2,540	1,482	
Moonshine	Lardeau	260	Willett Mines Ltd.	169	Crude ore		471		14,592	20,722	
Ottawa Mine	Springer Creek	248	Brimont Mining Ltd.	4,415	Crude ore		65,550				
Silver Hoard	Ainsworth	258	S. L. McLellan, Ainsworth	99	Crude ore		2,303		4,655	12,101	
Slocan Sovereign	Sandon	255	Wayne Turley, Kaslo	30	Crude ore	1	838	104	13,981	2,188	
Standard	Silverton	251	Panoil Canadian Mineral Associates	4,905	Lead concentrates, 80 tons; zinc concentrates, 203 tons		25,256		112,964	218,673	
Victor	Sandon	254	Kam-Kotia Mines Ltd.	38	Crude ore	5	5,502		42,911	8,683	
Washington	New Denver	255	Larch Mines Ltd.	171	Lead concentrates, 17 tons; zinc concentrates, 40 tons; crude ore, 8 tons	8	2,531		24,549	52,648	319
Westmont	Slocan	250	Eastmont Silver Mines Ltd.	24	Crude ore		1,703		2,055	1,615	
Trail Creek Mining Division											
Coxey Mine	Rossland	237	Red Mountain Mines Ltd.	196,396	Molybdenite concentrates, 304 tons containing 364,833 lb. of molybdenum						
Midnight	Rossland	236	Cinola Mines Ltd.	789	Crude ore	340	247		2,414	1,710	
Vancouver Mining Division											
Britannia Mine	Howe Sound	75	The Anaconda Co. (Canada) Ltd.	604,676	Copper concentrates, 18,053 tons; zinc concentrates, 2,828 tons	3,688	51,110	13,134,414	131,087	3,043,607	15,336
Vernon Mining Division											
Chaput	Lumby	222	F. K. Explorations Ltd.	327	Crude ore	7	18,063		33,402	20,275	
Victoria Mining Division											
Sunloch, Gabbro	Jordan River	106	Cerna Copper Mines Ltd.	152,543	Copper concentrates, 4,512 tons	540	7,064	2,270,019			

Departmental Work

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, consisting of three divisions, Mining Titles, Petroleum and Natural Gas Titles, and Accounts, is responsible for the administration of the Provincial laws regarding the acquisition of rights to minerals, coal, petroleum, and natural gas, and deals with other departments of the Provincial service for the Department or for any branch.

MINING TITLES

Staff

R. H. McCrimmon.....Chief Gold Commissioner
E. J. Bowles.....Deputy Chief Gold Commissioner
J. G. B. Egdell.....Gold Commissioner, Vancouver

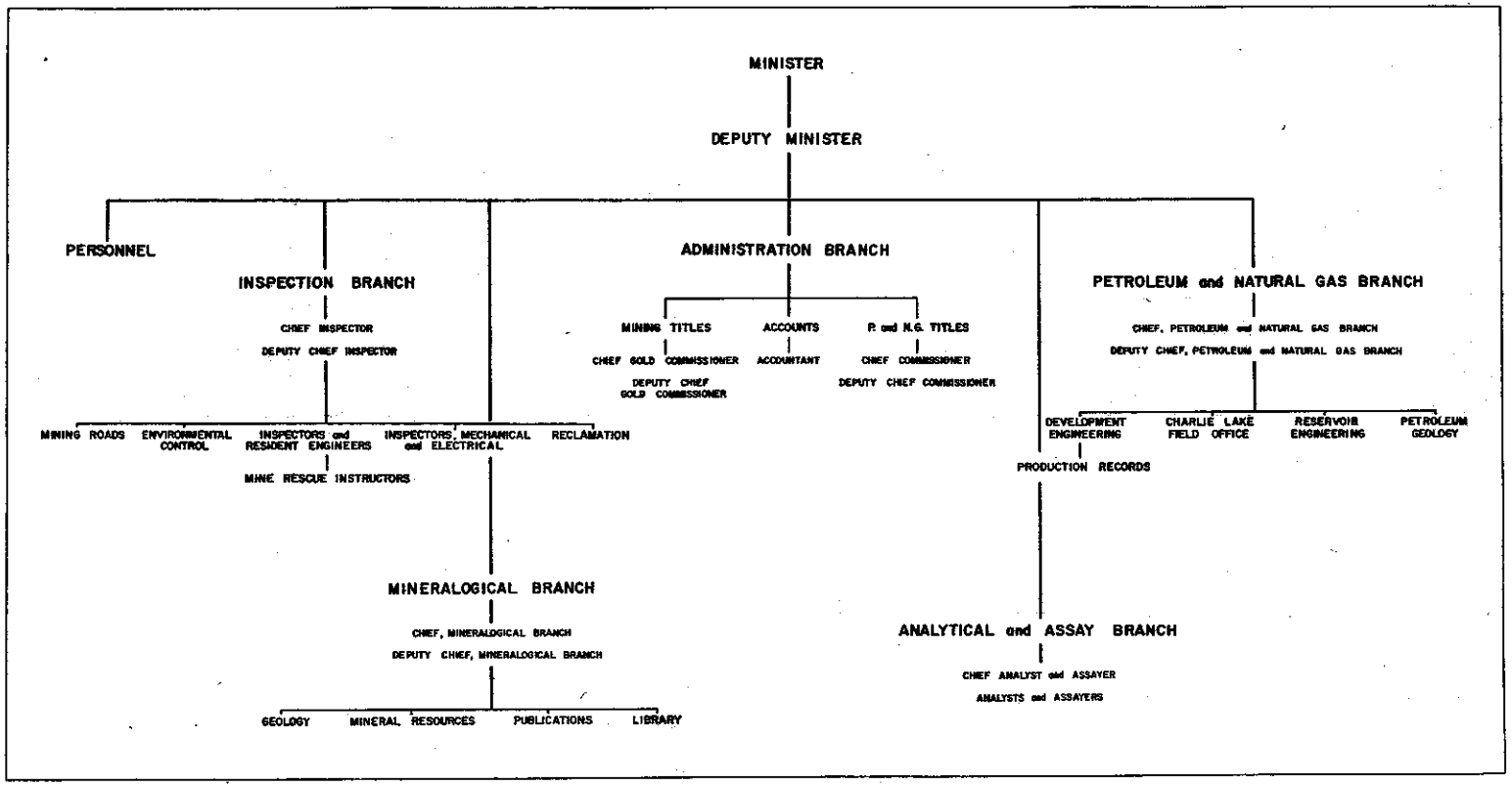
Gold Commissioners, Mining Recorders, and Sub-Mining Recorders, whose duties are laid down in the *Mineral Act* and *Placer-mining Act*, administer these Acts and other Acts relating to mining. Mining Recorders, in addition to their own functions, may also exercise the powers conferred upon Gold Commissioners 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 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 on page A 58.

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 1968, nine investigations were carried out pursuant to section 80 of the *Mineral Act*. Four investigations with regard to certificates of work being


MINISTER
DEPUTY MINISTER
PERSONNEL
INSPECTION BRANCH
CHIEF INSPECTOR
DEPUTY CHIEF INSPECTOR
MINING ROADS
ENVIRONMENTAL CONTROL
INSPECTORS and RESIDENT ENGINEERS
INSPECTORS, MECHANICAL and ELECTRICAL
RECLAMATION
MINE RESCUE INSTRUCTORS
ADMINISTRATION BRANCH
MINING TITLES
ACCOUNTS
P. and N.G. TITLES
CHIEF GOLD COMMISSIONER
ACCOUNTANT
CHIEF COMMISSIONER
DEPUTY CHIEF GOLD COMMISSIONER
DEPUTY CHIEF COMMISSIONER
PETROLEUM and NATURAL GAS BRANCH
CHIEF, PETROLEUM and NATURAL GAS BRANCH
DEPUTY CHIEF, PETROLEUM and NATURAL GAS BRANCH
DEVELOPMENT ENGINEERING
CHARLIE LAKE FIELD OFFICE
RESERVOIR ENGINEERING
PETROLEUM GEOLOGY
PRODUCTION RECORDS
MINERALOGICAL BRANCH
CHIEF, MINERALOGICAL BRANCH
DEPUTY CHIEF, MINERALOGICAL BRANCH
GEOLOGY
MINERAL RESOURCES
PUBLICATIONS
LIBRARY
ANALYTICAL and ASSAY BRANCH
CHIEF ANALYST and ASSAYER
ANALYSTS and ASSAYERS

wrongfully or improperly obtained resulted in 46 certificates of work being cancelled. Five investigations with regard to mineral claims having been located or recorded otherwise than in accordance with the *Mineral Act* resulted in 328 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).

Maps Showing Mineral Claims, Placer Claims, Placer-mining Leases, and Map Indexes

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

Coal

Information concerning the ownership and standing of coal licences and coal leases may be obtained upon application to 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, 1968

Licences—	
Fees	$10,210.00
Rental	51,440.45
Total	$61,650.45

Gold Commissioners' and Mining Recorders' Office Statistics, 1968

Mining Division	Free Miners' Certificates		Metal-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	86	2	1,433	855	$4,100.00	—	44	7	1	11	17	$250.00	38	$645.00	$19,291.25	$19,936.25
Atlin	223	5	1,797	702	5,600.00	—	73	10	1	13	48	—	29	1,811.00	21,528.00	23,339.00
Cariboo	1,048	7	4,226	3,192	7,600.00	—	99	9	3	115	265	2,500.00	108	6,488.00	70,198.75	76,686.75
Clinton	55	1	1,177	1,194	2,600.00	—	72	1	—	67	61	—	43	470.00	19,791.75	20,261.75
Fort Steele	199	4	3,010	4,200	11,500.00	—	79	12	1	20	32	1,000.00	3	1,695.00	59,661.50	61,356.50
Golden	79	7	635	850	4,000.00	—	63	10	—	13	26	—	39	1,420.00	16,080.75	17,500.75
Greenwood	189	4	1,787	2,086	4,844.00	—	136	30	—	4	10	—	—	1,545.00	32,739.50	34,284.50
Kamloops	410	14	7,994	7,479	10,100.00	—	347	2	—	10	14	500.00	1	4,550.00	104,258.85	108,808.85
Liard	358	1	5,791	4,446	21,980.00	—	155	—	—	30	63	750.00	41	1,886.00	82,121.25	84,007.25
Lillooet	178	3	1,150	994	2,200.00	—	127	7	—	36	16	500.00	5	1,295.00	18,000.25	19,295.25
Nanaimo	196	2	5,223	4,853	11,640.00	—	509	1	1	—	—	—	—	1,280.00	66,190.25	67,470.25
Nelson	321	6	1,044	1,140	2,700.00	—	77	24	—	7	14	250.00	2	2,582.00	20,303.50	22,885.50
New Westminster	525	16	1,170	1,375	5,500.00	—	69	4	2	62	182	1,250.00	94	4,981.00	29,572.50	34,553.50
Nicola	126	11	3,108	3,329	13,300.00	—	256	—	1	—	—	—	—	2,830.00	52,501.75	55,331.75
Omineca	522	10	8,395	13,490	24,100.00	1	419	13	—	84	136	2,700.00	85	4,406.00	172,574.90	176,980.90
Osoyoos	229	9	2,675	2,359	4,572.00	41	132	9	—	—	—	—	—	1,873.00	35,647.50	37,520.50
Revelstoke	100	4	1,465	3,306	6,200.00	—	64	8	—	2	8	—	—	1,296.00	36,474.25	37,770.25
Similkameen	268	3	2,530	3,254	11,800.00	—	175	4	—	92	117	9,750.00	157	1,840.00	72,767.75	74,607.75
Skeena	144	—	1,278	2,938	8,152.00	—	214	32	—	11	3	—	7	720.00	27,292.00	28,012.00
Slocan	250	6	1,364	2,006	5,964.00	—	206	43	—	—	—	—	—	2,275.00	32,089.00	34,364.00
Trail Creek	143	4	790	294	236.00	—	14	8	—	—	—	—	—	1,515.00	6,958.55	8,473.55
Vancouver	2,929	576	870	1,040	5,296.00	—	46	3	—	3	1	500.00	1	122,735.00	33,039.59	155,774.59
Vernon	336	3	1,248	648	500.00	—	72	6	1	6	26	—	1	1,931.00	12,804.75	14,735.75
Victoria	391	63	224	199	1,400.00	—	9	1	—	4	2	—	8	13,251.00	5,246.00	18,497.00
Totals for 1968	9,305	761	60,384	66,229	$175,884.00	42	3,457	244	11	590	1,041	$19,950.00	662	$185,320.00	$1,047,134.14	$1,232,454.14
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

Petroleum and Natural-gas Titles

Staff

R. E. Moss ..... Chief Commissioner
W. W. Ross ..... Deputy Chief Commissioner

This Division of 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 $15,077,020.47.

On September 24, 1968, a total of 8,911,042 acres of petroleum and natural-gas rights were released from Crown reserve. Of this sum, 208,908 acres were located in the Fraser Valley area with the balance of 8,702,134 acres located in the foothills and mountains south and west of the general Peace River area. This disposition created considerable interest in the petroleum and natural-gas industry.

Priority for making application for these rights was determined by draw, for which 414 persons registered as participants. Seventy-three permit applications were received, covering 4,644,673 acres. Sixty-eight permits covering 4,488,035 acres were located in the Peace River area, with five permits covering 156,638 acres being in the Fraser Valley area.

As of December 31, 1968, 43,556,808 acres or approximately 68,057 square miles, an increase of 8,734,093 acres over the 1967 total, 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	492	32,622,739
Natural-gas licences	------	----------
Drilling reservations	34	384,925
Leases (all types)	4,110	10,549,144
Total		43,556,808

Petroleum and Natural-gas Revenue, 1968

Rentals and fees—		
Permits	$1,184,456.79	
Drilling reservations	87,758.50	
Natural-gas licences	----------	
Petroleum, natural-gas, and petroleum and natural-gas leases	9,349,480.29	
Total rentals and fees		$10,621,695.58

Disposal of Crown reserves—		
Permits	$9,554,003.93	
Drilling reservations	1,785,527.02	
Leases	3,737,489.52	
Total Crown reserves disposal		$15,077,020.47
Royalties—		
Gas	$3,217,227.03	
Oil	7,677,404.82	
Processed products	50,761.62	
Total royalties		10,945,393.47
Miscellaneous fees		17,955.34
Total petroleum and natural-gas revenues		$36,662,064.86

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 1968 the chemical laboratory in Victoria issued reports on 2,480 samples from prospectors and Departmental engineers. A laboratory examination of a prospector's sample generally consists of the following: (1) A spectrographic analysis to determine if any base metals are present in interesting percentages; (2) assays for precious metals and for base metals shown by the spectrographic analysis to be present in interesting percentages. The degree of radioactivity is measured on all samples submitted by prospectors and Departmental engineers; these radiometric assays are not listed 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 *Prospector's Grub-stake Act*, and Departmental engineers:—

	Samples	Spectrographic Analyses	Assays
Prospectors (not grantees)	2,032	2,010	5,476
Prospectors (grantees)	228	227	617
Departmental Engineers	220	56	1,014
Totals	2,480	2,293[1]	7,107

[1] An additional 182 spectrographic analyses were done for prospectors and 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 71 such samples were examined.

Reports were issued on 28 samples. Sixteen of these were formation waters, 11 were petroleum samples, and one was a suspected oil seep.

Reports were issued on 48 samples of coal submitted by the Purchasing Commission for proximate analysis and calorific value. Two other coal samples were analysed for a citizen of the Province.

Reports were issued on 323 samples of a miscellaneous nature. Three hundred and eighty-two assays and 12 spectrographic analyses were reported in this category.

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

For the Minister of Health Services and Hospital Insurance, nine ore samples were assayed, and analysed spectrographically. For Public Health Engineering of the same department, a cylindrical filter from the Crystal Garden was examined and found to be plugged with a clay.

For the Materials Testing Branch of the Department of Highways, four water samples were analysed; one road de-icing salt was analysed; one ore sample was assayed, and analysed spectrographically. For Soils Design Engineering of the same department, an estimate of the sodium and calcium contents of three soil samples was made with the spectrograph.

For the Department of Lands, Forests, and Water Resources, Forest Service, two samples of old concrete were examined for the presence of chloride.

For the Outdoor Club of Victoria, an analysis was conducted on a sample of water from Goldstream Provincial Park.

For the Department of Agriculture, lime and magnesia were determined in a calcareous material, and the composition of a sample was determined by X-ray diffraction technique.

For the City of Victoria; Smoke Inspection, determination was made of the weight of residues collected in 295 bottles of water placed in various locations in the city to determine the extent of fly-ash fall-out over the city.

For a citizen of the Province, the salt content of a water sample was determined.

X-ray Powder Diffraction Analyses

Sixty-eight analyses of this type were performed for identification purposes.

Examinations for Assayers

The Provincial Government examination for certificates of efficiency was held in May and December. As a result of the May examination, 12 candidates passed and 1 was granted a supplemental. In the December examination, one candidate passed and two 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
S. Elias, Senior Inspector, Environmental Control.....Vancouver
H. Cameron, Inspector, Environmental Control.....Vancouver
A. R. C. James, Inspector and Resident Engineer.....Vancouver
W. C. Robinson, Inspector and Resident Engineer.....Vancouver
R. W. Lewis, Inspector and Resident Engineer.....Cranbrook

David Smith, Inspector and Resident Engineer.....Kamloops
T. M. Waterland, Inspector and Resident Engineer.....Kamloops
Harry Bapty, Inspector and Resident Engineer.....Prince Rupert
P. E. Olson, Inspector and Resident Engineer.....Nelson
W. G. Clarke, Inspector and Resident Engineer.....Prince George
W. H. Childress, Technician, Noise Surveys.....Vancouver

Inspectors are stationed at the places listed above and inspect coal mines, metal mines, and quarries in the districts shown on the accompanying Figure 1. They also may 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. Mine-rescue instructors are located at the mine-rescue stations in Fernie, Nanaimo, Kamloops, and Nelson.

Instructors, Mine-rescue Stations

Arthur Williams, Instructor, Mine Rescue and First Aid.....Fernie Station
T. H. Robertson, Instructor, Mine Rescue and First Aid.....Nanaimo Station
J. A. Thomson, Instructor, Mine Rescue and First Aid.....Kamloops Station
G. J. Lee, Instructor, Mine Rescue and First Aid.....Nelson Station

Staff Changes

R. W. Lewis joined the Department in June as Inspector and Resident Engineer in Cranbrook. H. Cameron also joined the staff in June, 1968, as Environmental Control Inspector in the Vancouver office. He terminated his services with the Department at the end of the year. In February, J. A. Thomson joined the staff as a mine-rescue and first-aid instructor at Kamloops, replacing T. H. Robertson who transferred to the Nanaimo office in March. In April, W. H. Childress, the former mine-rescue and first-aid instructor in Nanaimo, transferred to Environmental Control as a noise survey technician.

Board of Examiners

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.

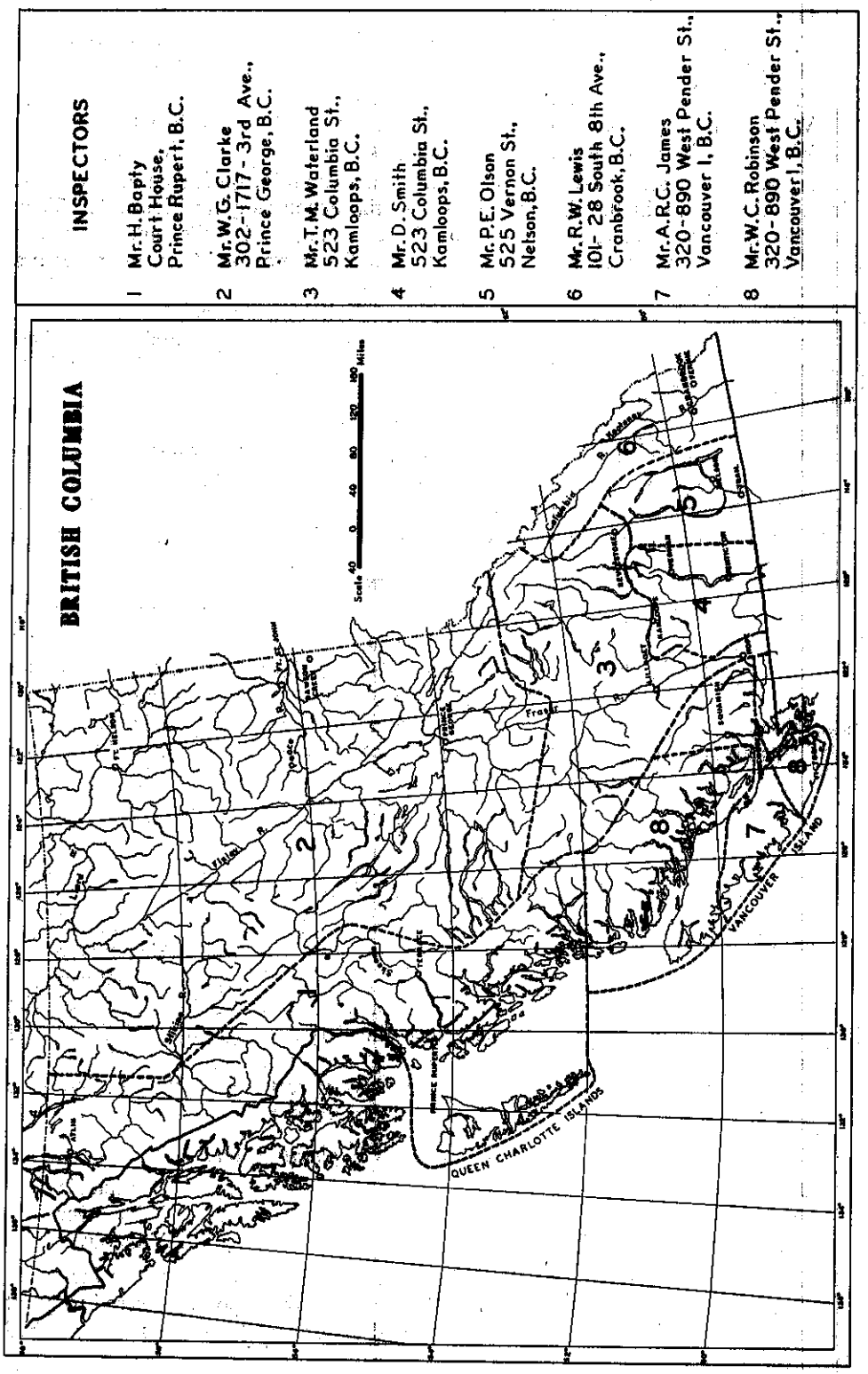


Figure 1. Index map showing inspectoral districts.

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-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
1968	31,224	47	234	402

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 if 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.

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

Sixty-five applications were received in 1968, and 47 grub-stakes were authorized. Three 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. Thirteen prospectors were given grants for the first time. Nine grantees proved to be unsatisfactory. A few grantees used aircraft for transportation to their prospecting areas.

D. H. Rae interviewed applicants in Vancouver and contacted 37 grantees in the field where he gave 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 from a base camp establised on the Tofino road 26 miles from Alberni. Minor amounts of magnetite were visible in iron-stained volcanic rocks. Outcrops of limestone and diorite occur in the same area on logging-roads close to the base camp. West of Kennedy River exposures of granodiorite and limestone were also prospected, and east of Kennedy River a large oxidized zone was reported associated with volcanic rocks, and limestone containing minor amounts of chalcopyrite was investigated. Further north, along the main road, outcrops of limestone and volcanic rocks continued. More work was done in this general area later on in the season.

A great deal of surface prospecting, trenching, and drilling of short diamond-drill holes was done along the north side of Sproat Lake between the 17 and 23 mile-posts on the Alberni–Tofino road. Copper mineralization occurs over a large area underlain by a variety of rock types. Some good copper assays were obtained from surface samples and from drill core. Exploratory work is continuing in this area.

In the Thunder Mountain area, copper and magnetite indications were investigated; and near Horseshoe Mountain volcanic rocks showing some sulphides were examined. Nothing of real interest was reported.

Some copper-bearing float was picked up in the Nitinat River valley; near Doobah Lake minor showings of chalcopyrite and magnetite were prospected; in the Francis Lake area considerable amounts of pyrite and minor amounts of chalcopyrite were observed in some rock outcrops. Some panning was done along Worthless Creek. Nothing of importance was reported.

Some prospecting was done in the Muchalat Inlet area near Gold River. No report was received on this work.

Atlin Mining Division.—In the Tootsee Lake area many outcrops of granodiorite and quartzite were reported, and minor occurrences of molybdenite and chalcopyrite were examined. A granite-limestone contact was prospected, and outcrops of argillite and monzonite were observed. No commercial values were obtained from the sampling done on outcroppings of limonite.

Prospecting was continued in the Squaw Creek-Rainy Hollow area. Limestone, argillite, and serpentine outcrops were reported, and several good copper assays were obtained from one mineral zone. In the Paddy Creek valley, limestone, granite showing some minor copper mineralization, volcanics, and volcanic ash were reported. More prospecting is warranted in this area.

Cariboo Mining Division.—Near Saxton Lake (northwest of Prince George), a narrow copper-bearing vein was found in volcanic rocks. Near Goat Mountain in the McBride area, outcrops of argillite, quartzite, and limestone were prospected. Some work was also done in the McGregor River valley. At the headwaters of Herrick Creek several gossans were prospected; small stringers of galena and chalcopyrite were investigated; and outcrops of conglomerate, shale, and quartzite were reported. Some inconclusive work was done on Otter Creek. On Woodall Creek, 12 miles north of Sinclair Mills, some fine gold was panned from the stream gravel, and minor chalcopyrite mineralization was found in altered limestone and schist.

Some prospecting was done west of Red Rock, on the west side of the Fraser River, and along the east side close to Red Rock. The following information was submitted: West of the Fraser River, in the Beaverdyke Creek area, red andesite, basalt, narrow pegmatite dykes showing some copper stain, granite, schist, and sandstone outcrops were reported. An effort was also made to locate a major fault shown on the geological map of the area, but heavy undergrowth and lack of rock outcrops interfered with the work. On the east side of the Fraser River, within a few miles north and south from Red Rock, the following data were submitted: Tabor Creek area—conglomerate; Cole Creek valley—quartz stringers in andesite;

Mouse Mountain—shale, diorite, and limestone; Stone Creek and Camp Lake areas—heavy overburden and swamp; Government Creek—granite with prominent muscovite and minor amounts of magnetite. Nothing of real importance was reported.

A base camp was established on Le Bourdais Lake and some prospecting was done in the adjacent area. The underlying rocks were mainly dark basic with some magnetite, and limestone containing minor sulphides. Some soil, silt, and water sampling was done but nothing of interest was reported. In the Maud Creek valley skarn and schist outcrops were seen, and soil sampling gave only minor reactions.

An attempt was made to run a small boat down the Dean River from near Anahim with the intention of doing some work along the river valley. This ended with a near loss of life.

From a base camp near the west end of Charlotte Lake, some prospecting was done on the north side of the lake extending westerly toward the Atnarko River. Much deep overburden was encountered, but outcrops of granite, mixed types of volcanic rocks, andesite, basalt, and greenstone were checked over. To the west the geology remained much the same with volcanic rocks predominant. No mineralization of interest was reported and only minor patches of green copper stain were seen.

Near Whitton Lake, just south of Charlotte Lake, a small amount of prospecting was done. Outcrops of granite, granodiorite, andesite, and some mixed basic rocks were reported. Nothing of interest was recorded.

Some work was done at Paput Creek, and along Willow River northeast of Quesnel. Argillite and narrow quartz stringers were observed.

Clinton Mining Division.—Some prospecting was completed 5 miles west of Clinton in an area underlain by quartzite, limestone, and greenish-coloured volcanics. Nothing of economic importance was found. A few miles farther west, on the east bank of the Fraser River, malachite stain was reported along a granite contact.

In the vicinity of Lone Butte, outcrops of basalt, greenish-coloured volcanics, granite, and granodiorite were examined.

Considerable work was done in the Maiden Creek valley where systematic soil and silt sampling failed to indicate anything of interest. This area appears to be underlain by a variety of rocks, including limestone containing stringers of calcite, some conglomerate and sandstone, and quartzite showing minor sulphides.

Starting along the Dog Creek road, 10 miles north of Clinton, and working west toward Meadow Lake, some stream sampling and geological mapping and checking of rock outcrops were carried on. Along the east side of the Fraser River from Churn Creek south to China Gulch, from China Gulch to Jesmond, and from Jesmond to Big Bar Lake road, preliminary prospecting, mapping, and soil sampling was done, and continued to Kelly Lake and southerly to Pavilion. The results of this work are not available.

Fort Steele Mining Division.—Some prospecting was done along the boundary of the Fort Steele-Nelson Mining Divisions, close to the 49th parallel. No information regarding this work was submitted.

Golden Mining Division.—One party prospected an area north of Findlay Creek between 50 degrees 20 minutes and 50 degrees 30 minutes north and 116 degrees 00 minutes and 116 degrees 25 minutes east, covering much of the Dutch and Ben Abel Creek valleys, and part of the area south of Toby Creek. Very little information was furnished regarding surface geology and related mineral occurrences. Six hundred soil samples and 60 mineral samples were taken, but the results of this work are not known. Some 90 additional mineral claims were staked in the area.

Another party did some prospecting in the Toby Creek valley about 4 miles west of Wilmer. The geology was reported to be complex; outcrops of dolomite, shale, and conglomerate were observed along with a reddish-coloured granite, greenstone, and iron-stained schist. Small gossans and minor amounts of sulphides were associated with some of these rocks. In the Mount Toby area, conglomerate and greenstone were recorded, and at Mount Farnham quartzite, greenstone, and some dolomite were reported. Nothing of economic interest was indicated.

Greenwood Mining Division.—South and east of Baldy Mountain, heavily fractured quartzite containing some massive iron pyrites was examined along with greywacke and limestone showing some barren-looking quartz veins. Sample assays were very low. In the Stanhope Creek area outcrops of gabbro and quartzite were observed. Upper Rock Creek valley showed pyritized limestone and some sepentine. A base camp was set up near Granby River, about 42 miles north of Grand Forks, and considerable field work was done within reach of this camp. Rock outcrops of syenite, granite, diorite, and gneiss were reported, and some scheelite was panned from stream gravel in Howe Creek. Near Bluejoint Mountain the underlying rocks are mainly granite and syenite. Nothing of economic interest was reported from any of this work.

Another party spent a short time about 20 miles north of Grand Forks in the Granby River valley; no information regarding this work was sent in.

Kamloops Mining Division.—A small amount of work was done 6 miles north of Barriere where the underlying rocks are mainly quartzite, limestone, and granite; minor pyrite and pyrrhotite mineralization was evident. Chlorite schist and iron-stained serpentine were also observed. Nothing of any particular interest was reported.

A great deal of work was completed along the valley of the North Thompson River southwest of Albreda. The following geological information was submitted: Montana Creek area—limestone, siltstone with vugs of iron pyrites, and some granite outcrops; on the south fork of Montana Creek—a limestone-granite contact showing some barren quartz stringers; in the Angus Horne Creek area—considerable folding, and some uninteresting contact zones and exposures of quartzite containing some garnet; Angus Horne Lake area—quartzite, garnetiferous schist, some pegmatite dykes, and limestone; between Mount Hogue and Angus Horne Lake and north of the lake, outcrops of diorite and crystalline limestone and several pegmatite dykes were carefully examined. The surface geology of the Angus Horne area is complex. Rocks outcropping at the headwaters of Knutson Creek are grey garnetiferous schist, some phyllite, green chert, and an amphibolite stock; between Knutson Creek and Angus Horne Creek lies an area underlain by quartzite and greyish-coloured schist. A shear zone was prospected near the headwaters of Myrtle River. Near Vimy Lakes, some sedimentary rocks are exposed along with schist, slate, pyritized skarn, and pyritized limestone. In the Lys Creek area a very considerable amount of faulting was observed, and outcrops of rusty schist and limestone were examined close to a granite contact zone. Along the Stormking Creek valley, grey schist was underlain by siltstone, and outcrops of limestone and marble were prospected. Near Vachon Creek, exposures of silicified Shuswap Formation, quartzite, schist, and some pegmatites were investigated. Nothing of economic interest was reported from the whole area.

In Highland Valley a group of 40 claims was staked covering an area underlain by granite showing some pyrite and epidote. No prospecting was done there.

Liard Mining Division.—A base camp was established on Cry Lake, and a considerable amount of prospecting was done in the area within 10 miles of the lake. Only very general geological information was submitted, with rock types mentioned

without specific data or exact location. The following rock exposures were noted: Limestone, diorite, granodiorite, greenstone, skarn; some quartz and calcite and coarse mica were associated with the various rocks mentioned. Nothing of importance was reported.

From a base camp on the Tanzilla River near the Cassiar road, a large area was prospected during the season, and the following information was submitted: Close to the camp the area is underlain by limestone containing quartz and calcite stringers. Six miles to the south and 2 miles west of the Cassiar road narrow quartz veins in volcanic rock show some galena and chalcopyrite mineralization; a short distance north of this, outcrops of serpentine were investigated. Close to Tanzilla Butte, outcrops of pyritized porphyry were prospected, and a short distance north of these, some short-fibre asbestos was found in an outcrop of serpentine; at Dalby Creek serpentine outcrops are common, and to the north volcanic breccia was noted. Eight miles south of the Tanzilla camp-site and 4 miles west of the road, pyritized outcrops of hornblende porphyry were prospected.

Along the east side of Dease Lake and on Dease Creek, numerous exposures of serpentine were examined; near the head of Dease Creek outcrops of pyritized schist and quartzite were observed. Short-fibre asbestos in serpentine was found in the Serpentine Creek valley. At Halfmoon Creek outcrops of pyritized greenstone were prospected. For a distance of 10 miles in the Hotel Creek valley, quartz and serpentine float are abundant. At Thenatlodi Mountain, exposures of argillite and volcanics were evident, and at Dome Mountain, much conglomerate and many volcanic rock exposures were seen. Heavy overburden encountered in the Little Eagle River, Goldpan Creek, and Castle Creek areas interfered with conventional prospecting.

Twenty miles west of Dease Lake, on the Telegraph Creek road, exposures of argillite were common.

Nothing of economic importance was reported by this prospecting party.

Very heavy undergrowth in the Sheslay-Inklin Rivers area necessitated a great deal of trail-cutting. Bad weather conditions throughout the season interfered with efficient prospecting. Exposed rocks encountered in this area included shale, siltstone, and conglomerate; no mineralization was reported. On the Nahlin Plateau, rock outcrops are mainly of various sedimentary types, a diorite-shale contact was prospected, some pyrite and marcasite mineralization was found along a fault zone, and a small amount of short-fibre asbestos was observed. North of Nahlin Plateau, the underlying rocks are diorite, limestone, and argillite. Some fine gold was panned from gravel in Kowatua Creek. In the Teditura Creek valley, some chalcopyrite and barite were found along a fault zone; outcrops of peridotite and serpentine were examined, and minor amounts of short-fibre asbestos were reported. Nothing of economic interest was found in the whole area.

Lillooet Mining Division.—Considerable prospecting was done in the Cayoosh Creek valley, a few miles from Seton Lake. The area is underlain by argillite and greenstone cut by a number of quartz porphyry dykes. All the exposed rocks show medium to heavy pyrite and pyrrhotite mineralization with minor amounts of chalcopyrite. Assays of samples taken indicated a medium to high gold content. This area merits further intensive prospecting.

Some work was done up Brett Creek, near Marshall Lake, where copper-bearing float was reportedly found.

Nanaimo Mining Division.—A great deal of prospecting was done at the north end of Buttle Lake. Unfortunately the information submitted gives nothing definite regarding exact locations or geological boundaries. The rocks encountered were breccia, basalt, dolomite, quartz containing some pyrite and chalcopyrite, greenish-

coloured volcanic rocks, and diorite. Fine gold was observed in narrow quartz stringers. Nothing of commercial interest was reported.

South of Kains Lake, about 10 miles west of Port Hardy, a base camp was established in a logging slash about 6 miles from the main access road. A great deal of work was done in the area within reach of the camp. Numerous logging-roads and a four-wheel-drive vehicle were useful assets. Carefully surveyed picket-lines were put in at regular intervals, and soil sampling and surface geology carried on along this grid pattern. Geochemical results and geology were incorporated on separate maps of the area. Geological work was made difficult by heavy overburden, many swamp areas, and few rock outcrops. A very wet season made the work more unpleasant. Some mineralization was encountered in a number of locations in the area, mainly pyrite, minor chalcopyrite, and native copper in volcanic rocks of certain flow types. A detailed report and both geochemical and geological maps of the ground covered during the season were submitted. Briefly, the area is underlain by several different types of volcanic rocks. Several major faults were located and mapped, and in superimposing the soil-sampling map onto the geological map it appears to be quite evident that there is a definite relationship between the fault zones and the soil-sampling highs. Two important anomalies are shown on the map, one of these extending for over 3,000 feet. Both of these anomalies merit further careful investigation. Several mineralized zones were also explored and these along with two other smaller anomalous areas deserve further attention. The maps and report covering this claim area were very thoroughly done.

Some work was done on the north side of Holberg Inlet on ground lying between the Inlet and the Bay (Island Copper) property. Earlier prospecting in the area reported the presence of finely disseminated chalcopyrite in Bonanza volcanics along with numerous small zones heavily mineralized with pyrite. Many exposures of Cretaceous conglomerates, containing thin layers of volcanics were examined, and found to contain disseminated pyrite and minor amounts of chalcopyrite. The ground lying between Clesklagh and Hushamu Creeks was investigated, but few rock outcrops were found. A number of claims were staked and soil sampling was done at 200-foot intervals along the location-lines. This area warrants further prospecting.

At Mount Arrowsmith, mineralized outcrops, showing some malachite and azurite and minor amounts of bornite, were prospected. Some inconclusive work was also done in the Franklin River valley.

South of Quinsam Lake, outcrops of limestone were reported, and in the Iron River area the underlying rocks were mainly andesite, tuff, and rhyolite. One mineralized zone containing a considerable amount of pyrrhotite and pyrite was examined.

In the Quinsam River area, logging-roads have exposed a contact zone between pinkish feldspar granite and rhyolite. Along the contact the granite shows some specks of molybdenite and chalcopyrite. Heavy overburden was encountered at the divide at the headwaters of Quinsam River where a brecciated zone shows some copper mineralization, and close to a limestone-granite contact, narrow quartz veins contained minor amounts of galena.

Nelson Mining Division.—Some prospecting was done near Kloosh Creek, but no information is available. In the Laib Creek valley, a heavily oxidized zone was prospected, and some minor sulphide mineralization was reported; the underlying rocks are granite. Eight miles up Cultus Creek from Tye, some surface work was done on a mineralized zone showing some copper carbonate. In the Midge Creek valley, about 11 miles up from Kootenay Lake, an oxidized mineral zone was investigated; sample assays were non-commercial.

In the Shaw Creek area, within 6 miles of Kootenay Lake, exposures of granite cut by pegmatite and aplite dykes were reported. On Steeple Mountain, outcrops of quartzite and impure limestone were examined. Nothing of particular interest was reported.

Along the Boundary Creek valley, exposures of granite and schist were common, and some float containing galena and iron pyrite was picked up. Seven miles east of Boundary Lake, schist and gneiss, showing minor amounts of molybdenite, were prospected. In the upper Priest River valley, crystalline limestone, slate, and conglomerate outcrops occurred, and some trenching was done on an oxidized zone showing minor amounts of pyrite and galena. Nothing of commercial importance was reported.

In the Ymir Creek area, a granite-argillite contact was prospected. One narrow stringer giving high assays in gold and silver was reported.

New Westminster Mining Division.—About 6 miles northeast of Agassiz, some prospecting was done in a logged-off area. The exposed rocks were mainly limestone and quartzite containing some calcite stringers. Some minor chalcopyrite, molybdenite, and sphalerite mineralization was reported; no samples were taken.

Seven miles north of Yale, access to the Sawmill Creek valley, from the main Fraser Canyon highway, was made possible by logging-roads. The rock exposures in the area were mainly granite, granodiorite, quartz diorite, and gabbro. Minor amounts of pyrite are associated with these rocks. Some magnetite float was picked up. Nothing of particular interest was reported.

A few days were spent in the Chilliwack River valley where some high-grade galena float was found along a logging-road. The source of the float was not found.

Omineca Mining Division.—Some prospecting was done south of Fort Fraser. In the Hallett Lake area, andesite, pyritized granite, and limestone outcrops were seen. Some pyritized quartz stringers were examined. Granite outcrops were common at the south end of Hallett Lake, and along the northerly side pyritized granite was prospected. Granite exposures were also common at both Triangle and Rognaas Lakes. At Bentzi Lake, a barren quartz vein was found close to a contact between granite and volcanic rocks.

Near Eutsuk Lake, on Chikamin Mountain, some prospecting was done on a gossan mineralized with minor amounts of bornite and magnetite; and on Maroon Island in Eutsuk Lake, another gossan was investigated. At Musclow Lake, south of the west end of Eutsuk Lake, some prospecting was done, but nothing of interest was reported. Some work was also done in the vicinity of Whitesail Lake. In the Coles Creek valley, heavily pyritized granite showing traces of bornite was prospected, and at Coles Lake, exposures of granite and granodiorite contain small stringers of quartz showing traces of molybdenite, some work was done on these and on several nearby gossans containing massive pyrite. At Kenney Lake, traces of molybdenite were found in quartz stringers, and in the Lindquist Lake area, traces of both molybdenite and scheelite were reportedly found in granite. East of Troitsa Peak, granite outcrops are common.

Some work was done in the Tahtsa Lake area. South of Tahtsa Range, patches of malachite were investigated. North of Tahtsa Lake, in the Mosquito Hills, some prospecting was done where schist outcrops show some pyrite, chalcopyrite, and malachite mineralization. On the Whitesail Range side of Tahtsa Lake, exposures of porphyry were examined, and along Tahtsa Lake, west of Swing Peak, several small gossans were reported in an area underlain by basalt. At Kasalka Creek, exposures of brecciated rhyolite were examined. In the Rhine Creek valley, pyritized quartz stringers occur in shale.

At the west end of Ootsa Lake, in the Shelford Hills, outcrops of basalt with barren quartz stringers, green andesite, granite, and diorite were found. Near

Hill-Tout Lake several gossans were investigated; in the Snake Lake area the surface geology was reported to be complex; some pyrite, pyrrhotite, and chalcopyrite mineralization was prospected. Nothing of commercial interest was reported. Near the northwest end of Francois Lake the exposed rocks were found to be mainly basalt, volcanic breccia, and pinkish coloured rhyolite. In the Nadina River valley a contact zone was examined where the underlying rocks were granodiorite, basalt, and banded limestone; at Gale Lake, basalt and rhyolite containing some hematite received some attention; south of Francois Lake, in the Isaac Lake area, pyritized quartz stringers in gabbro were prospected. Some prospecting was also done in the Topley area; fine galena and some bornite and chalcopyrite were found in volcanic rocks. No discovery of importance was reported from this prospecting group.

A short distance east of Usk, some work was done on copper showings in quartzite and limestone.

In the Lamprey Lake area, 50 miles southwest of Houston, some geophysical prospecting was done with fairly good results. In the Ailport Creek valley, low copper values were found in soil samples; copper-stained barite float was picked up; and coarse-grained granite showed green copper stain and fine disseminations of molybdenite and pyrite.

A well-equipped base camp was established near the east end of Chuchi Lake, on the north side, and a large area in reach of there was thoroughly prospected. Soil and silt samples were carefully taken and were analysed at the base camp. Surface geology was also tied in to the grid lines, and all this information was incorporated on a map. Several anomalous areas were found, and a number of interesting surface showings were investigated. The following general information was furnished: On the north side of Chuchi Lake, exposures of fragmental volcanics and fine-grained basalt containing minor amounts of pyrite were mapped; some copper-bearing float was picked up; and a lightly mineralized carbonate zone, with finely disseminated chalcopyrite in granite was investigated. At the east end of the lake, unaltered fragmental basalt is common, and some galena-sphalerite mineralization was prospected. On the south side of Chuchi Lake near the east end, a considerable amount of silt sampling was done; various types of volcanic rocks with finely disseminated pyrite and some barren-looking tuffaceous material were noted; and a basic dyke containing minor sulphides was prospected. A strong mineral zone near Witch Lake received considerable attention. Considerable work was done from the western end of Tchentlo Lake toward Nation Mountain. In this area, Cache Creek and Takla volcanics are common, and in places contain veinlets of epidote carrying low values in copper; both magnetite and copper sulphides are visible with a hand lens, in some places these occurrences are quite spectacular. Exposures of syenite and diorite, showing patches of lead, zinc, and copper mineralization were also found. Near the Nation River bridge, altered pyritized volcanics are common. In the neighbourhood of Mount Milligan, outcrops were rare. At Gidegingla Lake, and near Rainbow Creek, barren-looking volcanics, banded tuff, and volcanic breccia were reported.

Another party of three men spent a short time north of the centre of Tchentlo Lake, where a fairly promising mineral zone (molybdenite and chalcopyrite) is associated with diorite. This may turn out to be a large low-grade deposit. It has both good width and length.

Some work was done along the Gaffney fault, south of Manson Creek, where mineralized quartz veins were investigated.

Some work was done in the Wolverine Range, looking for a reported mineralized fault zone; no exact information has been submitted.

Geology in the Ospika River valley is reported to be complex. The following information was submitted: Outcrops of limestone containing minor amounts of gypsum and quartzite showing patches of galena were prospected. Exposures of schist and slate were also examined.

In the Ingenika River area, on the east side of Jensen Peak, several oxidized zones were prospected, and float showing both chalcopyrite and molybdenite was picked up. At the north end of Jensen Peak, large exposures of granite were common. At the east end of McConnell Range, the underlying rocks are mainly granite and greenstone. Near Dewar Peak and close to Moosevale Creek, both jasper and pyritized greenstone float were picked up. Some work was done near Fredrikson Peak, and in Fredrikson Creek valley quartz float containing chalcopyrite and galena was picked up, but the source of this float was not found. Some work was done between the McConnell Range and Fredrikson Peak. Near Serrated Peak, much overburden was encountered, but several oxidized zones were located, and some pyritized float was picked up. The valley below Jensen Peak produced some copper-bearing float, and along Fredrikson Lake numerous granite outcrops were examined. Nothing of particular interest was reported in this area.

Revelstoke Mining Division.—Some prospecting was done within a radius of 10 miles of the town of Revelstoke. Unfortunately no information is available, although some interesting mineral samples were seen.

Slocan Mining Division.—Some work was done between the Monashee Pass and Edgewood. A considerable amount of trenching had been done on a mineral zone in which pyrrhotite was the only visible sulphide. Samples taken assayed *nil*. No further details of the work done in this area have been submitted.

Near Sandon, an old tunnel was cleaned out and sampled where a porphyry dyke lies close to a granite-argillite contact. Some minor mineralization of galena was reported, but assay values were low.

From a base camp near the old town of Howser, some work was done in the Duncan Lake area. Along both east and west shores of the lake, barren quartz veins in mica schist are common. Outcrops of limestone, dolomite, and phyllite were examined near the old Duncan mine. The Gallop Creek valley showed exposures of mica schist and quartzite. In Hamling Creek area, outcrops of schist and marble were observed. On Howser Ridge, more barren quartz veins were found in mica schist.

In the Seaton Creek area, slate and schist outcrops were examined, and some galena float was picked up. Slate outcrops were also seen in both Carpenter and Cody Creek valleys, and near Kane Creek, which is the north fork of Carpenter Creek. Some work was done in Woodbury Creek area where outcrops of schist (ornamental) were examined. Nothing of interest was reported.

Prospecting was continued on the east side of Kootenay Lake, across from Kaslo. A base camp near Verandah Point was used as headquarters. The valleys of Murphy, Loki, and Campbell Creeks show many exposures of limestone. In the upper Campbell Creek area, beyond the old Leviathin property, a considerable amount of mica schist was observed, and some black sand was panned from the gravel of the creeks in the area. Close to Fry Creek, fault zones, pegmatite dykes, schist, and impure dark-limestone outcrops were reported. On the west side of the lake, near Schroeder Creek, veins of barren quartz were examined, and rusty altered outcrops of greenstone were prospected in the Emerald Creek area. Some inconclusive work was done on Blue Ridge, and in the Ten Mile Creek area. Nothing of importance was reported from this whole area, although some good assays were obtained from float specimens that were picked up.

Trail Creek Mining Division.—In the Mount Malde area, some galena float was picked up, but no other information was furnished.

Vancouver Mining Division.—Some prospecting was done in the Ashlu Creek valley, where minor amounts of chalcopyrite were observed in granite float. Outcrops of limestone, quartzite, and serpentine were examined, and some work was done on a shear zone containing pyritized quartz stringers. Nothing of importance was reported.

A small amount of work was done near Alice Lake, where the rocks exposed are all volcanics.

One party spent several weeks in the Soo River valley, but no information was sent in.

Two miles south of Woodfibre, a mineralized zone was traced for some distance along the coastline.

Close to Sunset Beach, four mineral claims were staked where pink feldspar granite shows some finely disseminated sulphides.

Vernon Mining Division.—Near Bessette Creek, good silver assays were reported from a granite plug, close to an argillite-limestone contact. A short distance south of this, slate overlies sericite schist, and more good silver assays were reported. In the Rawlings Lake area, heavy faulting in an area underlain by sericite schist and slate showed some pyrite mineralization.

Victoria Mining Division.—The upper Hemmingsen Creek area is heavily covered with undergrowth. Some prospecting was done along the edge of an exposure of granite. Some claims were staked on an outcrop of sheared granodiorite where interesting assays in copper and molybdenum had been obtained. Some work was done near Mount Todd and in the Clapp Creek area, where exposures of metamorphic rocks and hornblendite containing pyritized quartz stringers were investigated.

Some work was done in the Cowichan Lake-Cowichan River area. Near Stanley Creek, outcrops of argillite and pyritized quartzite were observed; at Oliver Creek, shale, sandstone, conglomerate granodiorite, and quartz-diorite exposures were examined; close to Cowichan Lake, outcrops of shale, cherty tuff, and dark-coloured limestone were reported; and at Rheinhart Creek, greenish tuff exposures are common. Nothing of particular importance was reported.

In the Chemainus River area, another party reported picking up float containing chalcopyrite, and other pieces of rock showing jasper and hematite. Nothing *in situ* was reported.

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 1968/69 fiscal year were as follows:—

	Miles	Cost
Roads—		
Construction	173.2	$216,222.75
Maintenance	240.0	85,327.44
Trails—		
Construction	19.0	4,000.00
Bridges—		
Construction		28,050.00
Maintenance		1,274.24
Total		$334,874.43

In addition to the above, work was continued on the Stewart–Cassiar road. Construction of this road was initially financed under the "Roads to Resources" agreement between the Governments of Canada and British Columbia. The Federal Government's contribution of $7,500,000 for the construction of this road was expended toward the end of September, 1967. Since then the whole cost has been borne by the Provincial Government.

Construction is done by contract, and is supervised by the Department of Highways on behalf of the Department of Mines and Petroleum Resources. There were two major contracts in progress during 1968, Projects Nos. 1391 and 1702. Further road construction was done under Project No. 1391, covering the 29.08-mile section between Burrage River and Ningunsaw River, contract for which was awarded to Ben Ginter Construction Company in November, 1965, and started the following year. The project was 55 per cent completed by the end of 1968. The contract for Project No. 1702 was awarded to Peter Kiewit Sons Company of Canada Ltd. in the sum of $2,673,160 on March 29, 1968, and started the following month. It includes construction of 38.10 miles of road between South and North Bell-Irving Crossings, and clearing and grubbing 23.73 miles of right-of-way between the North Bell-Irving Crossing and Ningunsaw River. The project was 48 per cent completed when operations were suspended for the winter at the end of October, 1968. There was no major bridge construction, but four small bridges were built under Project No. 1702.

MINERALOGICAL BRANCH

The function of the Mineralogical Branch is to assist in the development and use of the Province's mineral resources by making a variety of geological studies, publishing data concerning mineral occurrence and their potential, by collecting and storing geological and statistical data and making it available to the public, and by recording the activities of the industry. The Branch is capable of supplying general geological information as well as specific information regarding mineral deposits and the mineral industry. It provides rock and mineral identification of specimens submitted by prospectors and others, contributes lectures in courses on prospecting, participates in scientific discussions, and arranges educational exhibits.

Field work by officers of the Mineralogical Branch includes areal geological mapping, detailed geological examinations of mineral deposits and mining camps, examination of properties of current exploration 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.

STAFF

On December 31, 1968, 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	Geologist
D. B. Craig	Geologist
G. E. P. Eastwood	Geologist
James T. Fyles	Geologist
E. W. Grove	Geologist
R. V. Kirkham	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

D. B. Craig, geologist, a graduate of the University of British Columbia and a Ph.D. from the University of Wisconsin, joined the staff on September 9, 1968.

FIELD WORK, 1968 SEASON

J. M. Carr completed the work of property examinations in the Highland Valley. This ended a phase of geological investigation carried out with some interruptions since 1957. Some weeks were spent elsewhere in property examinations, particularly in the area of the Brenda mine.

N. C. Carter, with one assistant, for a short time continued genetic studies of mineralization begun in 1967 in the general Babine Lake-Smithers region and at Alice Arm. Most of the season was spent in systematically remapping the mineralized area north of Alice Arm, a continuation of work done previously in the molybdenum-producing area to the south.

James T. Fyles, with an assistant part of the time, mapped the molybdenum-producing area at Rossland and extended this work in revision of existing mapping. He completed studies of lead-zinc mineralization and geological structure west and south of Revelstoke and mapped an extensive zinc deposit west of the Columbia River, 65 miles north of Revelstoke.

E. W. Grove, with two assistants, mapped an area extending from Portland Canal to Hastings Arm. This included the copper deposit and smelter site at Anyox, and several mineral deposits elsewhere. This is an area where there have been several attempts at revival of mining in past years, and there is considerable current interest. The nature of the work required a seaworthy boat and helicopter assistance.

Stuart S. Holland examined a mining property near the Yukon border and another south of the Alaska Highway. He also visited sites of activity in the collection and processing of jade.

R. V. Kirkham paid a brief visit to Hudson Bay Mountain and to several molybdenum, copper, and silver properties near Smithers. This was in final completion of work for a forthcoming bulletin.

J. W. McCammon, with a part-time assistant, studied limestone deposits in various parts of the Province, gypsum in the East Kootenay, and various non-metallic deposits generally. This work was part of the continuous assessment of available industrial minerals and rock products.

N. D. McKechnie and G. E. P. Eastwood made property examinations in the southern Interior of the Province.

K. E. Northcote, with one assistant, began a study of the geology and mineralization in the neighbourhood of Port Hardy. This is a region in which copper has long been known to exist, but only recently had the major copper-molybdenum orebody Island Copper (Bay) of Utah Construction & Mining Co. been found. A few days were spent in visiting the area of 1968 exploration in the Groundhog Coal Basin between the Bell-Irving and upper Nass Rivers. Two weeks in October were spent visiting the several sites of coal investigation on the upper Elk River and in the Flathead Valley.

V. A. G. Preto completed a study of copper mineralization near Kamloops and began a detailed investigation of the important copper deposits on both sides of the Similkameen River at Copper Mountain. The area includes the Ingerbelle property and the former Copper Mountain mine both owned by Newmont Mining Corporation of Canada Limited. This is a very old camp with an impressive production record and an important potential.

A. Sutherland Brown made property examinations and visited mineralized areas in various parts of the Province in connection with an extensive study of the copper and molybdenum deposits of the Province. This will lead to publication of known data and is intended to serve as a guide to future exploration.

A total of six field assistants was employed on the various field projects undertaken in 1968.

Publications

In 1968, in addition to technical material published in the Annual Report of the Minister of Mines and Petroleum Resources, the Mineralogical Branch published Bulletin No. 54, "Geology of the Queen Charlotte Islands," by A. Sutherland Brown, and Bulletin No. 55, "Geology of the Kennedy Lake Area," by G. E. P. Eastwood.

Copies of six Mineral Inventory maps covering the Queen Charlotte Islands and the greater part of Vancouver Island and xerox copies of the relevant Mineral Inventory cards were also made available. Details of this material may be requested from the Chief of the Mineralogical Branch, Department of Mines and Petroleum Resources, Douglas Building, Victoria.

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.

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 Rosources, continued in 1968. The contractor, Lockwood Survey Corporation Ltd., operating from the airfield at Smithers, was plagued with bad

weather which delayed the completion of their three-year contract in central British Columbia.

Summary of aeromagnetic maps released is as follows:—

Release Date	Number	Scale	Location	When Flown
May 21, 1968	17	1 mile=1 inch	South central British Columbia	1966
Sept. 25, 1968	18	1 mile=1 inch	South central British Columbia	1966
April 8, 1969	15	1 mile=1 inch	Central British Columbia	1967
April 8, 1969	2	4 miles=1 inch	South central British Columbia	1966
May 6, 1969	18	1 mile=1 inch	Central British Columbia	1967
May 6, 1969	7	4 miles=1 inch	South central British Columbia	1966

The maps as well as index maps showing the coverage by aeromagnetic mapping in British Columbia may be obtained from the British Columbia Department of Mines and Petroleum Resources, Room 411, Douglas Building, Victoria, or the Geological Survey of Canada, 100 West Pender Street, Vancouver 3.

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 former provides 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 regulation concerning gas-oil ratio factors, production allowables, and overproduction and underproduction provides 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 the provision of 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 located 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 annually, at the end of December. Crown-owned oil and natural-gas rights are evaluated prior to being disposed of by public tender.

The Petroleum and Natural Gas Branch for administrative purposes is subdivided into three sections as follows: Development Engineering, W. L. Ingram; Reservoir Engineering, A. J. Dingley; and Geology, S. S. Cosburn.

The field office at Charlie Lake, which includes the core and sample laboratory, is supervised by the District Engineer, D. L. Johnson.

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
A. J. Dingley	Senior Reservoir Engineer
B. T. Barber	Reservoir Engineer
P. S. Attariwala	Reservoir Engineer
P. K. Huus	Reservoir Technician
S. S. Cosburn	Senior Petroleum Geologist
J. E. Hughes	Petroleum Geologist
D. L. Griffin	Petroleum Geologist
A. S. Nemeth	Petroleum Geologist
T. B. Ramsay	Petroleum Geologist

Field Office, Charlie Lake

D. L. Johnson	District Engineer
G. E. Blue (until April 11th)	District Engineer
D. A. Selby	Field Technician
G. T. Mohler	Field Technician
W. B. Holland	Field Technician
L. A. Gingras	Field Technician

Staff Changes

D. L. Johnson was transferred on March 4th to the Reservoir Engineering Section in Victoria and, following the resignation of G. E. Blue, was transferred back to Charlie Lake on April 12th to assume the duties of district engineer.

A. J. Dingley, reservoir engineer, joined the staff on March 7th.
G. E. Blue, district engineer, resigned, effective April 11th.
B. T. Barber, reservoir engineer, joined the staff on August 1st.
T. B. Ramsay, petroleum geologist, joined the staff on August 19th.
P. S. Attariwala, reservoir engineer, joined the staff on August 26th.

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 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 June 18th at which two applications involving six different owners carried over from 1967 were heard and subsequently settled by Board awards.

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 originally 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 1968.

PUBLICATIONS

Annual Reports of the Minister of Mines and Petroleum Resources, bulletins, and other publications of the Department, with prices charged for them, are enumerated in the List of Publications of the Department of Mines and Petroleum Resources. This list is available free on request to the Chief of the Mineralogical Branch or Chief of the Petroleum and Natural Gas Branch.

Publications that are in print may be obtained from the Department of Mines and Petroleum Resources, Douglas Building, Victoria, and from the Geological Survey of Canada, 100 West Pender Street, Vancouver. Current publications may also be obtained from the Gold Commissioner's Office, Room 320, 890 West Pender Street, Vancouver.

Publications are available for reference use in the Departmental library, Room 430, Douglas Building, Victoria, in the reading-room of the Geological Survey of Canada, 100 West Pender Street, Vancouver, in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in some public libraries.

LODE METALS

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GENERAL REVIEW OF METAL MINING AND EXPLORATION

By Stuart S. Holland

Production.—Metal production in British Columbia in 1968 set a new record with a value of $251,252,418, a gain of $15.4 million or 6.5 per cent. This is the third consecutive year in which a new production record has been established. The increase in value over that of the previous year's production was very largely due to major increases in the value of silver and zinc, accompanied by increases in lead, mercury, molybdenum, cadmium, and iron and despite decreases in copper, nickel, and gold.

The quantity of gold decreased slightly from the previous year's production. The loss was largely the result of smaller gold production at the Granisle, Old Sport, and Phoenix mines and despite increased production at the Bralorne, Horn Silver, and Lynx mines. In 1968, 54.2 per cent of gold production came from base-metal mines, compared with 53.5 per cent in 1967.

Silver production increased significantly, reflecting increased production at the Lynx and Horn Silver mines. Value of production was proportionately higher because of the increase in average silver price from $1.67 in 1967 to $2.31 in 1968.

Copper production decreased, being down 6.8 per cent in quantity, but only about 1 per cent in value because of the increase in average copper price from 50.02 cents in 1967 to 54.22 cents in 1968. The decrease was the result of smaller production at Craigmont mine, resulting from a lower grade of ore being treated during the change-over from open-pit to underground mining.

Significantly increased copper production is assured, but the record quantity of 1967 will not be exceeded until Granduc and Brenda mines attain production in late 1969 or 1970. Further increased production will ensue from Island Copper (Bay) (projected for production in 1971), from Britannia because of increased production from its new orebody expected to be in production in 1971, and from Lornex (projected for production in 1972). When these presently projected mines are in operation, the total milling capacity of all copper mines should be not less than 130,000 tons per day.

Production of lead and zinc, which is dominated by the Sullivan, Bluebell, Jersey, and Reeves MacDonald mines, increased for the first time since 1962, the Sullivan, Jersey, and Lynx mines accounting for most of the increase.

The production of iron concentrates declined slightly in quantity but increased fractionally in value. The closure of the Merry Widow and declines at most of the other mines were offset by very largely increased production at Tasu mine, which rose from 226,408 tons in 1967 to 617,956 tons in 1968. Further over-all decline in iron production in 1969 is expected with the closure of Brynnor Mines Limited (Kennedy Lake Division), and Jedway Iron Ore Limited in 1968, and the anticipated closure of Zeballos Iron Mines Limited in 1969.

The production of molybdenum increased by 13 per cent, reflecting a full year's production by British Columbia Molybdenum Limited and increased daily milling capacity at Endako Mines Ltd. At Endako, despite a 3½-month work stoppage through strike action, the average daily throughput was increased to 25,900 tons, and the company was able to maintain its annual production only slightly below that of 1967.

Increased molybdenum production is anticipated in 1969 because of further increased daily capacity at the Endako mine.

In August, 1968, Cominco Ltd. reopened the Pinchi Lake mercury mine at a rated capacity of 800 tons per day, and mercury production attained a significant amount for the first time since the closure of the mine in 1944.

Mining and Concentrating.—Metal production in 1968 was contained in 28,427,869 tons of ore mined at 60 mines. Of these, 8 produced more than 1 million tons each, 17 produced between 100,000 and 1 million tons, and 9 produced between 1,000 and 100,000 tons.

Ore produced from 11 open-pit mines totalled more than 19 million tons. The two largest mines in the Province—Endako at 6,597,000 tons and Bethlehem at 5,095,759 tons—are open-pit operations. The largest underground mines are the Sullivan at 2,523,024 tons and Craigmont at 1,764,230 tons.

In 1968, 33 concentrators were in operation: 10 treated silver-lead-zinc ore, 6 treated copper ore, 2 treated copper-iron ore, 2 treated copper-zinc ore, 1 treated nickel-copper ore, 3 treated iron ore, 4 treated molybdenum ore, 2 treated gold-silver ore, 1 treated mercury ore, and 2 treated copper ore by bacterial leaching.

In 1968 a new mill was completed to treat mercury ore at the Pinchi Lake mine of Cominco Ltd., and mills were under construction at the Granduc mine (copper ore) and at the Brenda mine (copper-molybdenum ore).

Milling capacity at Bethlehem mine was increased to 14,000 tons a day, and the rates of milling at Granisle and Endako mines were gradually increased almost to 7,000 and 26,000 tons per day respectively.

During the year, mining and milling operations were terminated by Cerna Mines Ltd. and Jedway Iron Ore Limited and milling operations were terminated at Brynnor Mines Limited (Kennedy Lake Division).

Smelting.—The Trail smelter, owned and operated by Cominco Ltd., is the only smelter in operation in the Province. It received 132,550 tons of lead concentrates and 160,957 tons of zinc concentrates from its two operating mines (Sullivan and Bluebell) in British Columbia. It treated on a custom basis 2,532 tons of lead concentrates, 753 tons of zinc concentrates, 17,006 tons of crude ore, and 4,444 tons of gold-silver concentrates from 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, 14,753 tons; lead concentrates, 14,021 tons; and zinc concentrates, 83,801 tons. The value of these products was $21,818,831, an increase from 1967, and was about 8.7 per cent of the value of the 1968 metal production of the Province.

Products exported to Japanese smelters were: Copper concentrates, 262,065 tons; nickel-copper concentrates, 18,200 tons; zinc concentrates, 21,267 tons; and iron concentrates, 2,094,745 tons. The value of these concentrates was $111,443,750, a decrease of $628,009 from 1967 and was about 44.4 per cent of the value of the 1968 metal production of the Province.

Development.—Pre-production development including overburden and waste-rock stripping in preparation for open-pit mining, construction of a concentrator of 24,000 tons daily capacity, and provision of power, transportation, and other facilities were undertaken at Brenda mine in preparation for the mine's coming into production in the autumn of 1969.

Development at Granduc continues. The Leduc camp was occupied for most of the year, and a considerable amount of underground work was done. The Tide Lake camp was occupied all year. The tunnel was advanced 19,447 feet, in the course of which several tunnelling records were established, and on December 8,

1968, broke through to the tunnel driven from the Leduc side. Powerhouse and concentrator buildings were constructed and other installations were made in preparation for initial production, which it is expected will begin in 1970.

Development at Pinchi Lake mercury mine culminated in the mine's reopening in August at 800 tons per day rated capacity after 25 years of inactivity since its earlier operation.

Statistical returns from mining companies indicate that in 1968, $69 million was spent by Brenda Mines Ltd., Granduc Mines, Limited, Cominco Ltd., Endako Mines Ltd., Bethlehem Copper Corporation Ltd., and other companies in preproduction mine development and preparation, and in additions to existing plant capacities.

Prospecting and Exploration.—The number of mineral claims recorded in 1968 was 60,384, 17.8 per cent greater than in 1967 but still very much below the record number of 91,703 recorded in 1966. There were increases in claims recorded in most mining divisions, the notable exceptions being Omineca, Skeena, Golden, Greenwood, and several other mining divisions where there was slightly less staking activity than in 1967. In contrast there was significantly increased activity in Liard, Nanaimo, and Kamloops, in addition to minor gains in the other divisions. The areas of greatest prospecting activity as indicated by numbers of recorded claims are in the Cariboo, Fort Steele, Kamloops, Liard, Nanaimo, Nicola, and Omineca mining divisions.

Certificates of work which give a measure of the amount of exploration work currently being done showed a slight decrease in the number issued, from 68,910 in 1967 to 66,229 in 1968.

The number of free miners' certificates issued to individuals increased from 8,780 in 1967 to 9,305 in 1968 and to companies from 717 in 1967 to 761 in 1968. The number of free miners' certificates issued to companies even exceeded those issued in 1966, the previous record year, and is a further indication of the increasing amount of company-financed exploration.

In order to obtain information about mining exploration in the Province and to provide statistics useful to the industry, the Department since 1964 has mailed a questionnaire to mining exploration companies. By this means and with the co-operation of the industry, it is possible to provide a useful and reasonably good record of activities.

In 1968 Departmental forms were sent out to 1,387 companies registered in the Province. Replies received from 709 companies indicated that 289 were actively engaged in exploration in British Columbia and that 420 were inactive. Co-operation of companies in providing information should be greatly appreciated by all members of the industry.

Statistical returns received from mining companies indicate that about $35 million was spent in exploration at 429 properties and in actual prospecting.

Properties on which major exploration programmes were being undertaken were the Valley Copper and Bethlehem copper deposits in Highland Valley, the Island Copper (Bay) copper-molybdenum deposit at Rupert Inlet, the Ingerbelle and Copper Mountain copper deposits at Princeton, and the Churchill Copper copper deposit on Delano Creek in the northern Rocky Mountains.

At the Lornex property in Highland Valley the results of a large amount of exploration work were being studied and a feasibility study was being made to evaluate the productive capabilities of the property.

In 1968 more than 10,000 feet of diamond drilling and (or) percussion drilling was done at each of the following properties: Catface; Jim and Nord; Val-

ley Copper; Bethlehem; Kimberley; Makaoo; O.K. (Alwin); Lornex; Liard Copper; Churchill Copper; June and Stikine; Island Copper (Bay); Newman; Morrison (Ellen); Bear (Laura); Ingerbelle and Copper Mountain.

Information provided to the Department by exploration companies regarding work done by them on 429 properties is summarized in Table 13. Of the 429 properties enumerated, geological mapping was done at 187, geophysical surveys at 160, and geochemical surveys at 159; this work in most instances was preparatory to surface work being done at 175 and drilling of one sort or another being done at 179. An indication of the modern trend of exploration is the fact that underground exploration work was done on only 7.5 per cent of the properties.

In 1968 more exploration drilling was done than in any previous year, amounting to 691,582 feet of surface diamond drilling, 103,858 feet of underground diamond drilling, and 200,903 feet of percussion drilling.

The exploration companies also reported that a total of not less than 11,800 man-months were expended on exploration in the field by company and contractor employees.

TABLE 13.—SUMMARY OF EXPLORATION INFORMATION

Mining Division	Number of Properties	Type of Work Done								Employment	
		Geological Mapping	Geophysical Surveys	Geochemical Surveys	Surface Work	Underground Work	Drilling: Surface Diamond Drilling (Ft.)	Drilling: Underground Diamond Drilling (Ft.)	Drilling: Percussion Drilling (Ft.)	Company Employees (Man-months)	Contractor Employees (Man-months)
Alberni	13	5	3	6	7	—	23,058	5,503	—	112	133
Cariboo	9	6	8	5	4	—	13,730	—	6,870	120	66
Clinton	12	7	5	7	4	—	755	—	—	83	29
Fort Steele	8	5	3	1	6	1	21,647	1,018	642	249	233
Golden	9	2	2	1	8	—	7,350	—	—	42	111
Greenwood	16	5	7	6	6	1	9,294	1,420	600	173	61
Kamloops	65	21	32	19	24	3	87,976	28,717	78,431	571	859
Liard	28	19	16	6	15	2	63,357	17,488	—	546	581
Lillooet	7	2	1	1	2	—	105	1,295	—	42	24
Nanaimo	37	21	8	23	9	3	109,212	—	3,360	904	1,109
Nelson	12	6	4	4	4	1	15,305	500	—	126	148
New Westminster	8	2	2	2	2	2	2,090	—	—	108	23
Nicola	21	4	9	6	7	1	6,594	—	—	223	146
Omineca	101	53	40	48	38	3	94,226	10,659	776	1,089	649
Osoyoos	13	4	4	4	6	1	3,359	—	4,615	55	46
Revelstoke	4	2	—	1	2	2	1,000	3,500	—	69	472
Similkameen	17	11	10	7	11	2	204,683	30,500	104,391	592	1,053
Skeena	18	8	3	6	4	3	15,136	261	320	182	226
Slocan	12	3	1	1	9	5	3,706	—	—	157	25
Trail Creek	1	—	—	—	1	—	1,126	—	—	4	4
Vancouver	8	3	4	2	2	2	4,361	2,997	—	91	45
Vernon	7	3	3	2	3	—	3,382	—	898	66	44
Victoria	3	1	1	1	1	—	130	—	—	67	36
Totals	429	187	160	159	175	32	691,582	103,858	200,903	5,671	6,123

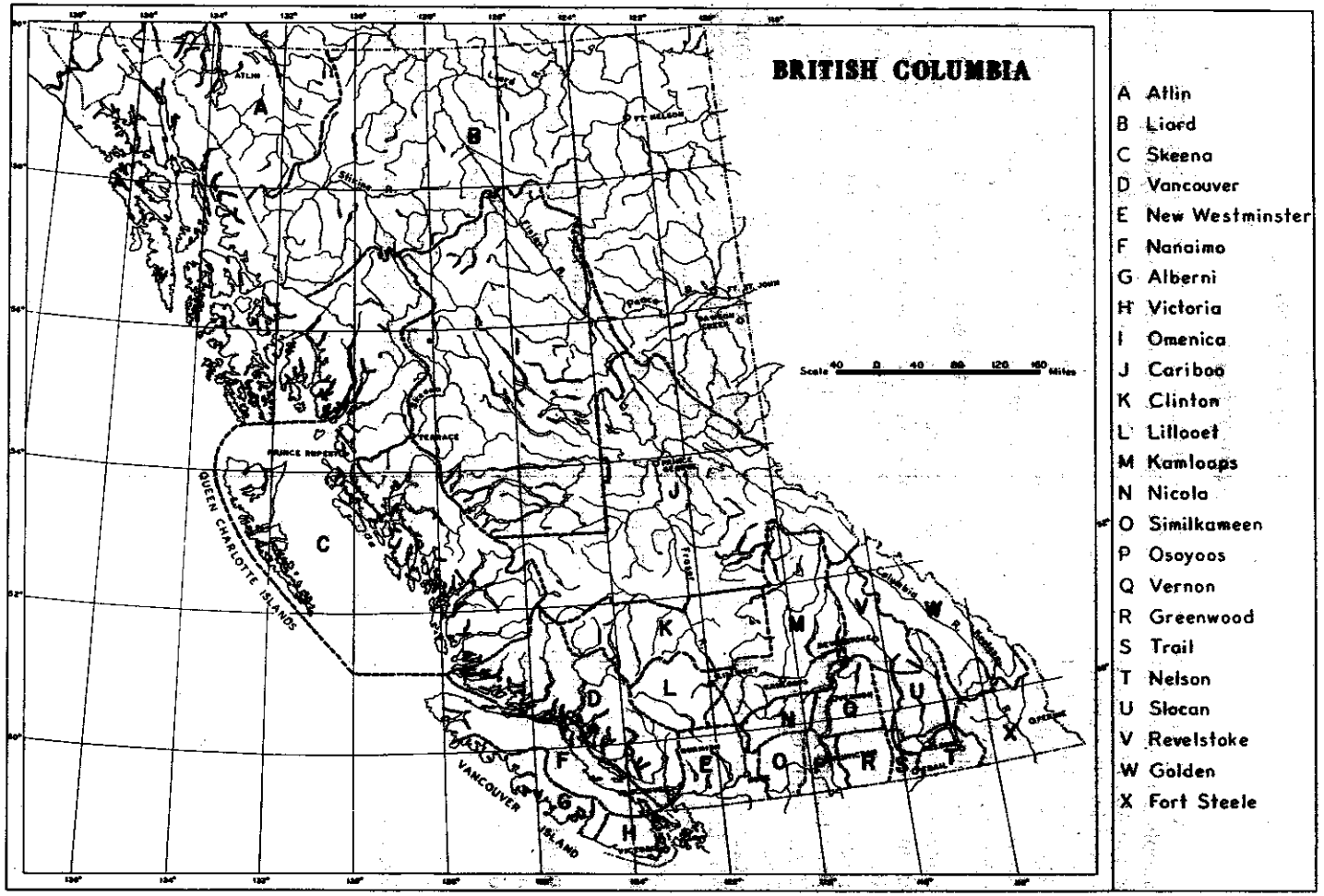


Figure 2. Index map of mining divisions.

REPORTS ON METAL MINES

INTRODUCTION

A very considerable amount of information in the following reports was supplied by exploration companies. Their co-operation in completing and filing exploration forms for the properties on which they worked should be greatly appreciated by all users of this Report.

The author of a report on any property that was examined is everywhere stated, whereas no author is given a report on a property that was not examined. Reports on them were compiled by Departmental staff from information obtained from owners, operators, or other sources.

The following section contains reports by staff geologists on currently explored mineral deposits and on some of the new discoveries made in the Province. Amongst them are informative reports on the Silvertip near Tootsee Lake, pages 24 to 33; Bowser Basin, pages 42 to 44; Monarch, Silver Bar property, pages 65 to 68; A.M., pages 78 to 82; the important Port Hardy-Coal Harbour area, pages 84 to 99; the Bear (Laura) on Mount Thomlinson, pages 113 to 116; the recently discovered Tetra silver deposit on Causqua Creek, pages 124 to 126; Peach, Tim at Peach Lake, pages 155 to 159; the Kimberley near Kamloops, pages 169 to 172; the extremely important Highland Valley area, pages 175 to 195; the important Copper Mountain mine, Cumont and Ingerbelle properties, pages 206 to 212; and others.

Additional geological, geophysical, and geochemical data are contained in reports that are submitted as assessment work. The properties and their co-ordinate locations are listed on pages 271 to 289. Specific reference to appropriate assessment reports is also made in various property reports that follow.

In 1968 two bulletins were published by the Mineralogical Branch. These are Bulletin No. 54, "Geology of the Queen Charlotte Islands," by A. Sutherland Brown, a very important contribution to our knowledge of the coast and of the mineral deposits of the islands, and Bulletin No. 55, "Geology of the Kennedy Lake Area," by G. E. P. Eastwood, a study of the geology of the Brynnor magnetite deposit and of the surrounding area.

Details of newly released aeromagnetic maps, resulting from the joint Federal-Provincial Government financed programme of aeromagnetic surveying, are given in the section on Departmental Work.

ATLIN MINING DIVISION

ATLIN

Big Canyon, Barber

LOCATION: (59° 133° N.W.) At elevations of 3,500 to 6,000 feet on Mount Vaughan, on Fourth of July Creek 10 miles east of the Atlin road.

CLAIMS: One hundred and forty-seven Crown-granted and recorded mineral claims covering and surrounding the old Atlin-Ruffner mine and including the Ruffner, Big Canyon, Canuck, Alpha, Omega, and other groups.

ACCESS: Eighteen miles by road north of Atlin, 10 miles east on Fourth of July Creek.

OWNER: Interprovincial Silver Mines Ltd., 355 Burrard Street, Vancouver 1; J. C. Wallis, superintendent.

METALS: Silver, lead, zinc.

WORK DONE: Twelve men were employed. Work consisted of widening existing drifts and diamond drilling. All six veins were sampled and bulk samples were taken from the No. 2 and No. 4 veins.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1925, p. 89.

Lucky

LOCATION: (59° 133° N.W.) The claims extend from the mouth of Pine Creek eastward to the western slope of Union Mountain.

CLAIMS: Lucky 11 to 69, Aud 1 to 50, Pork 1 to 8, and mineral lease M32, Scarab (Lot 5644) and Pictou (Lot 5643).

ACCESS: By road from Atlin.

OWNER: T. O. Connolly.

METALS: Gold, silver (*see* Table 12 for production).

WORK DONE: Some clearing of overburden was done and some trenches were blasted in bedrock. One ton of ore gathered from old shafts and adits was shipped to the Trail smelter.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 78.

TULSEQUAH

Janet, Joker

LOCATION: (58° 133° N.W.) At elevations of 90 to 120 feet on the east side of Tulsequah River, 3 miles upstream from the junction with the Taku River.

CLAIMS: Seventy-five Crown-granted claims held by the company include the Janet 1 to 8 and the Joker (formerly the Banker).

ACCESS: By aircraft or boat from Juneau, Alaska, or by aircraft from Atlin.

OWNER: New Taku Mines Limited, 401, 1033 Davie Street, Vancouver 5.

METALS: Silver, lead, zinc.

WORK DONE: Four men prospected the Janet and Joker claims for four months under the direction of George Bacon.

LIARD MINING DIVISION

ALASKA HIGHWAY

TOOTSEE RIVER

Silvertip By Stuart S. Holland

LOCATION: (59° 130° N.E.) Between elevations of 4,500 and 5,500 feet on the east side of Tootsee River, 3 miles northeast of Tootsee Lake.

CLAIMS: Silvertip A 1 to 8, B 1 to 8, C 1 to 7, and D 1 to 7, Topaz 1 to 62, and Bell 1 to 16.

ACCESS: By 17 miles of road south from the Alaska highway at Mile 701, where the Rancheria River may be forded at low water. Alternatively the Rancheria River may be crossed at the microwave bridge at Mile 706, where a road follows along the south side of the river and joins the road from the ford at Mile 701.

OWNER: A. Zborovszky and associates.

OPERATOR: Under option to Silverknife Mines Ltd., 505, 730 Humboldt Street, Victoria, and operated in 1968 by Northern Comstock Mining Ltd.

METALS: Silver, lead.

WORK DONE: A seismic survey was made on four claims, 300 feet of trenching was done by bulldozer, and two holes totalling 1,274 feet were diamond drilled. Six men spent three months working on the property under the direction of Peter Heron.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1958, p. 13; 1961, p. 6; 1962, p. 6; 1966, p. 17; 1967, p. 25; Assessment Reports Nos. 352 and 370; *Geol. Surv., Canada,* Map 18-1968.

DESCRIPTION:

This report is based on an examination of the property between August 8 and 12, 1968, inclusive. Advantage is also taken of numerous private reports written by various engineers between 1958 and 1967 to provide a description of the surface outcrop of the mineralization, which is badly obscured by recent bulldozing, to provide information on the two adits, both of which are now inaccessible, and to provide logs of the earlier diamond drilling, core from which is mostly unavailable or unidentifiable.

The accompanying Figure 3 is a composite of data derived from several sources. Compass surveys made during the examination indicate that the map may contain a considerable amount of error which could not be corrected without a complete new survey.

Conclusions

1. Four mineral zones on the Silvertip are in faults and fractures along the crest of an anticlinal fold in limestone of the Middle Devonian McDame Group; they lie west of the Camp fault, which is steeply dipping and northerly trending.

2. The mineral zones are oxidized and leached to considerable depths. The surface gossans contain residual masses of argentiferous galena assaying as much as 150 ounces silver per ton and 70 per cent lead.

3. One oreshoot has been found. It is 40 feet long and is 5 to 12 feet wide in No. 4 zone exposed in the upper level drift.

4. The rocks east of the Camp fault are downthrown, and the limestone anticline is draped with slate and phyllite of the Upper Devonian Sylvester Group.

5. Extensive geophysical work east of the Camp fault, followed up by more than 5,000 feet of rotary and diamond drilling, has failed to disclose mineralization of grade comparable to that on the west side of the fault.

Previous Work

The mineralized showings were found in the autumn of 1955 by A. Zborovszky, V. Allody, S. Mesaros, and S. Papp, who at the time were working under a Government grubstake. The original claims, Silvertip A 1 to 8, B 1 to 8, C 1 to 8, and D 1 to 8, were located in 1956 and were optioned that year by Conwest Exploration Company Limited. After some surface trenching was done, the company drove a 510-foot upper adit at elevation 5,125 feet, a 1,290-foot lower adit at elevation 4,530 feet, and did 1,908 feet of diamond drilling in 11 holes from surface and 650 feet in six holes from the upper adit. The company relinquished its option in October, 1957. This work is recorded in a report dated February, 1958, by T. Horsley.

In the spring of 1958 a group comprising Canex Aerial Exploration Ltd., Noranda Mines, Limited, and Bralorne Mines Limited held the claims under option, and from the face of the lower adit drilled three diamond-drill holes totalling 3,024 feet. This work is recorded in a report dated February, 1959, by Emil Bronlund.

In 1960 E. P. Chapman, Jr., of Chapman, Wood & Griswold Ltd., obtained a lease agreement on the property as agent for Peerless Oil & Gas. In September, 1960, an AFMAG survey was run over the property, but suitable drilling targets were not found, and the agreement was terminated early in 1961.

In 1961, 1962, and 1963 the property was under option to Pegasus Explorations Limited, during which time the following work, supervised by Chapman, Wood & Griswold Ltd., was done: In 1961 a preliminary induced polarization survey was made of the area previously covered by AFMAG, and two vertical diamond-drill holes, Peg Nos. 1 and 2, were drilled to check induced polarization anomalies. In 1962 additional induced polarization surveys of the same area confirmed and extended anomalous zones found the previous year, and one vertical drill-hole, Peg No. 3, and an inclined hole, Peg No. 4, were drilled. The four drill-holes totalled 1,624 feet. In 1963 photogeologic studies of the Silvertip area were made, some geological mapping was done, a geochemical survey (based on 1,650 soil samples taken over the property) was made, and an inclined drill-hole, Peg No. 5, was drilled to a depth of 167 feet. This work is recorded in reports by McPhar Geophysics Ltd. and by E. P. Chapman, Jr., and G. M. Hurd, of Chapman, Wood & Griswold Ltd.

In 1966 Rodstrom Yellowknife Mines Ltd. drilled 2,243 feet in four holes using a 4½-inch rotary drill mounted on a Nodwell carrier.

The claims were acquired by the present holders in 1967. An airborne electromagnetic survey of the claims was made and two inclined diamond-drill holes, S1-67 and S2-67, totalling 500 feet, were drilled. In 1968 a gravity survey was made and two vertical diamond-drill holes totalling 1,274 feet were drilled.

Geology

The claims in the immediate vicinity of the mineral showings are the Silvertip C 3 and C 4 and the Silvertip D 3 and D 4. They are underlain by a considerable thickness of pale to medium grey thick-bedded limestone belonging to the McDame Group of Middle Devonian age and from which poorly preserved fossil corals

(*Amphipora*) and brachiopods may be collected. The carbonate rocks are overlain by the Upper Devonian Sylvester Group, whose lower part consists of about 500 feet of grey to black phyllite. These rocks are involved in a northwesterly trending anticlinal fold whose axial plunge is variable from horizontal to 15 degrees southeast. A prominent set of northeasterly striking and steeply dipping fractures, some of which are occupied by calcite veinlets, are extension joints more or less at right angles to the fold axis.

The rocks in which the showings occur lie west of a northerly striking fault whose downthrow side is on the east. This fault has been mapped by the Geological Survey of Canada (see *Geol. Surv., Canada,* Map 18-1968) for at least 6 miles north of the property and for 2 miles south. It is the main structural element of the area, but its trace across the Silvertip D 3 and D 4 claims is not precisely known.

The rocks are also cut by the Camp fault, a north to northeasterly striking fault thought to have a steep easterly dip and whose downthrow side is on the east. The trace of this fault crosses the top of the ridge about 300 feet northeast of the northwest corner of Silvertip D 3 mineral claim. The amount of vertical movement cannot be less than 377 feet because the phyllite-limestone contact was intersected at that depth in diamond-drill hole C1-68. Mullions plunging 45 to 55 degrees northeast indicate northeasterly movement of unknown amount.

Two northeasterly striking faults have been recognized. No. 4 mineral zone occupies a northeasterly striking fault which dips 60 degrees to the northwest between its exposures in the upper and lower adits; no information regarding the movement on it is available. Another northeasterly striking fault with a 55-degree northwesterly dip was intersected in the three diamond-drill holes drilled in 1958 from the lower adit. Bronlund considered that this fault was the No. 2 mineral zone, but it is more apt to be the No. 1 zone (*see* Fig. 4).

Mineralization

Gossan zones and galena float were found in the autumn of 1955 by Andy Zborovszky and his partners between elevations of 5,100 and 5,400 feet on a northwesterly trending limestone ridge. Despite the steep slope, outcrops are not plentiful and bedrock is obscured by a thick blanket of frozen talus and rubble. Permafrost extends to a depth of about 150 feet below the surface.

Surface pits and open cuts and diamond-drill holes from surface made by Conwest Exploration Company Limited indicate the presence of four parallel northeasterly trending gossan zones within a width of 700 feet. These are numbered consecutively from east to west, and of them the No. 2 and No. 4 zones seem the best.

No. 2 zone is the largest, and where exposed in test pits and bulldozed trenches it had widths ranging from 15 to 65 feet and a length of 700 feet. Bronlund in 1959 states " 21 channel samples of the oxidized gossan across 10 to 35 foot widths, show an average of 5.7 ounces silver, 6.2 per cent lead and 2.9 per cent zinc." This is a corroboration or repetition of Horsley's 1958 statement that " the average value of samples from trenches on the zone was 5.53 ounces silver, 6.29 per cent lead and 3.08 per cent zinc." Individual float pieces of residual galena from these exposures assay about 150 ounces silver, 70 per cent lead, and less than 1 per cent zinc.

No. 2 zone is not reported to have been intersected in the upper or lower adits. Intersections of frozen mineralized gossan in drill-holes Nos. 12, 13, 14, and 16 probably represent No. 2 zone dipping southeastward at 40 to 70 degrees. Core recovery from the zone was poor, and although silver-lead-zinc values were obtained, they are insufficient to support a reliable estimate of the assay value of the zone at

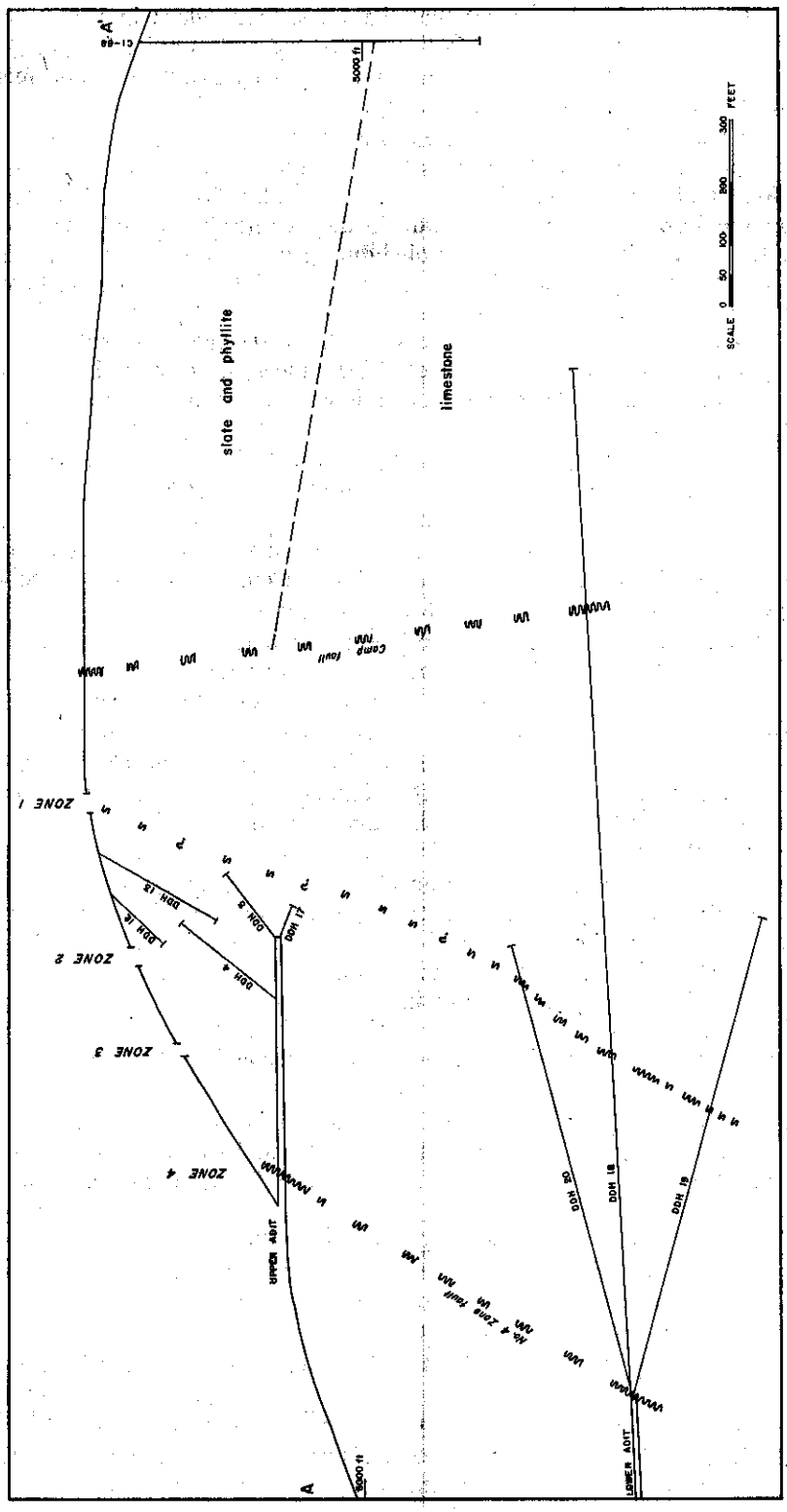


Figure 4. Silverknife Mines Ltd., Silvertip group section along A-A'.

depth. However, they do suggest that the subsurface values in No. 2 zone are lower than those on the surface. Both the Horsley and Bronlund reports suggest that the surface exposures of No. 2 zone slid by gravity as much as 200 feet down hill, but this interpretation is unsatisfactory.

No. 4 zone had a small surface exposure. The zone was intersected 60 feet inside the portal of the upper adit, was followed 65 feet west, was explored in two short raises, and was intersected in diamond-drill holes Nos. 1 and 2 drilled at the portal of the adit. The zone dips about 55 degrees northwest and has a width of about 5 to 12 feet. The zone was sampled during the drifting in 1957, and Horsley records that from a 38-foot length the average assay of 33 muck samples taken from 175 cars was: Silver, 13.84 ounces per ton, and lead, 15.4 per cent. The average assay of 16 channel samples along a length of 40 feet in the west drift was: Width, 5 feet; gold, 0.02 ounce per ton; silver, 12.0 ounces per ton; and lead, 14.5 per cent. A selected sample of galena from this zone assayed: Silver, 112.2 ounces per ton, and lead, 72.25 per cent.

The lower adit, elevation 4,530 feet, was driven south 34 degrees east in limestone for 1,290 feet. In it No. 4 zone was intersected 1,200 feet from the portal; the zone there has a width of 5 feet, strikes north 70 degrees east, and dips 60 degrees northwest. The vein material is reported by Horsley to be completely oxidized, "resembling soft brown sugar." The average of 11 channel samples is: Silver, 0.2 ounce per ton; lead, 0.1 per cent; and zinc, 4.5 per cent.

It is concluded that No. 4 zone mineralization occupies a fault which above the upper level dips about 55 degrees northwest and between the upper and lower level dips 60 degrees northwest, that a 40-foot oreshoot is present in the upper adit west drift, and that a low-grade section of the zone was intersected in the lower adit.

At the present time the two adits are not accessible and drill core is not available for examination. Consequently the character of the mineralization must be inferred from a very few surface trenches and from descriptions in reports written in 1958 and 1959, when most of the work on the veins was done.

At the surface the several mineralized zones are highly oxidized, and this oxidation extends to a depth of at least 250 feet, which is the maximum distance below surface at the face of the upper adit. Any pyrite is completely oxidized to finely powdered rust, and no sphalerite is to be seen. The galena remains largely unchanged, though evidently a small amount of cerussite (lead carbonate) is present. Partial oxidation of the vein minerals, especially in faults or fractured zones, extends to the depth of the lower adit, elevation 4,530 feet and 600 feet lower than the upper adit.

Notes on Horsley's maps of the lower adit indicate the presence of narrow calcite veinlets mineralized with galena, sphalerite, and pyrite and occupying joint fractures. Bronlund also records that in two holes (Nos. 18 and 20) drilled from the face of the lower adit, stringers of pyrite, galena, and sphalerite were intersected, some of which are parallel to bedding planes which dip 20 to 30 degrees southeast.

Despite the amount of work done and the large amount of money expended, there are uncertainties about the nature of the mineral occurrences. Nevertheless some conclusions may be reached, that is:—

(1) Mineralization on the Silvertip C 4 claim was largely localized on faults and fractures in McDame Group limestone, along the crest of an anticline and close beneath the contact of overlying Sylvester slate and phyllite.

(2) The mineralization lies west of a major northerly striking fault and southwest of the northerly to northeasterly striking Camp fault.

(3) Mineral zone No. 1 may be the surface expression of the northeasterly striking and northwesterly dipping fault that was intersected in drill-holes Nos. 18, 19, and 20 from the lower adit.

(4) Mineral zones Nos. 2 and 3 occupy northeasterly striking and steep southeasterly dipping fractures which are extension joints localized along the crest of the anticline.

(5) Mineral zone No. 4 occupies a northeasterly striking and northwesterly dipping fault. It contains a 40-foot oreshoot exposed in the west drift on the upper level.

(6) Other minor mineralization may occupy minor northeasterly striking fractures or ones parallel to the bedding.

(7) There is no indication of extensive replacement mineralization.

Exploration Since 1960

The earliest work directed by Horsley was based on the assumption that the gossan zones were the surface outcrops of steeply dipping fracture veins. In 1959 Bronlund concluded that, although some mineralization was in northeasterly striking and northwesterly dipping faults, the extensive gossan zones and residual galena fragments probably represent the remnants of flat-lying or gentle southeast dipping bedded replacement deposits. The possibility of the occurrence of bedded replacements east of the Camp fault influenced the direction of exploration since 1960, for evidently it was considered that adequate exploration had been done west of the Camp fault. Attention was therefore given to exploration east of the fault.

In 1960 the property was held by Peerless Oil & Gas and from 1961 to January, 1967, by Pegasus Explorations Limited. During that time a considerable amount of exploration was done under the direction of E. P. Chapman, Jr., of Chapman, Wood & Griswold Ltd.

In 1960 an AFMAG survey of the property was made, and although three conductive zones were found, the results were not sufficiently specific to justify any drilling being done. In 1961 and 1962 induced polarization surveys were made by McPhar Geophysics Ltd., of Toronto, of the area previously covered by the AFMAG survey. A number of strong anomalies were found, confirmed, and extended. Two reports by McPhar Geophysics Ltd. describe the results of the induced polarization work in detail. Chapman, Wood & Griswold Ltd. states: "The anomalies reported are large, cover a considerable area and suggest significant quantities of sulphide mineralization. The anomalies are of two distinct types:—

"1. Broad zones of high frequency effects accompanied by low resistivities over areas south and east of the showings and the limestone phyllite fault contact (Camp fault). Patterns appear to indicate bedded deposits or disseminated mineralization with areas of very high sulphide concentration.

"2. Sharp narrower patterns with much more moderate resistivity differentials. These suggest steep dipping vein-like features."

The large induced polarization anomaly outlined by McPhar Geophysics Ltd. is shown on the accompanying sketch-map, Figure 3.

In 1961 Pegasus Explorations Limited drilled two holes, Peg 1 and Peg 2, and in 1962 drilled Peg 3 and Peg 4. All four holes were drilled to check induced polarization anomalies. Holes Peg 1, 2, and 3 are vertical holes drilled on broad induced polarization highs with low resistivities. Hole Peg 4 was drilled at minus 50 degrees

on a bearing north 67 degrees west. The positions of the holes are shown on Figure 3, and logs of the holes are available in the Chapman, Wood & Griswold Ltd. report as follows:—

Peg 1: Vertical, depth 365 feet, elevation of collar 5,050 feet, core recovery 43 per cent. The hole was drilled in phyllite and slate with some quartz and calcite stringers and having disseminated pyrite and occasional grains of sphalerite and galena. A composite sample representing the bottom 65 feet of the hole contained 3.3 per cent pyrite.

Peg 2: Vertical, depth 430 feet, elevation of collar 5,440 feet, core recovery 40 per cent. The hole was drilled through phyllite, greywacke, and slate containing pyrite-bearing quartz stringers, and seams and disseminations of pyrite, chalcopyrite, and occasional sphalerite. Low assays of silver, lead, and copper were obtained from sludge samples. "The first 274 feet was bedded dark grey shale, slate, and greywacke similar to Hole Peg No. 1, from 274 to 410 feet highly siliceous with introduced quartz replacing greywacke and shale and below 350 feet quartzite. Considerable pyrite, minor galena, sphalerite, and chalcopyrite. From 350 to 419 feet core averages 20.2 per cent pyrite."

Peg 3: Vertical, depth 404 feet, elevation of collar 4,950 feet, core recovery 92.2 per cent. Hole is all in dark-grey phyllite with considerable fault gouge, approximately 7 per cent pyrite throughout and the bottom 200 feet averaged 10 per cent pyrite.

Peg 4: Minus 50 degrees at north 67 degrees west, depth 425 feet, elevation of collar about 4,900 feet, core recovery 97 per cent. The hole was drilled in brecciated limestone with calcite and pyrite cement and dolomitized to a large extent. Pyrite averages 3 to 5 per cent with bands up to 8 feet containing 50 per cent.

Chapman, Wood & Griswold Ltd. analyse the results of their drilling by stating "graphite on fracture planes in drill holes 1, 2, and 3 (that is, Peg 1, 2, and 3) probably accounts in large measure for the low resistivities encountered during the geophysical work. The indicated quantity of sulphide present may be sufficient to explain the induced polarization effects.

"Hole 4 intersected its target, mineralization was sufficient to explain the anomaly but no minerals of economic interest were present."

In 1963 Chapman, Wood & Griswold Ltd. made a photogeological study of the Silvertip claims, did some additional geological mapping, and made a geochemical survey of the claims, during the course of which 1,650 soil samples were taken and analysed for their heavy metal content. Some bulldozer stripping and trenching were done on a geochemical anomaly south of the main showings, and a diamond-drill hole, Peg 5, was put down to a depth of 167 feet without encountering economic mineralization.

Chapman, Wood & Griswold Ltd., in a report dated November, 1963, conclude: "Two possible economic targets remain. One, that the observed fissure filling mineralization in conjunction with possible replacement bodies, as yet undiscovered, would make ore grade material. The second possibility is a sheeted deposit and/or replacement bodies below the limit of oxidation. . . .

"In our opinion the probable size and grade of the potential targets are not sufficient to justify the high cost of further exploration."

In 1966 Rodstrom Yellowknife Mines Ltd. obtained an option on the property and drilled four rotary-drill holes shown as RDH 1, 2, 3, and 4 on Figure 3. The holes were drilled by a 4½-inch rotary drill mounted on a Nodwell carrier.

The holes were intended to investigate the McPhar induced polarization anomaly but, with the possible exception of RDH 2, the others were not particularly well located with reference to the anomaly.

The following logs of the holes were provided by A. Zborovszky, who was present when they were drilled:—

RDH 1: Black shale to 275 feet with estimated 5 per cent pyrite; grey limestone from 275 feet to 820 feet with some pyrite.

RDH 2: Black shale with 10 per cent pyrite to 365 feet; limestone with 5 per cent pyrite from 365 to 550 feet.

RDH 3: Grey to black phyllite and slate to 130 feet where grey dolomite containing 38 per cent pyrite was intersected; from 200 to 375 feet white limestone with 35 to 40 per cent pyrite decreasing to 5 to 10 per cent pyrite; from 375 to 600 feet dolomite(?) and limestone with 3 to 10 per cent pyrite.

RDH 4: Black slate with 1 to 2 per cent pyrite to 210 feet; from 210 to 260 feet greywacke with 40 per cent pyrite; from 260 to 275 feet oxide zone with some galena panned from cuttings—presumably the top of the underlying limestone.

Three of the four holes were bottomed in limestone, and the fourth is presumed to have reached the top of the underlying limestone. All holes are presumed to have reached what was thought to be a potentially favourable zone on the top of the limestone and beneath the phyllite cover without having intersected economically interesting mineralization.

The claims were acquired by the present companies in January, 1967. In August an airborne electromagnetic survey of the property was made by C. B. Selmser, of GeoCal Ltd., and in a report dated September 1, 1967, it is stated by Selmser that the "airborne electromagnetic survey gave good correspondence with the geochemical survey (made by Chapman, Wood & Griswold Ltd. in 1963). This work is now being followed up with diamond drilling under the direction of the author."

Two holes diamond drilled in the autumn of 1967 are on the Silvertip D 3 mineral claim east of the Camp fault and designated S1-67 and S2-67 on the accompanying Figure 3.

The following two summary logs were provided by A. Zborovszky, who was present during the drilling:—

S1-67: Elevation of collar approximately 5,400 feet, dip 65 degrees to the north.

0 to 130 feet: Grey phyllite.

130 to 170 feet: Black slate — pyrite and traces of galena were panned from cuttings.

170 to 300 feet: Greywacke with layers of disseminated pyrite — some galena was panned from cuttings.

S2-67: Elevation of collar approximately 5,350 feet, dip 65 degrees to the north.

0 to 33 feet: Surface rubble.

33 to 60 feet: Iron-stained grey phyllite.

60 to 70 feet: Some galena(?) panned from oxidized sludge.

70 to 110 feet: Oxidized calcareous greywacke.

110 to 130 feet: Black, graphitic slate—some galena(?) panned.
130 to 200 feet: Oxidized slightly calcareous greywacke.

Neither hole is on the McPhar induced polarization anomaly shown on Figure 3, and neither hole was deep enough to penetrate the limestone beneath the phyllite-slate cover.

On April 1, 1968, an agreement was signed between Northern Comstock Mining Ltd. and Silverknife Mines Ltd. by which work on the property was to be undertaken by Northern Comstock Mining Ltd.

In a report dated November 25, 1967, C. B. Selmser, of GeoCal Ltd., stated that " It is proposed that the surface material of *Zone 1, 2, 3, & 4* be removed with D-8 Caterpillars using 3 shank ripper blades and 18 yard scrapers. This material, which consists of frozen talus, can be easily removed at a rate of 900 tons per hour. Since there are 1.8 million tons of this material with at least an average grade of Silver of 97.99 ounces per ton, Lead of 50.3% and Zinc of 1.22% a mill rated at 1500 tons per day is necessary. . . .

" The direct worth of the ore would be at least $300.00 per ton. This would provide a return of about 600 million dollars or 150 million per year of operation."

Because of this report, Northern Comstock Mining Ltd., in the early summer of 1968, did some bulldozer exploration along the surface exposure of No. 2 zone with the intention of mining and milling the presumed high-grade ore of the No. 2 zone. After only a few days' work it became clearly evident to them that the amount of residual galena in the gossan zones is extremely small, that no surface material of milling grade is present, and that the 1.8 million tons of ore assaying 50 per cent lead and 98 ounces silver per ton as reported by Selmser does not exist.

In April, 1968, a seismic survey of the property was made by C. B. Selmser, of GeoCal Ltd., in which high gravity anomalies were recorded over the No. 2 and No. 4 zones west of the Camp fault and also in the northern part of the Silvertip D 3 claim east of the Camp fault.

In early August a hole, C1-68 on Figure 3, was located and drilled with the intention of investigating the gravity anomaly. When the hole was surveyed, it was found, because of error in the seismic survey, that the hole was 200 feet off the gravity high.

Hole C1-68, collar elevation about 5,370 feet, was drilled vertically to a depth of 551 feet. The summary log of the core is as follows:—

Started coring at 90-foot depth.

90 to 179 feet: Pale grey and black laminated phyllite; bedding at 80 degrees to the hole; that is, a dip of 10 degrees.
179 to 223 feet: Dark-grey sand composed of phyllite fragments, angular quartz, and iron oxide.
223 to 334 feet: Light-grey limy phyllite overlying dark-grey phyllite; bedding at 80 degrees.
334 to 355 feet: Slightly oxidized quartzite.
355 to 368 feet: Soft, friable, grey pyritized sericitic phyllite.
368 to 377 feet: Oxide zone with mud, iron oxide, and a little pyrite.
377 to 388 feet: Grey crystalline limestone.
388 to 398 feet: Unconsolidated sand composed of quartz and phyllite fragments and iron oxide.
398 to 551 feet: White, grey, and black crystalline limestone with a few oxidized fractures. The limestone contains numerous small fossil corals (*Amphipora*) and an occasional grain of pyrite.

Because of the unsatisfactory location and results of the first hole, it was decided to drill a second hole. This hole, C2-68, was located by survey so as to be on the McPhar induced polarization anomaly and was drilled vertically to a depth of 723 feet.

The core from this hole was logged by Ian F. Morton, and a copy of his report was provided by Northern Comstock Mining Ltd. A summary of his log follows:—

Coring started at a depth of 30 feet.

30 to 192 feet: Laminated phyllite with quartz and calcite veinlets and some pyrite. Small amounts of galena and cerussite are recorded.

192 to 619 feet: Interbedded phyllite and greywacke with quartz veins and veinlets mineralized with pyrite and small amounts of galena, sphalerite, and chalcopyrite.

619 to 667 feet: Sand with abundant pyrite and carbonate.

667 to 723 feet: Limestone, fractured and slightly mineralized.

It is reported that a 1½-inch length of core from a depth of 403 feet consisted of massive pyrite on both walls of two ¼-inch veins of galena.

No further work was done on the property after the completion of hole C2-68.

Alan Creek

Pagi

Location: (59° 130° N.W.) Between elevations of 5,500 and 6,500 feet at the headwaters of Alan Creek on both sides of the British Columbia-Yukon boundary 6 miles south of Mile 707, Alaska highway.

Claims: Fifty-five claims located as the Pagi, HY, JSK, and DR groups.

Access: From Mile 707, Alaska highway, by 10 miles of access road.

Owner: Emperor Mines Ltd., 1112, 1111 West Hastings Street, Vancouver 1; D. Reese, field manager; Weymark Engineering Ltd., consulting engineers.

Metals: Gold, silver, copper, lead, zinc.

Work Done: A topographic map was made, surface workings were surveyed, the claim geology was mapped, and an electromagnetic survey was made. Some bulldozer trenching was done, 500 square feet of bedrock was stripped, and several open cuts were blasted in bedrock. Ten miles of access road in the Yukon and 4 miles in British Columbia were built. Eight men spent six months on the property.

References: *Minister of Mines, B.C.*, Ann. Repts., 1948, p. A 60; 1959, pp. 69–70.

Description: Quartz veins mineralized with pyrite, chalcopyrite, and galena occupy fractures in granite and argillite.

Little Rancheria River

Blue Light

Location: (59° 130° N.W.) South of the Little Rancheria River and 8 miles northeast of the south end of Jennings Lakes.

Claims: Blue Light 1 to 8, located by A. Zborovszky; Violet 1 to 36, located by Spartan Explorations Ltd.

Access: By helicopter from the Silvertip road 25 miles to the north.

Owners: A. Zborovszky and Spartan Explorations Ltd.

Operator: Spartan Explorations Ltd., 303, 1035 West Pender Street, Vancouver 1; Clyde L. Smith, chief geologist.

METAL: Tungsten.

WORK DONE: For a four-month period during the summer three men were on the property doing surface and geological mapping.

DESCRIPTION: Scheelite is disseminated in quartz-rich augen gneiss zones.

RACING RIVER

Magnum

LOCATION: (58° 125° N.E.) Between elevations of 6,200 and 6,500 feet at the headwaters of Delano Creek, a tributary of Racing River.

CLAIMS: Fifty-eight claims, including the Me, Don, Mac, and Hi groups.

ACCESS: By 33 miles of access road south from Mile 401, Alaska highway.

OWNER: Churchill Copper Corporation Ltd., 401, 1111 West Hastings Street, Vancouver 1; J. R. Billingsley, manager.

METAL: Copper.

WORK DONE: Fifty-five men were employed for eight months. Underground development and exploration: Drifting, 5,587 feet; raising, 752 feet; diamond drilling, 17,488 feet; surface diamond drilling, 11,504 feet. A permanent 64-man camp was built, 13 miles of road was built to connect with the Alaska highway at Mile 401, and an airstrip was constructed. A perimeter survey of the claims was made. Some detailed geological mapping was done by E. Holt, of Chapman, Wood & Griswold Ltd., consultants.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1959, p. 21; 1967, pp. 25–26.

Kid, Goat, Paul

LOCATION: (58° 125° N.E.) On the west side of Racing River, 5 miles southwest of the mouth of Wokkpash Creek.

CLAIMS: Kid, Goat, and Paul groups.

ACCESS: From Mile 419 on the Alaska highway via the Churchill Copper Corporation road up the Racing River 26 miles.

OWNER: Racing River Mines Ltd., 12, 515 Granville Street, Vancouver 2.

METAL: Copper.

WORK DONE: An electromagnetic survey was made on the Kid 3 to 6, 8, 10. Bedrock trenching was also done on the Billy, Nanny, and Sam groups held by the company.

REFERENCE: Assessment Report No. 1042.

BLUE RIVER

Ice Lake, FH

LOCATION: (59° 129° N.W.) Between 5,200 and 7,000 feet elevation on Heazlewood Creek, west of the head of Blue River.

CLAIMS: Fifty-six claims, Ice Lake, FH, June, KW, PC, AS, Heazlewood groups.

ACCESS: Fifty-seven miles by helicopter from Watson Lake.

OWNER: Univex Mining Corp. Ltd., 215, 744 West Hastings Street, Vancouver 1.

METAL: Nickel.

WORK DONE: Three men spent three months blasting five trenches, total length 1,000 feet, and 60 test-pits about 3 feet deep in rock. Some bedrock was stripped by hand and by ground sluicing.

CASSIAR

Atan, Adair

LOCATION: (59° 129° S.E.) Between elevations of 2,300 and 2,350 feet at Atan Lake, 2 miles northeast of McDame Post.

CLAIMS: Forty-seven claims, including the Atan, Ski, Adair, Fox, and Wolf groups, formerly known as the Carlick.

ACCESS: From the Cassiar road by 11 miles of road suitable only for four-wheel-drive vehicles.

OWNER: Tournigan Mining Explorations Ltd., 2386 West 19th Avenue, Vancouver 8.

METALS: Silver, lead, zinc, copper.

WORK DONE: Ten men spent three months making topographical, geological, geophysical, and geochemical surveys. One small test-pit was drilled and blasted and one-half mile of road was built.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 26.

SQE, Kon, Rex

LOCATION: (59° 129° S.W.) Four miles southeast of Cassiar.

CLAIMS: Fifty-four claims in the SQE, Kon, and Rex groups.

ACCESS: From Cassiar via 4 miles of access road suitable for four-wheel-drive vehicles.

OWNER: New Jersey Zinc Exploration Company (Canada) Ltd., 909, 525 Seymour Street, Vancouver 2; J. F. Ariz, geologist.

METAL: Molybdenum.

WORK DONE: Twelve men spent four months on the property. Some geological mapping was done, six camp buildings were moved onto the property, 8,000 feet of access roads was built to drill-sites, and 18 holes totalling 9,304 feet were diamond drilled.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 12; 1966, p. 18.

DESCRIPTION: Pyrite and molybdenite are disseminated and in quartz veinlets in fractures in monzonite and quartz feldspar porphyry.

Ray

LOCATION: (59° 129° S.W.) Between elevations of 5,650 and 6,000 feet, 1 mile southwest of Cassiar.

CLAIMS: Ray 1 to 8, MOS 1 to 6, MO 1 to 6, Dom 1 to 4, Fall 1 to 4.

ACCESS: Two miles down the road from Cassiar, then by 2 miles of access road.

OWNER: Chapparal Mines Ltd., 428, 470 Granville Street, Vancouver 2; P. H. Sevensma, consulting geologist.

METALS: Silver, lead, zinc, molybdenum.

WORK DONE: The claim geology was mapped and some trenches and test-pits were bulldozed. Two miles of access road was built. Two men were employed for two months.

Al

LOCATION: (59° 129° S.E.) Between elevations of 4,600 and 5,000 feet on the third north fork of McDame Creek, 2 miles southwest of Hot Lake.

CLAIMS: Al 1 to 7.

ACCESS: By 1¼ miles of trail from the Cassiar road.

OWNER: Tournigan Mining Explorations Ltd., 2386 West 19th Avenue, Vancouver 8.

METALS: Copper, nickel.
WORK DONE: Two men spent one week making topographical and geological surveys and drilling and blasting three trenches and two test-pits.

Luna

LOCATION: (59° 129° S.E.) On the southeast side of Mount Haskins, north of McDame Creek.
CLAIMS: Luna 1 to 6, 9, 10.
ACCESS: By 4 miles of trail from Mile 69, Cassiar highway.
OWNER: Bartle Explorations Ltd., 360 Raymond Avenue, Richmond; John Bartle, director.
METALS: Silver, lead, zinc.
WORK DONE: Two trenches, total length 170 feet, and three small test-pits were made by hand.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 26.

Hazel, Eloise, Rusty

LOCATION: (59° 129° S.W.) At the head of Lang Creek, 6 miles south-southeast of Cassiar, between elevations of 4,500 and 6,700 feet.
CLAIMS: Two hundred and five claims, including the Hazel, Eloise, Rusty, Tail, X, and Lillian groups.
ACCESS: By 8 miles of access road from Simmons Lake, on the Cassiar–Stewart highway.
OWNER: Value Line Minerals Ltd., 203, 415 Third Street S.W., Calgary 1, Alta.; Dolmage, Campbell and Associates Ltd., consulting geologists.
METALS: Molybdenum, copper.
WORK DONE: Twelve men spent five months on the property. A crosscut adit 2,100 feet in length was driven, and 8 miles of access road was built.
REFERENCE: Assessment Report No. 1700.

DEASE LAKE

Horn

LOCATION: (58° 129° S.W.) Twenty miles southeast from Dease Lake, south of Tanzilla Butte at elevations of 3,000 to 4,000 feet. It is 5 miles east of the Stewart–Cassiar road.
CLAIMS: Forty-five recorded claims located as the Horn group.
ACCESS: By air from Dease Lake to an airstrip on the property.
OWNER: United States Smelting, Refining and Mining Company, 935, 470 Granville Street, Vancouver 2; R. W. Woolverton, geologist.
WORK DONE: Four holes, total length 1,087 feet, were diamond drilled on a magnetic and induced polarization anomaly caused by pyrite and graphitic sediments. Nine men were on the property for two months.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 27; Assessment Report No. 849.

June, Stikine, September

LOCATION: (58° 129° S.W.) Sixteen 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.
CLAIMS: June 1 to 12, Stikine 1 to 20, September 1 to 37.

ACCESS: By road from Dease Lake.
OWNER: Dease Lake Mines Ltd., 915, 1030 West Georgia Street, Vancouver 5; D. W. Asbury, chief geologist.
METAL: Copper.
WORK DONE: Work was done on the June and Stikine claims; 37 holes totalling 21,726 feet were diamond drilled. Twenty men were employed for four months.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, pp. 19–20; 1967, p. 27.

May

LOCATION: (58° 129° S.W.) On Stewart–Cassiar road, 15 miles south of Dease Lake, elevations 4,200 to 5,000 feet.
CLAIMS: May 1 to 11.
ACCESS: By Stewart–Cassiar road from Watson Lake, 176 miles.
OWNER: Newconex Canadian Exploration Ltd., 806, 525 Seymour Street, Vancouver 2.
METALS: Copper, molybdenum.
WORK DONE: The claims were surveyed by chain and compass, and geochemical sampling was done over 550 acres. Three men were on the property with A. J. Teed in charge.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 16; Assessment Report No. 771.
DESCRIPTION: Sulphide mineralization occurs in basic volcanics.

Joyce

LOCATION: (58° 129° S.W.) Twenty-five miles southeast from Dease Lake at elevations of 5,000 to 6,000 feet on the northeast side of Horn Mountain.
CLAIMS: Joyce 1 to 57.
ACCESS: By air from Dease Lake to an airstrip on the property.
OWNER: United States Smelting, Refining and Mining Company, 935, 470 Granville Street, Vancouver 2; R. W. Woolverton, geologist.
METALS: Molybdenum, copper.
WORK DONE: The geology of the claims was mapped, magnetometer, electromagnetic, and self-potential surveys were made, and soil samples were taken for geochemical analysis. Seventeen trenches, total length 6,200 feet, were bulldozed, and 10 holes, total length 2,700 feet, were diamond drilled. Six men spent five months on the property.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 28.
DESCRIPTION: Pyrite, molybdenite, and chalcopyrite are disseminated and along fractures in biotitized granodiorite.

CRY LAKE

Sphinx

LOCATION: (58° 129° N.W.) Between elevations of 3,500 and 4,000 feet 20 miles northwest of Cry Lake.
CLAIMS: Sphinx 1 to 24.
ACCESS: Seventy miles by helicopter from Watson Lake.
OWNER: Union Miniere Explorations and Mining Corporation Limited, 808, 900 West Hastings Street, Vancouver 1; Dolmage, Campbell and Associates Ltd., consulting geologists.

METAL: Copper.

WORK DONE: A three-man crew spent three weeks making magnetometer and geochemical surveys.

TUYA RIVER

Elk

LOCATION: (58° 130° S.W.) Along the Tuya River 4 miles northeast of Thirty Mile Lake.

CLAIMS: Elk 1 to 48.

ACCESS: By Telegraph Creek road 25 miles from the south end of Dease Lake.

OWNER: Peter Einsigel.

OPERATOR: Union Miniere Explorations and Mining Corporation Limited, 808, 900 West Hastings Street, Vancouver 1; Dolmage, Campbell and Associates Ltd., consultants.

METAL: Copper.

WORK DONE: The geology of the claims was mapped. A magnetometer survey was done on claims Nos. 1 to 17, 19, 21, 23, and 25, and an induced polarization survey of claims Nos. 4, 6, 8, 21, and 23. Geochemical soil-sampling was done over 2 square miles of the northwestern claims. Sixty-four trenches, total length 1,400 feet, were bulldozed. Five men were employed on the property for two months.

TURNAGAIN RIVER

Ram, Sheep, Ewe

LOCATION: (58° 128° N.E.) Between elevations of 5,500 and 6,500 feet on the Turnagain River 90 miles south of Watson Lake.

CLAIMS: Seventy claims, Ram, Sheep, and Ewe groups.

ACCESS: By float-plane from Watson Lake.

OWNER: Rip Van Mining Ltd., 020, 640 Seventh Avenue S.W., Calgary, Alta.

WORK DONE: Four men made topographical and geological surveys and dug three trenches and nine test-pits under the supervision of W. A. MacKenzie, field manager.

STIKINE RIVER

BARRINGTON RIVER

LLC

LOCATION: (57° 132° N.E.) At 3,000 to 6,000 feet elevation on the north side of the Barrington River, 4½ miles southwest of Little Tahtan Lake.

CLAIMS: LLC 1 to 94, a relocation of the Balsom showing.

ACCESS: Twenty-five miles by helicopter west of Telegraph Creek.

OWNER: Spartan Explorations Ltd., 303, 1035 West Pender Street, Vancouver 1; Clyde L. Smith, chief geologist.

METAL: Molybdenum.

WORK DONE: Six company employees and six contractors were employed on the property for four months. Surface workings were mapped, a topographic survey was made, and a geological map was made of the LLC 31, 33, 35, and 38 claims. Two holes totalling 1,530 feet were diamond drilled.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1959, pp. 6–7.

Chutine River

Tap, Gay

Location: (57° 132° N.E.) Between 6,000 and 8,000 feet elevation on the east side of Triumph Creek, 14 miles southeast of Chutine Lake.

Claims: Tap 1 to 140, Gay 1 to 42.

Access: Forty-eight miles west of Telegraph Creek to Chutine Lake, thence 14 miles by helicopter to a tent camp.

Owner: R. Coutts.

Operator: Coast Silver Mines Ltd., 660, 890 West Pender Street, Vancouver 1; E. North, field superintendent.

Metal: Copper.

Work Done: Eight men spent five months on the property. The whole claim area, 14 square miles, was covered by airborne electromagnetic and magnetometer surveys. One X-ray hole was diamond drilled to a depth of 228 feet.

References: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 29; Assessment Report No. 1701.

Mess Creek

Bird, Sno

By R. W. Grove

Location: (57° 130° S.W. and 57° 131° S.E.) Thirty-six miles south of Telegraph Creek just east of the junction of Hickman Creek with Schaft Creek, between elevations of 3,000 to 4,500 feet.

Claims: One hundred and forty-one claims located as the Bird, Sno, Bud, Gav, NOV, and ID groups.

Access: From Stewart, 120 miles to the south by aircraft.

Owner: Liard Copper Mines Ltd.

Operator: Hecla Operating Company, 2009, 1177 West Hastings Street, Vancouver 1; Harold Linder, project manager.

Metals: Copper, molybdenum.

Work Done: During a seven-month period ending December 20th, work performed by 12 men included geological mapping of surface outcrop and workings at 1 inch to 100 feet of an area 7,000 by 8,000 feet, 46 line miles of magnetometer survey compiled at 1 inch to 200 feet, 16.74 line miles of induced polarization survey compiled at 1 inch to 200 feet, 33 trenches totalling 17,145 feet cut by D6C tractor crawler, and nine core drill-holes size BQ and NQ totalling 13,095 feet.

References: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 26–29; Assessment Report No. 588.

Description:

The setting and preliminary geology of the property has been described and illustrated (*see* Ann. Rept., 1966, pp. 26–29).

Trenching done during the 1968 season was facilitated by the presence of only thin overburden which appeared to average 2 to 3 feet deep and apparently seldom exceeds 20 feet. Surface outcrop in the known mineralized area was fairly scattered, and the extensive new cuts have increased geological information. Excellent bedrock exposures are readily accessible in the creeks and glacial cirques southeast of the main mineralized zone. These are largely massive porphyritic pyroxene (augite) basalts with intercalated andesitic sub-members of similar aspect. The units trend north to north-northeast and have steep west to vertical dips. Toward the mineralized area the volcanic flows, fragmental andesites, and breccia have been deformed by extensive steep north-northeast trending shear zones which are now well exposed

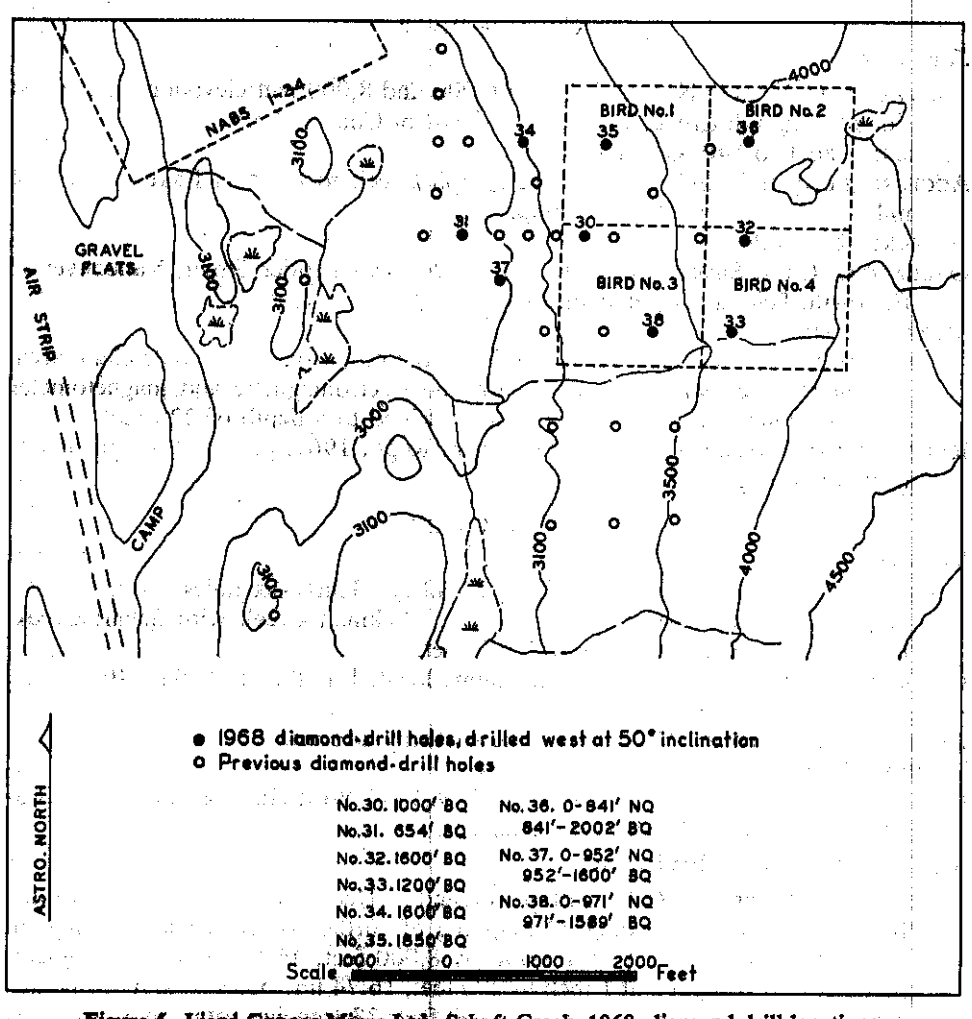


Figure 5. Liard Copper Mines Ltd., Schaft Creek, 1968, diamond-drill locations.

in the trenches. Mappable faults are evident, but they are not as definitive or as pervasive as previously thought. The recent work has also indicated a fairly clear mineral zoning extending east across the property. From the west coarse-grained pyrite with increasing amounts of fine chalcopyrite grades perceptibly into fine pyrite with coarse chalcopyrite, to chalcopyrite-bornite near the west top of the saddle then back to coarse pyrite. Vertical zoning is also indicated but controls are elusive, especially in regard to molybdenite, which appears to be closely associated with the intrusive material which forms screens or panels within the volcanic assemblage.

Alteration of the volcanics in the deformed zones is abundantly illustrated by the almost ubiquitous presence of chlorite, biotite, epidote, sericite, pinkish feldspar, and pyrite, as well as apparent local granitization.

At least three basic dyke swarms trending northwesterly have been outlined in the general mineralized area. Dykes intersected in the drilling tend to confuse the structural information somewhat.

A summary of the present information indicates porphyry-copper type mineralization within deformed, altered, and intruded andesite to basaltic volcanic rocks near

the eastern margin of the Hickman Batholith. This is a quartz monzonite satellite pluton intrusive into volcanics forming part of the margin of the main Bowser Basin. Recent studies of mineralized areas and basin lithology enhance the general concept of unique litho-structure controls within the complex basin environment.

During the season the project crew collected a large number of obsidian arrow and spear heads from the north side of the saddle area above the drill-sites. The artifacts are generally a greenish-black volcanic glass. The collection-site appears to lie mainly above the uppermost moraine in open ground. The obsidian looks like that found in a small quarry near Edziza Peak. The upper moraine has not been dated, and so far anthropological details are not known.

RM

PORCUPINE RIVER

LOCATION: (57° 131° S.W.) On the north side of Porcupine River 2 miles upstream from the junction with the Stikine River.

CLAIMS: RM 1 to 10.

ACCESS: By boat up the Stikine River for approximately 70 miles, from Wrangell, Alaska.

OWNER: Honda Mining Co. Ltd., 540 Seymour Street, Vancouver 2; H. H. Cohen, consultant.

METAL: Copper.

WORK DONE: Three men worked on the property for two weeks; three rock cuts were drilled and blasted.

E and L

ISKUT RIVER

LOCATION: (56° 130° N.W.) At elevations of 5,700 to 6,200 feet at the head of Snippaker Creek.

CLAIMS: E and L 1 to 41.

ACCESS: Fifty miles by air north from Stewart.

OWNER: Nickel Mountain Mines Ltd.

OPERATOR: Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2; W. St. C. Dunn, superintendent of exploration.

METALS: Nickel, copper.

WORK DONE: The airstrip was lengthened to 3,100 feet, 5 miles of road was improved, and 1 mile of new road was built. Three men spent one month on the property.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, pp. 31–34; 1967, p. 30; Assessment Report No. 741.

Cat

LOCATION: (56° 131° N.E.) On the west slope of Johnny Mountain, east of the junction of Craig and Jekill Rivers, 3 miles south of Iskut River.

CLAIMS: Cat 1 to 12.

ACCESS: Seventy miles northwest from Stewart, by aircraft.

OWNER: Cominco Ltd., 1199 West Pender Street, Vancouver 1; R. G. Bagshaw, geologist.

METALS: Copper, silver, gold.

WORK DONE: Two men spent six weeks on the property. A topographic map was made and the geology of the claims was mapped.

REFERENCE: Assessment Report No. 1657.

DESCRIPTION: Pyrite, chalcopyrite, and sphalerite in a quartz gangue occur in a shear zone in dacitic and andesitic pyroclastic rocks.

The Bowser Basin

By E. W. Grove

The hydrocarbon and metal potential of the Bowser Basin of north central British Columbia received widespread attention in 1968 following the land acquisition by Dome Petroleum Limited in March of large land acreage. There were early investigations of the Groundhog coalfield and desultory development of the coal in the Hazelton-Smithers area, but little attention was paid to the basin for petroleum or natural gas apart from the investigation of Pan American in 1959. The reasons for this lack of attention are readily evident when one considers the virtual isolation of the large area by the almost complete lack of transportation facilities except along parts of its periphery. To date metal-mining within the basin margin has sustained the interest and the life of most of the communities in or near the basin. The western edge of the area has been partly opened by the current construction of a road which, when completed, will connect Stewart on the Portland Canal to Telegraph Creek, Cassiar, and the Alaska highway. Meanwhile expansion

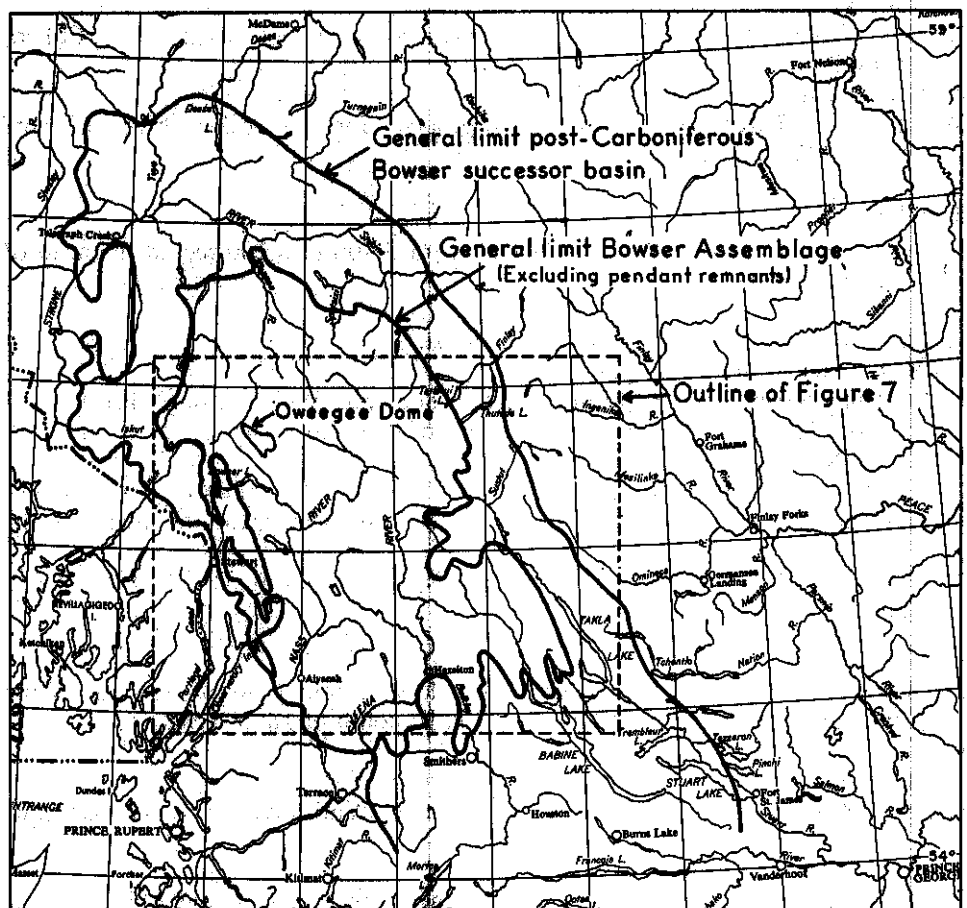


Figure 6. Bowser Basin area, northwestern British Columbia.

of timber production north of the Skeena River has led to the partial penetration of the south half of the basin by forest access roads which could be used by recently developed mobile exploration equipment. In 1959 Pan American Petroleum initiated exploration of 13 million acres of the basin, but after two years terminated the project. The results of this exploration, and recent work by mining companies, and the Mineralogical Branch of the Department of Mines and Petroleum Resources combined with earlier areal studies by the Geological Survey of Canada, have produced at least a preliminary concept of the Bowser Basin and its economic implications.

The location and approximate extent of the geologic feature referred to as the Bowser Basin is illustrated on Figure 6.

Doubtlessly the geologic outline presented here will undergo considerable revision as subsurface and detailed surface information becomes available.

Very generally the Bowser Basin can be described as a successor basin, one of several which occur within the "Basin and Belt" province of the northwestern cordillera. The parent Bowser sub-trough (Brew, 1968) apparently joined the northerly Whitehorse sub-trough, and also extended south to include the successor Central Interior Basin, forming what Gabrielse and Wheeler (1960) termed the "Central Belt." The northerly sections of this feature, the Tagish Belt, including the Atlin Horst, are fairly well known and have received a considerable amount of geologic attention in the last two decades. The Bowser Basin, lying roughtly between the Stikine River and Babine Lake, has not attracted the same concentration of effort because of the generally poor weather, difficult topography, lack of access, and, more importantly, the presumed low economic potential. In general the limits of the Bowser Basin (Nass Basin of some reports) have been variously indicated as a structural depression partly bounded by high-angle faults, the apparent depression covered by Mesozoic Bowser Assemblage formations, or the depression lying between the Coast Crystalline Belt and the Cassiar-Omineca Plutonic Belt.

In the broad sense the Bowser Basin has evolved from the sub-trough through geologic time as a complex interplay of tectonic, volcanic, sedimentary, and igneous events which have produced a northwest-trending sedimentary basin about 100 miles wide and 200 miles long. Presently it is visualized as a relatively unmetamorphosed thick sedimentary-volcanic succession bounded along its periphery by Palæozoic rocks and apparently in part at least underlain by an early Palæozoic-Precambrian(?) igneous-metamorphic-sedimentary complex, comparable to the Horseranch-Wolverine complexes. Recent geologic mapping in the southern half of the Bowser Basin shows a complexity of plutonic intrusion ranging in age from Triassic to Tertiary. The general geological features of this area and the widespread distribution of known plutons is illustrated on Figure 7, where, for simplicity in this brief presentation, the types and ages of basin intrusives have been referred to as the Skeena plutons, a relatively non-definitive term. As indicated on the map (Fig. 7), a large part of the better-known basin area has been invaded by swarms of igneous bodies in part limiting the potential hydrocarbon areas but at the same time increasing the potentially metalliferous area. As exploration and mapping throughout the basin continue, it appears likely that the known number and extent of Skeena plutons will be enlarged. At present these plutons include a great compositional variety, including granite, granodiorite, quartz monzonite (which appear to predominate), quartz diorite, gabbro, syenite, monzonite, diorite, as well as most textural types. Structurally they include plugs, stocks, batholiths, sills, dykes, diapirs, and deformed tadpole-shaped masses. Apart from the obvious plutonic concentration in the basin margin areas, other zonation is still undefined.

Palæozoic rocks, which for present purposes form the basal succession, include Mississippian, Pennsylvanian, and Permian formations. They outcrop along the basin periphery or within marginal uplifts such as the Bear River Uplift (Oweegee Dome) and probably underlie much of the depression. The Permian carbonate rocks unconformably overlie Mississippian and Pennsylvanian sedimentary and volcanic rocks and are in turn unconformably overlain by thick Mesozoic strata.

The Mesozoic succession comprises the main outcrops within the somewhat ill-defined limits of the successor Bowser Basin. That the Mesozoic basin was considerably larger is indicated by the widespread extent of Mesozoic rocks as pendants or remnants within the now bounding plutonic belts. The complexities of basin evolution are well illustrated by the Mesozoic stratigraphy, in which continental and marine lithology are intercalated and are complicated by contemporaneous erosion and deformation. Known Triassic rocks are predominantly fragmental volcanic rocks, andesitic flows, tuffs, epiclastic volcanic rocks. In the western basin area, lenticular carbonate and quartzite members suggest periodic stability in latest(?) Triassic prior to the deposition of coarse clastic debris interspersed with extensive pillow lavas in earliest(?) Jurassic. Generally, Jurassic rocks overlie all the older rocks unconformably, except in the Bear River Uplift or west central basin, where, with the exception of intercalated limestones, Triassic-Lower Jurassic clastic-volcanic sedimentation was essentially continuous up to Middle Jurassic when fine-grained marine deposition became dominant. From the central basin area, Jurassic marine shales and sandstones grade to coarse epiclastic rocks, agglomerates, and volcanic flows around the margin. Marine sedimentation continued into the early Lower Cretaceous, whereupon marine and continental sedimentation alternated. Along the eastern margin of the basin, non-marine shales, sandstones, and conglomerates with coal unconformably overlie the deformed older Mesozoic and Palæozoic assemblages.

During the development of the successor basin, periods of deformation and plutonism mark regional periodic tectonic activity, and are represented by major unconformities in the pre-Mississippian, pre-Triassic, pre-Lower Jurassic, pre-Upper Cretaceous, and Recent. Plutonism during Late Palæozoic or Early Triassic, Middle-Late Jurassic, and Tertiary has been concentrated along the basin margins. Deformation is obvious in most all rocks within the basin, especially the Bowser assemblage, which forms the main surface exposures. This superficial cover is characterized by what can best be described as " confused " folding with disharmonic relationships that may largely result from gravity tectonics. However, despite the surficial complexities, major subsurface (even basement) features have been outlined along the western side of the basin (for example, Oweegee Dome, Ritchie anticline, etc.), where extensive petroleum and natural-gas permits were acquired in 1968.

The economic mineral development of the basin has been entirely confined to metal production from the margin area. Early precious-metal production from the Stewart and Alice Arm districts, as well as numerous less-distinguished camps, has currently been supplanted by copper from Granisle and molybdenum from Lime Creek. Current developments of other porphyry-type deposits localized within the margin area now almost ring the basin, and interest in the hydrocarbon and uranium potential of the Bowser Basin will necessarily produce new information and should lead to a less simple concept within a few years.

[References: *Geol. Surv., Canada*, Paper 60-24; Brew, D. A., 1968, The Role of Volcanism in Post-Carboniferous Tectonics of Southeastern Alaska and Nearby Regions, North America, *XXIII International Congress*, Vol. 2, pp. 107–121.]

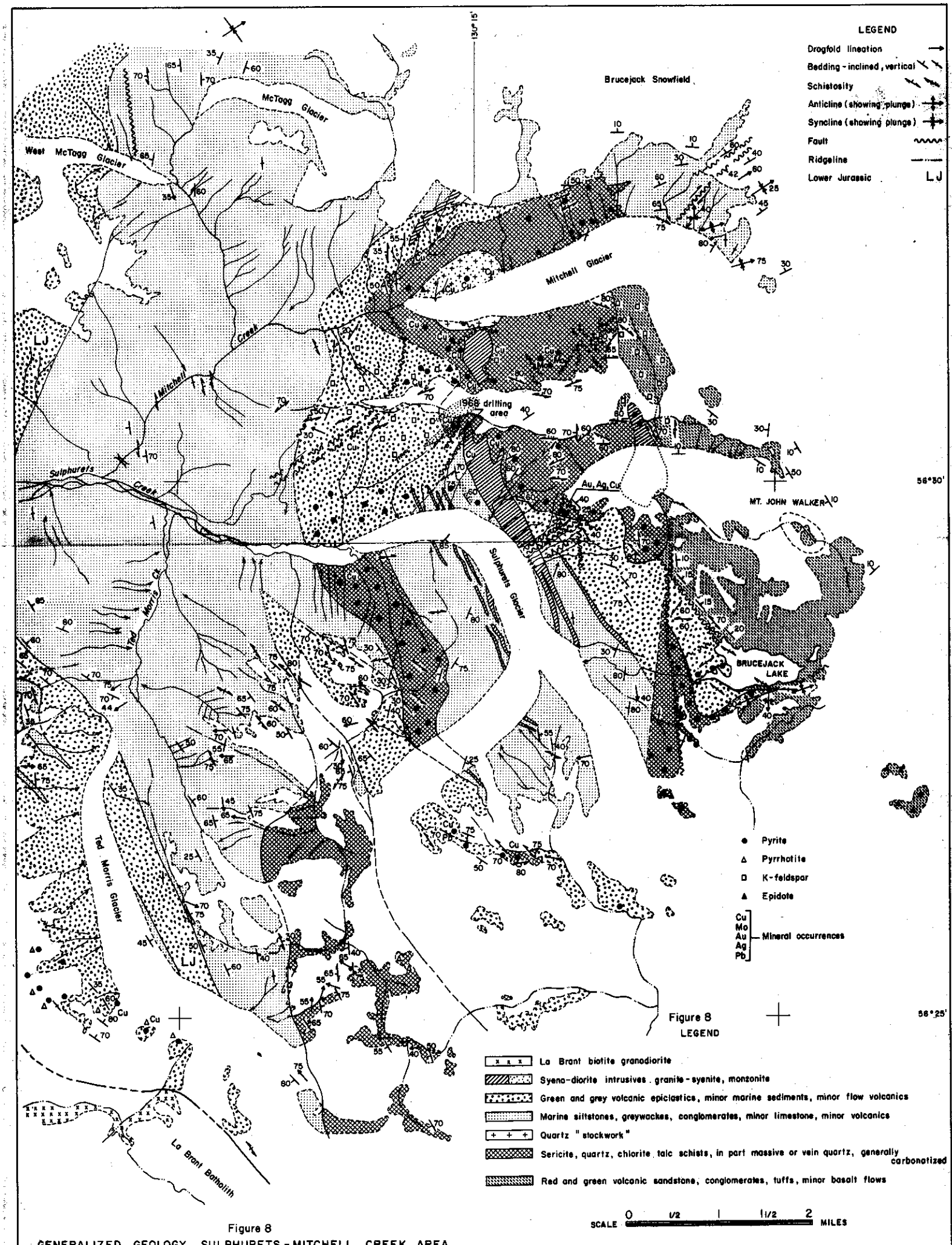


Figure 8
GENERALIZED GEOLOGY SULPHURETS - MITCHELL CREEK AREA

SKEENA MINING DIVISION

UNUK RIVER

Ted, Ray By E. W. Grove

LOCATION: (56° 130° S.E.) The Sulphurets-Mitchell Creek property is on the east side of the Unuk River, 40 miles northwest of Stewart, and 20 miles north of the Granduc mine.

CLAIMS: The property presently consists of 78 claims, including the Ted, Ray, Ran, Patty, Arbee, John Bull, and Dawson-Ross claim groups.

ACCESS: Men and materials were transported by helicopter from Stewart.

OWNER: Granduc Mines, Limited, and Don Ross and Associates, of Ketchikan, Alaska.

OPERATOR: Granduc Mines, Limited, 2009, 1177 West Hastings Street, Vancouver 1.

METALS: Copper, molybdenum.

WORK DONE: A geological crew of seven men spent 3½ months preparing a topographic and geologic map of the property, which covers about 9 square miles. A geochemical orientation programme was run on the Patty and Ran 40 to 48 mineral claims, and six EQ-size core holes totalling 3,819 feet were drilled by an eight-man crew. The project was supervised by E. Ostensoe, chief geologist, Granduc Mines, Limited.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1962, p. 8; 1967, p. 31.

DESCRIPTION:

The Sulphurets-Mitchell Creek property is one of three large conspicuous gossan exposures in an area bounded to the north by the confluence of Unuk River and Treaty Creek. All three occurrences appear to be localized within altered Lower Jurassic volcanic and sediments intruded by syenitic plutons and are marked by intense mechanical deformation. Deep valley erosion has removed most of the Bowser Assemblage sediments, which once capped the mineralized complex, and recent glacial action has scoured clear large parts of the area. Since the initial discovery of the deposit in 1935, glacial ablation has exposed extensive outcrop areas below the old trim lines. Investigations at the Sulphurets-Mitchell Creek property in 1967 indicated that a detailed geological mapping programme was required before further evaluations could proceed. As a result, company geologists mapped about 9 square miles by plane-table in 1968 at a scale of 1 inch equals 200 feet.

Structurally, the mineralized zone, which includes pyrite, chalcopyrite, and molybdenite within quartz, carbonate, sericite, and talc alteration, lies near the northwest end of an elongate regional dome. The layered country rocks, which include intercalated volcanic epiclastics, volcanic flows, and marine sediments, have been intruded by a complex of syenite, monzonite, and diorite plutons. So far most of the alteration-mineralization appears to be concentrated within schists developed from certain horizons intruded by syenitic plutons. At least three prime directions of schistosity are visible and post-mineral faulting has been extensive. Thrust faults appear to dominate along the west margin of the intrusive complex, whereas northeasterly tear faults are prominent in the central and eastern sections. Even the glacial moraines in the area are disturbed by the most recent faults.

Three core holes, DDH 68-2, 68-3, 68-4, were drilled at the north edge of Patty No. 1 claim to test the extension of a mineralized zone previously drilled in 1962 near the top of the main ridge which separates the Mitchell and Sulphurets glaciers. Three other holes were drilled at other points to test mineralization and extend geological information.

A generalized geological map of the immediate area surrounding the Sulphurets-Mitchell Creek property is shown on Figure 8. This area was mapped by members of the Mineralogical Branch as part of a regional project directed by the writer in 1966–67 to revise the British Columbia section from Portland Canal to the Iskut River with special reference to mineral-deposit occurrences. The Sulphurets-Mitchell Creek zone lies within rocks forming the western margin of the Bowser Basin and is adjacent to the important Coast Crystalline Complex of intrusive igneous rock which transects the western limits of the main basin (*see* Fig. 7). The granitic La Brant batholith is one of several satellite plutons likely related to the main complex. The syenite-monzonite and related intrusives found in the Sulphurets-Mitchell Creek area are just a few of many such intrusives localized along the exposed basin margin forming a belt which in the Unuk area is approximately 26 miles wide. For convenience these and other plutons found within the basin area have been termed "Skeena Intrusions," and so far age, composition, and genesis are not implied. Within the regional tectonic framework the Sulphurets-Mitchell Creek deposit lies within the Bear River uplift, a major unit found to extend from Alice Arm to the Iskut and east to include the Oweegee Dome-Ritchie anticline area.

Within the confines of the map-area (Fig. 8), general relationships are usually decipherable. The rock units, consisting of intercalated, lenticular members, generally dip steeply and trend north-northwest. These rocks include marine siltstones, greywackes, volcanic epiclastics, and mixed volcanics. Near the La Brant batholith the intruded country rocks have been variously hornfelsed, indurated, or sheared, depending on their composition and competency. In the Mitchell Creek-Sulphurets section, where syenite-monzonite plutons are localized, alteration has been varied and extensive with sericite, K-feldspar, and silica dominant. Sulphide mineralization has been found areally in disseminations and vein-type deposits. Pyrite, chalcopyrite, molybdenite, galena, sphalerite, tetrahedrite, and bornite along with magnetite locally form the most abundant metallic minerals.

PORTLAND CANAL

Tide Lake Flats

Granduc Mine By H. Bapty and L. Wardman

Location: (56° 130° S.E.) The Granduc mine is at the head of the Leduc River, 25 miles north-northwest of Stewart, between elevations of 2,500 and 4,000 feet.

Claims: Sixty-four Crown-granted and 220 recorded mineral claims.

Access: By 28 miles of road from Stewart to Tide Lake and thence by an 11.6-mile tunnel to the mine.

Owner: Granduc Mines, Limited.

Operator: Granduc Operating Company, 520, 890 West Pender Street, Vancouver 1; N. Gritzuk, general manager; mine address, P.O. Box 69, Stewart; D. E. Howard, resident manager.

Metal: Copper, silver.

Work Done:

Leduc Camp

The camp was opened on February 26, 1968, and was closed on December 19, 1968.

On the 2475 level, excavation of the crusher-room was started, the top crusher-room was slashed out and the back rock-bolted using Roc-Loc bolts, and longhole drilling and blasting of the ore bin above the crusher-room was completed.

On the 2600 level, excavation was completed of the powder magazine, cap storage, underground warehouse, mobile-equipment repair-shops, main electrical substation, fuel storage bay, and rectifier station. The compressor-room excavation was 75 per cent complete. The haulageway to the main waste-pass raise was completed, and the tail track and the supply storage area were also driven. A crosscut was driven to provide access to the ore-pass dump and crusher, and another crosscut was driven to provide access to the conveyorway that will be driven to the top of the ore loading-bins. The main tunnel access to the mine was driven eastward to a junction with the main tunnel drive.

Other development work carried out from this level included the completion of the waste pass to the 3100 level, stubbing off an access to a probable location of a No. 2 shaft, and starting the up-ramp to the 3100 level.

On the 3100 level, the main air intake was connected through to surface and a fan by-pass was driven. The up-ramp was driven to approximately the 3,540-foot elevation. The old hangingwall drift, on this level, was slashed to permit the use of mobile equipment and provide access to raise locations that were driven to shorten haulage of waste in the up-ramp and improve ventilation conditions. An ore-pass and a ventilation raise were also driven 600 feet to the top of the orebody, and a start made on a second pair of raises.

A water tank and pipe-line were installed above the 3100 level adit to provide an underground water supply from the hanging glacier during the summer months.

Changes to plant facilities were the addition of a Caterpillar 398 diesel generator to the existing powerhouse and the installation of some permanent electrical distribution cables.

Camp improvements were the addition of a new 32-bed staff-house and extension of the dry-building to provide more space. Four-inch steel sets were erected and sheeted in at the main air intake portal to provide protection for this adit.

Total development for the year: Advance, 16,041 feet; excavation, 514,486 cubic feet; surface diamond drilling, 2,206 feet; and underground diamond drilling, 7,696 feet.

The crew at Leduc averaged 151 men. Between February 29th and April 18th, 3,947.3 tons of freight was hauled by Nodwell tracked vehicles over the ice road from Troy camp at Summit Lake to Leduc.

During the season, 2,339.65 tons of freight was transported by Otter and helicopter aircraft from the Stewart base.

Tide Lake Camp

This camp was operated all year with no work interruption.

Tunnel.—The tunnel was advanced 19,447 feet to 53,743 feet from the portal, at which point it broke through to the tunnel driven from the mine end. Slash for laybys and equipment amounted to 136,575 cubic feet. Total rock removed was 366,300 tons (*see* tunnel statistics). Diamond drilling to check ground condition amounted to 112 feet.

Dual fans were installed at 36,750 feet, at 46,275 feet, and at 50,725 feet, each with a capacity of 16,000 cubic feet per minute and drawing 100 horsepower per set. Substations were installed in conjunction with each fan installation.

Drilling-water at the face continued to be supplied by pumping from a sump. The last sump was established at No. 13 layby (50,275 feet). Heavy water-flows were encountered at approximately 50,000 feet, and a sump and pump station was established at the No. 1 layby to handle the water accumulated at this point, and prevent flooding of the track at the portal.

A second 1,000-kva. transformer was installed at the tunnel mid-point (No. 8 layby). Three ER-6 compressors were installed underground in the old portal shop area to provide the tunnel with compressed air. The previous surface compressor-house was abandoned owing to interference with surface construction.

Additional rolling-stock put into use during the year included five muck cars, one flat car, one track tamper, and one cement mixer-placer and conveyor car.

Tail Track and Conveyorway.—Excavation in the tail-track area was completed during the year. This included the track from the main tunnel over the ore bin and the tail-track extension beyond, excavation of the ore bin, and driving of the conveyorway leading from the underground bin to the surface crushing plant. Total work amounted to 1,952 feet of advance and 79,286 cubic feet of slash.

Surface.—Major surface construction was carried out during the year, under contract to Commonwealth-Hume. Work was commenced at the site on March 1, 1968, and was suspended on December 15, 1968, for the Christmas-New Year period.

The main water tank and fuel tanks were erected. Water wells were established in the Tide Lake Flats basin, together with the gathering-lines to the pumphouse. Erection of the pumphouse was completed and installation of main water-line and fire-lines to the powerhouse. An overhead pole-line was established between the powerhouse and the pumphouse.

The thickener foundation was installed and the thickener tank erected.

The concrete work in the main concentrator building was completed, steel erection was completed, concrete block walls and cladding were completed, and work started on interior installation. The miners' locker-room and basket-room were completed and are now in use.

Overhead cranes were installed in the railroad bay and grinding-bay. The concentrate-drier was installed. Installation of the flotation cells was started. All tanks were installed. Installation of rod mills and pebble mills and motors was started. Installation of vacuum pumps was started.

The snowshed and railroad bridge connecting the tunnel and the concentrator building were completed. The access incline from the coarse-ore storage bin to the secondary crusher, in which the transfer conveyor will be installed, was concrete-lined.

Total personnel in the mining camp averaged 199 men, with a maximum of 213 men. Total personnel on construction averaged 335 men, with a maximum of 432 men.

Tide Lake camp was serviced by road. Total freight hauled excluding construction was 15,928.39 tons.

Summary of Work Accomplished

	Leduc	Tide Lake	Total
Tunnel (ft.)	1,756	19,447	21,203
Lateral development, including inclines (ft.)	11,411	1,840	13,251
Raising (ft.)	2,874	112	2,986
Slash (cu. ft.)	514,486	235,061	749,547
Diamond drilling (surface and underground) (ft.)	9,906	112	10,118

Tunnel Statistics

Introduction.—The break-through of the Granduc tunnel on December 8, 1968, marked the completion of what must be considered as one of the world's major tunnelling achievements. At the time the tunnel started, access to the mine

camp-site at the South Leduc Glacier, some 30 miles northwest of Stewart, could only be effected by helicopter or fixed-wing aircraft, and the initial tunnelling facilities had to be established by hauling material about 48 miles by "caterpillar trains" up the Salmon Glacier and across the Frankmackie snowfield. The average annual snowfall of about 800 inches is only partly indicative of the natural physical obstacles with which this project had to contend. The permanent snow and ice which covers most of the tunnel route made it difficult to obtain detailed geological information regarding the country rock conditions. It was known that the tunnel would encounter granodiorite, sediments, and volcanics complicated by dyke swarms before entering the mine area. The depth of the glacier ice was tested by "hot point" drilling to determine the subsurface topography and the rock burden over the projected tunnel route.

The men that drove this tunnel were hard-rock miners who utilized new equipment and tunnelling methods to the point that they established world records. A start was made in late 1964 to drive the tunnel from the Leduc end, but was forestalled on February 18, 1965, when a climactic avalanche off Granduc Mountain took the lives of 26 men and virtually wiped out the camp-site. As a result, all efforts were concentrated in tunnelling from the Tide Lake camp, which was serviced by the 30-mile-long new road built from Stewart and opened to traffic in August, 1965. Difficulties encountered at the Tide Lake end included broken ground, water-flows, and one labour strike, but break-through was finally made on exact line and grade after 10.2 miles of driving, and a historic mark in British Columbia mining had been reached.

The statistics related to this tunnel are listed below:—

Size: 15 by 15 feet.
Length (Tide Lake portal to Granduc mine): 54,348 feet.
Date started: July 1, 1965.
Date completed: December 8, 1968.
Average daily footage: 42.7.
Feet drilled per foot of advance: 54.
Additional excavation (laybys, substations, etc.): 559,358 cubic feet.
Total tons: 1,040,000.
Tons trammed per day (average): 826.

Major delays were experienced between October 20, 1965, and March 1, 1966, due to water-flows and a labour strike, and between September 30, 1966, and March 1, 1967, due to broken graphitic argillite ground in a dyke zone. Average rate of advance, disregarding the above delays, was 52.2 feet per day; average rate of advance (per day worked), disregarding the above delays, was 72.8 feet per day.

World Records Established:

Longest tunnel driven from one end, 53,743 feet.
Greatest advance per 24-hour period, 115 feet.
Advance per six-day week (Sunday maintenance only), 601 feet.
Advance per calendar month, 2,314 feet.

Equipment:

Drilling: Gardner Denver 7-boom Jumbo (six 123D drifters, one 143 cut machine).
Mucking: Two Conway 100-1 mucking-machines (one operating, one spare).
Locomotives: Seven 150-horsepower Goodman battery-trolley locomotives (15 tons).
Cars: Thirty 10-cubic-yard Moran side-dump cars.

Sliding floor: 450-foot sliding floor designed by Jacobs Associates.
Auxiliary units: Ditch digger, vent-pipe scissor unit, personnel jitney, track tamper, and cable positioner.
Ventilation: 50-horsepower type K fans (Joy & Woods) (installed every 900 feet as two-stage units to provide 15,000 cubic feet per minute at 25-inch water gauge).

Materials:

Explosives: Total tunnel consumption, 2,583,000 pounds or 6 pounds per cubic yard.
Bits and drill steel: Steel size, 1¼-inch, and bit size, 1⅞-inch.
Rock-bolts: 83,451.
Straps: 25,303.
Steel sets: 350.
Fuel oil (for power): 3,000,000 gallons.
Vent pipe (36-inch diameter): 18 gauge galvanized.
Track: Weight, 100 pounds; gauge, 42 inches.

Number of Employees:

Staff at site (average for tunnel-driving period)	31
Hourly	128
Total	159

Electrical Installations

In the main haulage tunnel 61,000 feet of No. 4/0 A.W.G. 25-kilovolt cable was installed; also three 450-horsepower air compressors were installed underground. A 1,000-kva. transformer bank was moved from the old powerhouse to the tunnel portal.

A new powerhouse was built and two turbogenerators rated at 15 mva., 13.8 kv., 3,600 r.p.m., three-phase, 60-cycle were installed. The boilers for these turbines are rated at 300,000 pounds per hour. All the diesel-driven generating units were moved from the old powerhouse to the new. Installation of equipment in the concentrator was commenced and will be completed in 1969.

At Leduc two unit substations were installed underground. Six hundred feet of No. 4/0 A.W.G., S.W.A. 5,000-volt cable was installed in the shaft. Four 50-horsepower fans were installed for ventilation. A 625-kva. portable diesel-driven generating unit was installed in the powerhouse.

STEWART

Silbak Premier Mine

LOCATION: (56° 130° S.E.) On Cascade Creek 12 miles north of Stewart at 2,000 feet elevation.

CLAIMS: Crown-granted claims covering an area of approximately 5 square miles.

ACCESS: By good road from Stewart.

OWNER: Silbak Premier Mines Limited, 355 Burrard Street, Vancouver 1.

METALS: Gold, silver, lead, zinc (*see* Table 12 for production).

WORK DONE: There was no company operation during the year. Four tons of ore was hand picked from the old stockpile area near the present mill. This was cobbed, sacked, and shipped to the Trail smelter.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1964, p. 21; 1967, p. 34.

Blue Grouse

LOCATION: (55° 129° N.W.) At 4,500 feet elevation between the middle fork and the south fork of Glacier Creek.

CLAIMS: Blue Grouse, Blue Grouse 2 and 3, J.L., and Salt.

ACCESS: Eight miles by trail from the Dunwell mill or by helicopter from Stewart.

OWNER: John R. Lehto.

METALS: Silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Ore was taken from old dumps and 8 tons was hand cobbed, sacked, and transported to Stewart by helicopter for shipment to the Trail smelter.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1938, pp. B 20–B 23 (Blue Ribbon).

Goat

By H. Bapty

LOCATION: (56° 129° S.W.) At elevations of 4,500 and 5,000 feet, 3 miles north of the Stewart–Cassiar road and 7 miles west of Meziadin Lake.

CLAIMS: Goat 1 to 4, 13 to 80, A to H.

ACCESS: Forty miles by road from Stewart.

OWNER: The Canada Trust Company.

OPERATOR: Noradco-Shield Joint Venture, 1019, 409 Granville Street, Vancouver 2.

METAL: Silver.

WORK DONE: Three adits 759 feet and two raises 127 feet were driven and 1,922 tons was slashed. Underground workings were mapped and four holes, total length 261 feet, were diamond drilled from underground. One company employee and 20 contract miners were under the supervision of L. K. Lytle, mine manager. Improvements to the trailer camp and road repairs were made. A 100-kva. generator was installed. It supplies a 15-horsepower fresh-water pump and 1 horsepower of miscellaneous equipment, as well as camp lighting.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1965, pp. 55–57.

Red Top

By E. W. Grove

LOCATION: (56° 129° S.W.) North side of Bear River Pass, about 20 miles northeast of Stewart.

CLAIMS: Sixteen claims including the Crown-granted Red Top, Superior, Amazon, Hector, and Foothill.

ACCESS: By road from Stewart.

OWNER: Crest Metals Limited.

OPERATOR: United Asbestos Corporation, Limited, 911, 1155 Dorchester West, Montreal, P.Q.; J. Koski, project geologist.

METALS: Copper, silver.

WORK DONE: A topographic map at a scale of 1 inch equals 400 feet was made. The Copper adit at elevation 2,750 feet and the Silver adit at elevation 3,760 feet were surveyed and a geological outcrop map was prepared of the immediate areas. Eight AQ-size core holes totalling 1,996 feet were drilled. Seven of the eight holes were drilled in the vicinity of the Copper adit, while the eighth was placed to the west to explore the Erickson copper zone.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1925, 1927–29, 1967, p. 36; *Geol. Surv., Canada,* Mem. 175, pp. 141–143.

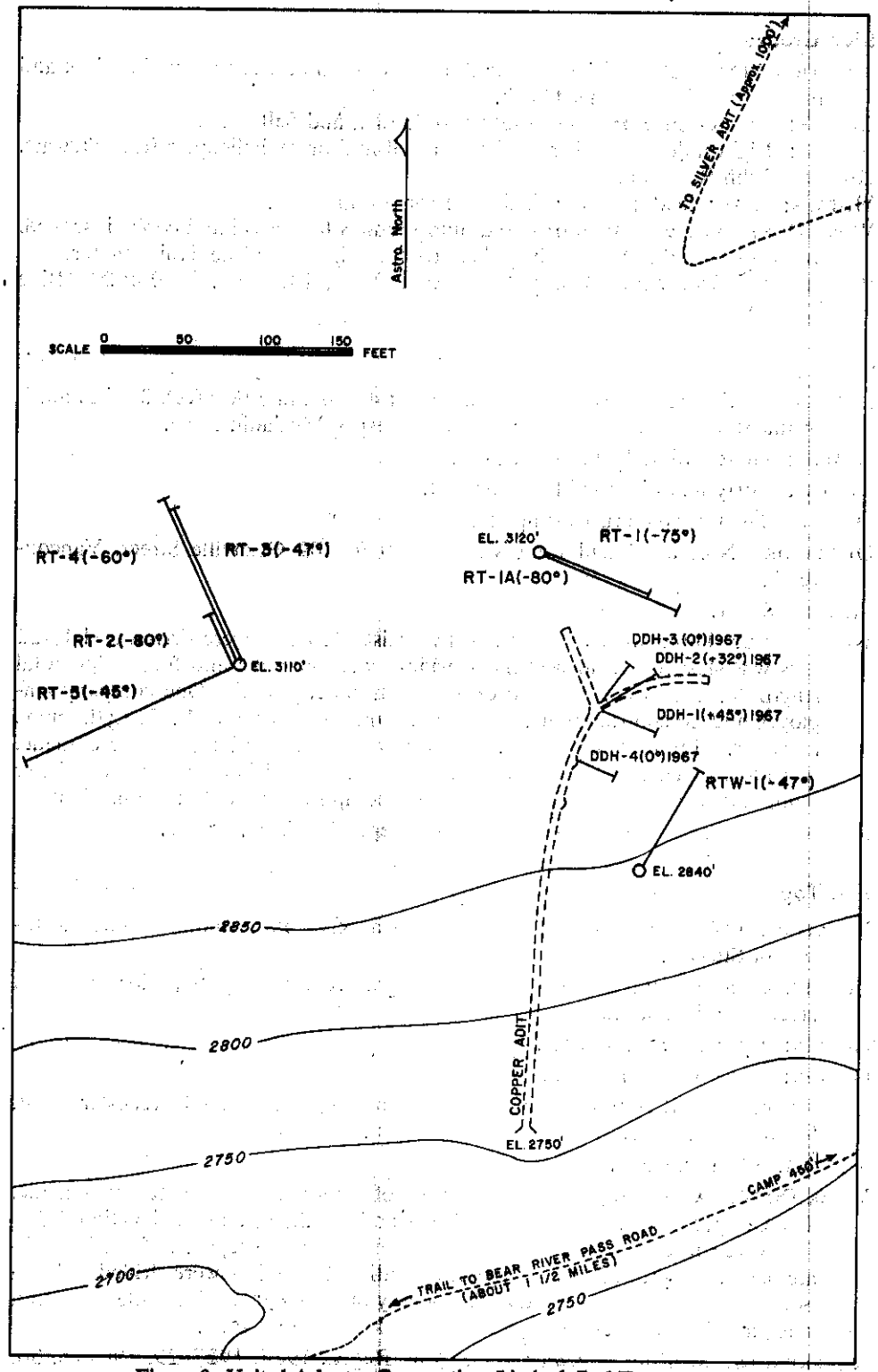


Figure 9. United Asbestos Corporation, Limited, Red Top property, diamond-drill holes in the vicinity of the Copper adit.

DESCRIPTION:

Mineralization at the Red Top property in the Copper zone consists of pyrite, minor chalcopyrite, and sphalerite disseminated along a dark siltstone, acidic volcanic contact. Rocks in this contact area comprise rusty or pyritic flows, breccias, and epiclastics, with thin interealated siltstones. Drill-hole results in the Copper adit area suggest several cupriferous pyritic horizons within the flat to undulating bedding sequence. However, a number of closely spaced northwesterly faults have disrupted continuity. Rocks in the Silver adit area also consist of mixed acidic to intermediate volcanics, fragmentals, and minor sediments typical of the upper Hazelton Assemblage volcanics exposed in the Bear River Pass section. Mineralization in the 400-foot-long Silver adit quartz-carbonate vein is galena, sphalerite, pyrite, and chalcopyrite. The narrow vein which trends north-northwest is cut by closely spaced northwest faults. Northwest-trending basic dykes are common in the area and form a conspicuous swarm along the east limits of the property.

In the Bear River Pass area, country rock is generally well exposed, especially on the steep south side, where up to 5,000 feet of section is visible in shear cliff walls. The north wall of the pass is less grand, having a number of breaks which decrease the slope. Gossans are visible from the road most of the way through the pass, and a number of these have had considerable exploration work in the past. All these known gossans or mineralized zones appear to lie at or within a thick mixed volcanic-sediment zone which marks the local transition between essentially volcanic Hazelton rocks and the overlying marine Bowser assemblage. Pyritic mineralization, some with associated copper, lead, zinc, and silver minerals, generally appears most prominent within sedimentary (and tectonic) breccias (and shears) within the transition zone sediments. Epidote, chlorite, and carbonate alteration is common, and pyrrhotite is present locally as replacement lenses. Structural features, such as fractures, faults, vary within the formations, depending on the rock composition and competency. Outside the pass section, the mineral-bearing transition zone is hidden beneath Bowser sediments, ice, and snow, except where the succession is incised by deep stream erosion.

Little Joe, Gypsy, Lucky Seven

By E. W. Grove

LOCATION: (56° 129° S.W.) South side of Glacier Creek at elevation 2,400 feet about 2 miles east of the Bear River road.

CLAIMS: Total of 17 claims including the key Little Joe, Gypsy, and Lucky Seven.

ACCESS: From Stewart by helicopter or by road and foot-trail.

OWNER: Starbird Mines Ltd.

OPERATOR: Granduc Mines, Limited, 520, 890 West Pender Street, Vancouver 1.

METALS: Lead, zinc, silver, gold.

WORK DONE: Three men, supervised by E. Ostensoe, chief geologist, Granduc Mines, Limited, were employed in reopening the lower adit at elevation 2,400 feet. The drift was mapped at the scale 1 inch equals 50 feet.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1910, pp. 71–75; 1913, pp. 90–92; *Geol. Surv., Canada,* Mem. 175, p. 136.

DESCRIPTION:

Mineralized veins on the property lie within thin-bedded dark siltstones and greywackes of the Bowser assemblage, which overlie volcanic epiclastics of the Hazelton assemblage. The sediments have been intensely folded and deformed, and intruded by a number of plutons and dyke swarms. The veins have been injected into extensive fractures localized near the contact between the Bowser and Hazelton

assemblages apparently controlled by underlying intrusions. The fracture system was referred to as the Portland Canal fissure zone in the old publications.

The main vein was developed by three adits connected by raises. The concentrator constructed near the mouth of Glacier Creek received 7,000 tons of ore during 1911 by aerial tram from the 2,400-foot level adit and produced 2,000 tons of concentrate. The ore averaged 0.12 to 0.30 ounce gold, 5 to 25 ounces silver, 2.5 to 12 per cent lead, and minor variable zinc.

Two oreshoots averaging 5 feet in width were mined from a quartz breccia vein which averaged 8 feet wide and was traced on surface for about 2,000 feet. Both oreshoots were essentially flat-lying pods confined to narrow portions of the main vein. Sulphide mineralization in the quartz breccia consisted primarily of pyrite with minor galena and sphalerite.

Like other similar veins in this zone, the vein has a sinuous swelling shape and is cut or bounded by later thin hornblende diorite (lamprophyre) dykes.

Periodic Drainage of Glacier-dammed Summit Lake

By E. W. Grove

Summit Lake from November 10 to 13, 1968, again drained beneath the Salmon Glacier, for the fourth time since 1961. The lake had partly filled during the brief summer when heavy rain and early snow in September and October raised the lake water to a level which triggered the drainage phenomenon. Although high, the water level was well below the previous marks recorded prior to previous outbursts. Obviously at present, water pressure plays a dominant role in the action. Again the Salmon River rose about 8 feet above normal, but road and local damage was largely averted.

Changes in the local macroclimate have been substantial in the last 90 years, as evidenced by such events as the shrinking of local glaciers, the formation and drainage of Tide Lake, and now the events which are leading to the extinction of Summit Lake.

Evidence gathered during the summer of 1968 suggests that even more drastic climatic reversals have occurred within the last 1,500 years.

Pieces of tree trunks frozen into one of the glaciers north of Tide Lake Flats were recovered from the ice at an elevation of 2,500 feet. A section of one tree submitted to the Federal Forestry Laboratories was identified as a yellow cedar about 120 years old. Special studies performed on the wood indicated the tree had been buried in fresh water for about 500 years and then frozen into glacial ice for a subsequent 500 to 1,000 years.

Although at present yellow cedar grows only on the coast near sea-level, it is suggested that at one time yellow cedar grew well inland at a fairly high elevation where only moss and scrub brush are now found. In the past 1,500 years the climate has apparently cooled considerably; glaciers were formed and are now receding as part of complex glacial-interglacial events.

As an adjunct to continuing glaciological research in the Unuk-Bowser area, specimens of ice worms have been collected from ice over a wide portion of the district. These have been identified as *Mesenchytræus solifugus,* but specific varieties are so far unnamed and await detailed research. They abound in portions of the major ice areas in the region, specifically the Cambria and Frankmackie snowfields. Generally they are black or brownish-black, have a distinct earthworm-like appearance, and commonly attain a length of one-half to three-quarters of an inch, rarely exceeding 1 inch. They have been seen most commonly in surface sinkholes in the ice and along meltwater channels where the ice and water are mainly clear

and free of rock debris. They have been found in these locations in bright summer sun and have been seen to leave their ice channels and move onto clean glacial ice surfaces in direct sunlight. This environment appears to exist best in the 2,500- to 3,500-foot elevation range of the glaciers, and gentle north ice slopes appear to be preferred. Ice worms also have been found at lower elevations (1,500 to 2,500 feet) in the glacier toe areas, living at least 1½ to 2 feet under the ice surface. Like their life cycle, the ice worms' diet is largely unknown; however, micro-organisms such as " red snow " may play a part and additionally there may be vitamin A dissolved in the ice water.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1965, pp. 48–49; 1967, pp. 38–40.]

OBSERVATORY INLET

ANYOX

CD, CU By B. W. Grove

LOCATION: (55° 129° S.W.) Anyox—the work area is one-half mile east of the main dam on Falls Creek between 800 and 1,200 feet elevation.

CLAIMS: One hundred and twenty-one claims including the CD, CU, and Sunshine groups of located claims and mineral leases Nos. 115, 129, 192, 196.

ACCESS: By boat or float-plane from Prince Rupert.

OWNER: Arcadia Explorations Ltd., 1325, 925 West Georgia Street, Vancouver 1; J. T. Williamson, president.

METALS: Copper, iron.

WORK DONE: Camp construction, drilling and blasting 32 ERT and E size core holes totalling 1,230 feet. Work during the 1968 season was supervised by J. T. Williamson.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 40.

DESCRIPTION:

The main mineralized areas on which work was done in 1968 were found during the 1967 field season. Outcrop in the general area is relatively abundant and overburden is thin except in swamp. Like most of the Anyox area, tree cover is virtually absent and light brush provides the main vegetation cover.

Country rock on the immediate property includes altered amphibolite-grade andesitic pillow volcanics and broken pillow breccias. These rocks underlie thin-bedded dark Bowser assemblage siltstones which outcrop immediately to the south and east of the Arcadia area. The main synclinal structure of the country rocks and the occurrence of most known mineral deposits in areas at or near the pillow volcanic siltstone contact has been described in a previous report (Ann. Rept., 1965, pp. 57–61).

Mineralization uncovered so far consists of massive to disseminated pyrrhotite, pyrite, and chalcopyrite confined largely to altered quartz-biotite schist zones within the volcanics. The mineralized alteration zones appear to be steep lens-like bodies apparently trending east. A north-trending shear system may control localization of the mineralized zones, but this remains to be confirmed. To date the mineralized area has an apparent extent of at least 800 feet, with the top or Hillside showing at elevation 950 feet. The first known galena mineralization in this area was found in 1968 just south of the Hillside area at about elevation 1,150 feet. This consisted of a steeply dipping, leached quartzose zone trending about north 80 degrees east lying entirely within altered pillow volcanics. The need for careful, thorough prospecting has been well illustrated by these recent discoveries in this old mining camp.

ALICE ARM

Ace, Galena

By N. C. Carter

LOCATION: (55° 129° N.W.) Twenty-one miles north of Alice Arm, east of the Kitsault River, between elevations of 1,500 and 3,000 feet.

CLAIMS: Eleven recorded claims including the Ace 1 to 10 and the Galena.

ACCESS: By helicopter from Alice Arm or by road and trail 4 miles from the old Torbrit camp.

OWNER: Silver Butte Mines Ltd., 705, 850 West Hastings Street, Vancouver 1; R. L. Roscoe, consulting engineer.

METAL: Silver.

WORK DONE: Three holes totalling 680 feet were drilled near a surface cut exposing high-grade mineralization on the Ace No. 2 claim. An area underlain by a soil anomaly at 2,600 feet was tested by seven holes totalling 829 feet. The major showings were surveyed and some geophysical work was done with a Ronka EM16. An average crew of four men was employed for four months.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1951, pp. 91–93; 1963, p. 12; 1964, p. 45; 1967, p. 42.

DESCRIPTION:

The property was originally located as the Tyee group in 1929. Showings of high-grade galena yielding good silver values on the south side of Bluebird Creek were explored by a series of open cuts and a few short adits between 1930 and 1934. In 1946 the claims were relocated as the Galena group. In 1951 Transcontinental Resources Ltd. did some trenching and drilled eight holes before dropping its option on the claims. The ground was subsequently relocated as the Ace and Galena claims, and Silver Butte Mines Ltd. acquired the ground in 1963. In that year and the following year, 1,500 feet of drilling was done. Prospecting in 1967 uncovered a zone yielding high silver values in the vicinity of an old surface cut on the Ace No. 2 claim.

The area of the claims is underlain by light- to dark-grey thinly bedded tuffs, volcanic sandstones, greywackes, and siltstones which overlie and are locally interbedded with massive red and green tuffs and breccias. The stratified rocks strike north to northeast with uniformly moderate dips to the west. Basic dykes, including fine-grained andesites and diorites, and post-dating the period of mineralization, cut the sedimentary and volcanic rocks.

Bluebird Creek follows the southern part of a northeast-striking fault, the surface expression of which is a prominent linear feature extending from the Kitsault River to Kitsault Lake, a distance of 2 miles. Following this fault continuously between 2,100 and 3,200 feet elevation is a quartz-breccia vein, usually between 25 and 40 feet wide, but locally as wide as 70 feet, and dipping northwest at moderate angles (*see* Fig. 10). Indications of similar vein material have been observed farther northeast along the same break. The vein, known locally as the Bluebird vein, consists mainly of medium-grained allotriomorphic quartz and minor interstitial feldspar and one-quarter to one-half inch angular fragments of grey crystal tuff. The vein is only sparsely mineralized with pyrite. Slickensided chloritic selvages of wallrock on the footwall side of the vein indicate late strike-slip movement.

The principal showings are within 50 feet of the footwall of the Bluebird vein and are exposed in a series of trenches between 2,300 and 2,600 feet altitude (*see* Fig. 10). Stringers of massive fine-grained galena, with rounded ¼- to 1-inch rock fragments, cut light-grey bleached tuff which contains abundant disseminated pyrite. Silver content is directly proportional to the amount of lead, and zinc is present only in very minor amounts (Black, 1951, p. 93). Although mineralization was en-

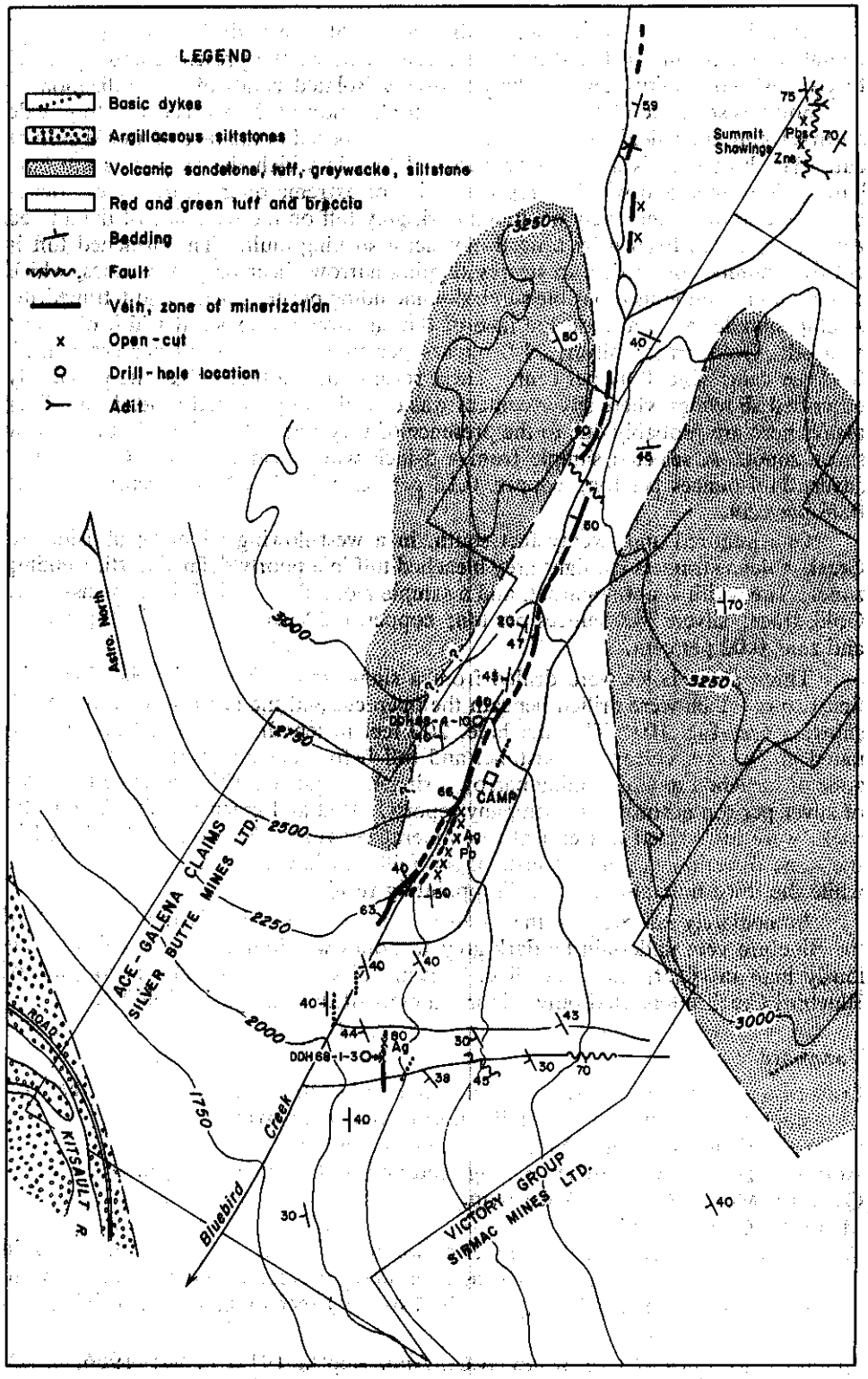


Figure 10. Silver Butte Mines Ltd., geology of the Ace-Galena claims.

countered in several trenches over a distance of 500 feet, drilling by Transcontinental Resources in 1951 and in more recent years by the present company failed to establish continuity between the apparently isolated zones of mineralization.

Southwest of the above showings at an elevation of 2,150 feet, a 4-foot-wide north-striking zone yielding good silver values is exposed in the face of an old surface cut. The host rock is a light-grey bleached tuff, in which the fragments are only barely discernible and which is representative of extreme quartz-carbonate-sericite-pyrite alteration. Relatively unaltered dark-grey tuff on the west side of the altered zone is separated from it by a north-northeast-striking fault. The bleached tuff is cut by a number of vertical to steeply dipping narrow shear or gouge zones, which contain minor amounts of visible sulphides, including pyrite, galena, and tetrahedrite. A chip sample taken around the face of the cut over the exposed width of 4 feet assayed: Gold, trace; silver, 31.0 ounces per ton; copper, 0.20 per cent; lead, 0.64 per cent; zinc, 0.04 per cent. These results suggest that unlike the previously described showings where silver content was directly proportional to lead, the silver assays here are probably due to the presence of very fine native silver in the narrow shear zones. A selected sample from a 5-inch wide shear assayed: Gold, trace; silver, 34.4 ounces per ton; copper, 0.18 per cent; lead, 0.32 per cent; and zinc, 0.06 per cent.

One hundred and twenty feet south, in a west-flowing tributary of Bluebird Creek, galena stringers cut light-grey bleached tuff in a poorly defined north-trending zone. The width is not apparent, and a sample along the trend of the zone assayed: Gold, trace; silver, 28.0 ounces per ton; copper, 0.22 per cent; lead, 6.0 per cent; and zinc, 0.02 per cent.

Three angle holes were drilled from a single set-up below the showings, the first two of which were drilled beneath the open cut and the third beneath the creek showing (*see* Fig. 10). The first hole, 200 feet in length, intersected thinly laminated greywacke, volcanic sandstone, and tuff before encountering a 29-foot-wide zone of bleached tuff containing narrow stringers of galena, which assayed 6 ounces of silver per ton according to company reports. Red and green massive fragmental rocks were intersected just east of the mineralized zone. A second hole, drilled in the same direction but at a steeper angle, failed to intersect the mineralized zone, while the third hole also yielded disappointing results.

Immediately northeast of the camp (*see* Fig. 10) an area near the footwall of the Bluebird vein underlain by dark-grey siltstones was found to have soils anomalously high in silver, lead, and zinc. Seven holes collared on the north side of Bluebird Creek intersected only minor amounts of disseminated sulphides.

Vanguard

LOCATION: (55° 129° N.W.) At elevations of 2,400 to 3,300 feet on the west slope of Kitsault Valley 20 miles north from Alice Arm.

CLAIMS: Vanguard, Nero, Nimrod, Highland Boy, etc.

ACCESS: Twenty-one miles by mining road and trail from Alice Arm.

OWNER: Morris Petersen, Alice Arm.

METALS: Copper, gold.

WORK DONE: The property was under option to Canex Aerial Explorations Ltd. in 1966, at which time an electromagnetic survey was made and soil samples were taken for geochemical analysis. In 1968, 10 feet of additional driving was done underground.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1912, p. 99; 1966, p. 42; Assessment Report No. 956.

Wolf

LOCATION: (55° 129° N.W.) Twenty miles north of Alice Arm at elevations of 900 to 2,000 feet.

CLAIMS: The Wolf 1 to 3 Crown-granted mineral claims are part of the 73-claim Dolly Varden group. These claims straddle the Kitsault River 20 miles north of Alice Arm.

ACCESS: By road and mining trail from Alice Arm.

OWNER: Dolly Varden Mines Ltd., 304, 1033 West Pender Street, Vancouver 1; G. Aaltonen, manager.

METALS: Silver, lead, zinc.

WORK DONE: A topographic map was made and eight holes having a total length of 320 feet were percussion drilled. A crew of 12 company employees and six contractor employees spent three months on the property under mine superintendent W. Maki. Rehabilitated roads were improved and part of the Torbrit camp was rehabilitated. An adit was driven 100 feet on the Wolf 2 claim.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, p. 42; 1967, p. 41.

Tiger

LOCATION: (55° 129° N.W.) Between elevations of 1,100 and 2,500 feet on Tiger Creek, a west-flowing tributary of the Kitsault River, 18 miles north of Alice Arm.

CLAIMS: The Tiger group of three Crown-granted claims, Lots 3613 to 3615.

ACCESS: By trail from Kitsault Valley road.

OWNER: The Anaconda Company (Canada) Ltd.

OPERATOR: Silver Butte Mines Ltd., 705, 850 West Hastings Street, Vancouver 1.

METAL: Silver.

WORK DONE: Three men were employed for three weeks in September. Old workings, including three adits and surface cuts, were found and sampled.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 101–102.

Esperanza

By N. C. Carter

LOCATION: (55° 129° N.E. and S.E.) One mile north of Alice Arm, west of the Kitsault River between elevations of 400 and 1,500 feet.

CLAIMS: Esperanza group, mineral lease M71, including Black Bear (Lot 1071), Aldebaran (Lot 1072), and I'll Chance It Fraction (Lot 1073), plus nine recorded Lori claims.

ACCESS: By road and trail from Alice Arm.

OWNER: Lori Explorations Ltd., 609, 850 West Hastings Street, Vancouver 1.

METALS: Silver, gold. (Recorded production 1911 to 1948: Tons shipped, 4,987; gold, 257 ounces; silver, 143,115 ounces; copper, 2,623 pounds; lead, 13,303 pounds.)

WORK DONE: Open cutting and prospecting above No. 1 adit on the Esperanza property.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1947, pp. 92–94; *Geol. Surv., Canada*, Mem. 175, pp. 62–65.

Dollar Bill

By N. C. Carter

LOCATION: (55° 129° N.E.) At 3,800 feet elevation on the northeast slope of Tsimtol (Haystack) Mountain, 7 miles northwest of Alice Arm.

CLAIMS: Four recorded claims, Dollar Bill 1 to 4.

ACCESS: By helicopter from Alice Arm.

OWNERS: D. Collison and A. D. York, Alice Arm.
METALS: Silver, lead, zinc.
WORK DONE: Open cuts along vein.
DESCRIPTION: The principal showing is a 3-foot-wide quartz vein in a bedding-plane shear in interbedded black siltstones and brown pebble conglomerate. The vein, striking northwest and dipping 45 degrees to the southwest, can be traced for several hundred feet along the steep mountainside and is apparently barren of mineralization except for a 20-foot section near its southern end, where it is cut by a narrow northeast-striking biotite lamprophyre dyke. There, mineralization consists of near-massive lenses of fine-grained pyrite and arsenopyrite with some galena and sphalerite. A chip sample across a 3-foot width assayed: Gold, trace; silver, 0.4 ounce per ton; copper, 0.05 per cent; lead, 0.37 per cent; zinc, 0.15 per cent.

LaRose, Speculator No. 2, Bunker Hill By N. C. Carter

LOCATION: (55° 129° N.W.) East slope of Tsimtol (Haystack) Mountain, at an elevation of 2,000 feet, 6 miles northeast of Alice Arm.
CLAIMS: Contiguous claim groups, including from north to south: LaRose group—mineral lease M92 consisting of four reverted Crown-granted claims, Lots 4245 to 4247 and 4249; Speculator No. 2—Crown-granted claim, Lot 886; Bunker Hill group—seven Crown-granted claims, Lots 927 to 929 and 5806 to 5809.
ACCESS: Logging-roads extend from the Kitsault River road to an elevation of 1,000 feet. From this point, an old trail, one-half mile long, leads to the LaRose adit at an elevation of 1,960 feet.
OWNERS: LaRose group (mineral lease M92), Mrs. Barbara Crossley, 837 West Hastings Street, Vancouver 1; Speculator No. 2 and Bunker Hill Crown-granted claims, E. A. Trethewey, 837 West Hastings Street, Vancouver 1.
OPERATOR: E. A. Trethewey, 837 West Hastings Street, Vancouver 1.
METALS: Silver, lead, zinc. (Recorded production between 1918 and 1927: Ore shipped, 74 tons; gold, 15 ounces; silver, 15,993 ounces; lead, 4,383 pounds; zinc, 3,576 pounds.)
WORK DONE: Two men were engaged for a week brushing out the trail and reopening underground workings on the LaRose property. Later in the season, four men spent three days prospecting and locating old showings.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1916, p. 63; 1919, pp. 50–51; 1923, pp. 56–57; 1925, pp. 74–75; 1928, pp. 84–85; 1929, p. 85; *Geol. Surv., Canada,* Sum. Rept., 1928, Pt. A, p. 39; *Geol. Surv., Canada,* Mem. 175, p. 69.

DESCRIPTION:

Silver mineralization was discovered on the steep east slope of Tsimtol (Haystack) Mountain prior to 1916. The LaRose quartz-breccia vein, which occurs along a prominent north-south depression at an altitude of 2,100 feet, was originally explored by a shallow inclined shaft. Some ore was shipped in 1918 and 1919, and in 1920 the Alice Arm LaRose Mining Company was incorporated. In 1925 a crosscut adit was driven in a southeasterly direction toward the shaft from a point 125 feet vertically below it. The vein was intersected 350 feet from the portal and drifts were driven north and south. According to old reports, the best mineralization was encountered in raising between the south drift and the shaft. Ore was shipped in 1926 and 1927, but since that time the property has remained idle.

The area of Tsimtol Mountain covered by the claims is underlain by thinly laminated dark-grey to black colour-banded siltstones which are locally interbedded

with massive reddish-brown greywackes. The sedimentary rocks strike northwest and dip moderately to steeply northeast. The LaRose quartz-breccia vein is on the west side of the prominent north-south gully at an elevation of 2,100 feet. The gully is the surface expression of a shear zone, which, near the LaRose shaft, is nearly parallel to the stratification, striking slightly west of north and dipping east at 75 degrees. The vein is between 1 and 2 feet wide and follows the shear zone separating footwall reddish greywackes from hangingwall fractured and iron-stained black siltstones. Post-vein movement along the shear zone is indicated by a north-east-striking post-vein hornblende lamprophyre dyke apparently cutting footwall rocks only. An old report (Ann. Rept., 1929, p. 85) indicated fair silver values in footwall greywackes which contain finely disseminated pyrrhotite and magnetite. A random sample taken by the writer assayed: Silver, 0.3 ounce per ton; copper, 0.01 per cent; lead, 0.04 per cent.

Good specimens of vein material can be found on the dump of the crosscut adit. Fragments of siltstone, one-half to 1 inch in size, are contained in milky-white quartz, along with fine- to medium-grained metallic minerals including, in decreasing order of abundance, pyrite, arsenopyrite, galena, sphalerite, tetrahedrite, silver sulphides, and flaky native silver on fractures.

The crosscut is in fair condition. Drifts north and south on the shear zone and vein are in poor condition, particularly the south drift, from which a raise was driven to the bottom of the shaft. The vein underground follows a bedding-plane shear, striking northwesterly and dipping 60 degrees northeast. Length of the vein in the south drift is difficult to determine, but in the north drift it extends 10 feet from the crosscut, where it apparently pinches out. A chip sample across a width of 1 foot taken from the vein at the junction of the north drift and the crosscut assayed: Gold, trace; silver, 22.6 ounces per ton; copper, 0.03 per cent; zinc, 0.01 per cent.

The Speculator No. 2 claim is 1,600 feet south of the LaRose shaft. The principal showing is a quartz-breccia vein adjacent to the same gully as the LaRose vein. The vein, which dips steeply east, was explored by an inclined shaft sunk near the northeast corner of the claim in 1926. The shaft is now caved. A grab sample from the dump of vein material, consisting of quartz with angular siltstone fragments and pyrite, galena, and sphalerite, assayed a trace of silver.

The Bunker Hill showings were not visited. According to old reports, they are 4,000 feet south-southwest of the LaRose workings in a tributary of LaRose Creek at an elevation of 2,000 feet. The showings are reported to consist of a north-striking quartz vein which contains pyrite, galena, and sphalerite and follows a shear zone in siltstones.

Roundy Creek

By N. C. Carter

LOCATION: (55° 129° S.E.) South of Alice Arm, on Roundy Creek, 1¼ miles from tidewater.

CLAIMS: Fifty claims including the Lee group of 34 claims, eight CJ claims, five Roundy claims, three DM claims.

ACCESS: By road from Kitsault, a distance of 2½ miles.

OWNER: Sileurian Chieftain Mining Company Limited, 846 West Hastings Street, Vancouver 1.

METAL: Molybdenum.

WORK DONE: All work was done in the Sunshine Creek area and included soil-sampling and the drilling of 19 holes totalling 3,227 feet.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1964, pp. 36–39; 1965, pp. 62–63; 1966, p. 48; 1967, p. 43.

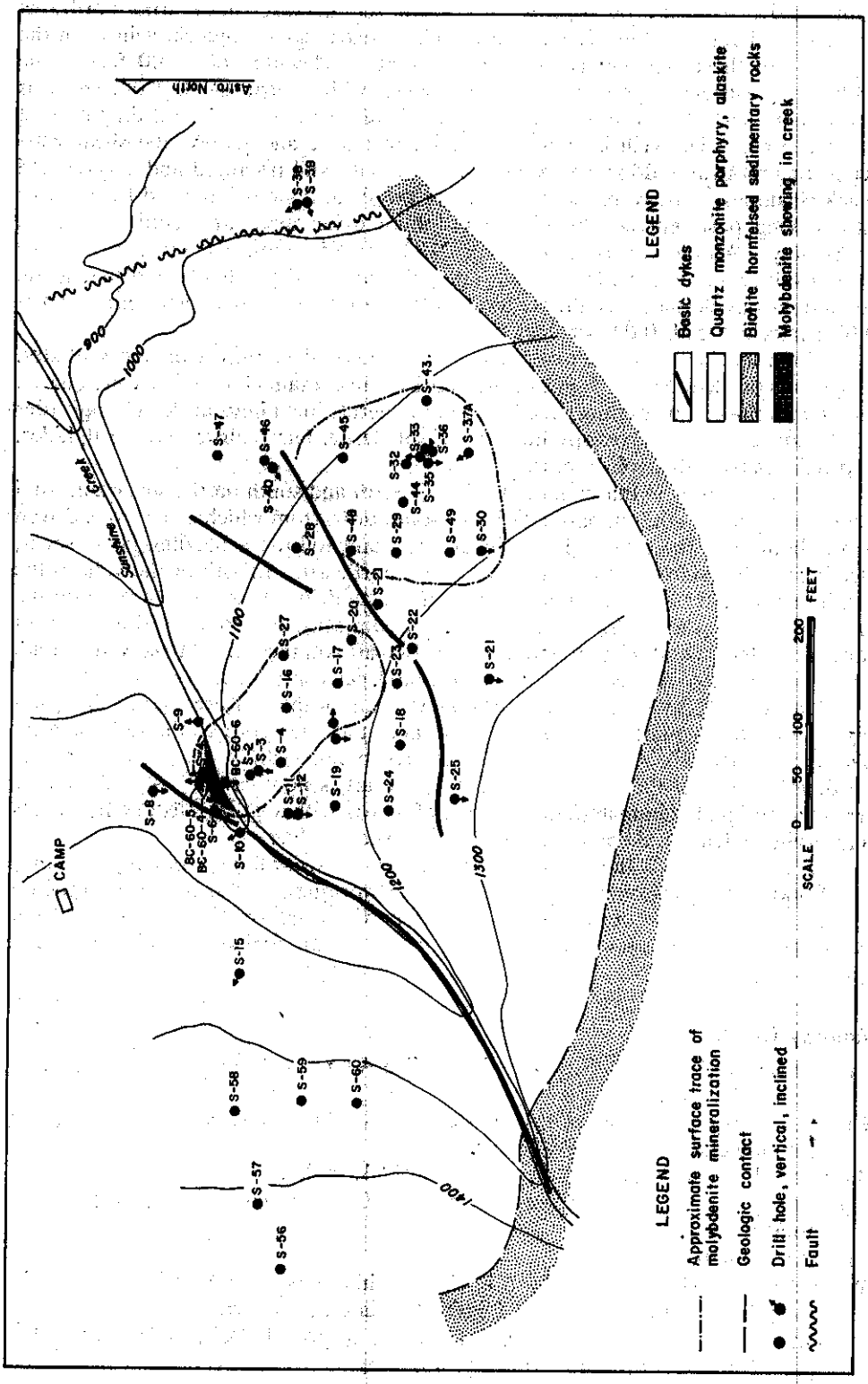


Figure 11. Silurian Chieftain Mining Company Limited, sketch showing positions of diamond-drill holes on Sunshine Creek.

DESCRIPTION:

The locations of holes drilled by the company in the Sunshine Creek area between 1965 and 1968 are indicated on Figure 11. Also included are holes drilled by Southwest Potash Corporation in 1960 and by Bethex Explorations Ltd. in 1967.

An area south of Sunshine Creek, between elevations of 1,100 and 1,200 feet, includes two zones of molybdenite mineralization apparently separated by a fault, now marked by a basic dyke (*see* Fig. 11). Within these zones are sections of relatively high-grade molybdenite, similar to the showing exposed in the creek from which assays as high as 2 per cent molybdenite were obtained (*see* Ann. Rept., 1964, p. 39). Drilling in 1968 began with hole 2-45, and seven holes were drilled to define the limits of the southern mineralized zone. Molybdenite in this area occurs as selvages along quartz veinlets, and as disseminations and irregular lenses in leucocratic quartz monzonite porphyry and fine-grained alaskite. Biotite-bearing phases of the intrusive are notably deficient in mineralization. Sections of brecciated quartz monzonite and alaskite were noted in which half-inch angular fragments are cemented by a fine-grained mixture of quartz, chlorite, carbonate, sericite, and molybdenite.

Four holes were drilled to test a geochemical and geophysical anomaly 800 feet north of the area shown on Figure 11. Results indicated a screen of hornfels sedimentary rocks within the boundaries of the stock. Drilling to test a similar anomaly along the northwest segment of the stock yielded negative results. Late in the season, the drill was moved to an area 3000 feet southwest of the camp to test a geochemical anomaly (*see* Fig. 11). Five holes were drilled prior to the suspension of operations due to weather in late November, and the company reported intersections of good grade molybdenite similar to that found south of Sunshine Creek.

British Columbia Molybdenum Mine

By H. Bapty

LOCATION: (55° 129° S.E.) The mine is 5 miles south of Alice Arm post office, at about 2,000 feet elevation on the southeast fork of Lime Creek.

CLAIMS: One hundred and forty-three recorded mineral claims, of which the key mining claims are Patricia 1 to 5. The property has previously been called the Alice.

ACCESS: From Prince Rupert by boat or float-plane. Local freight is handled by coastwise shipping and off-loading to barge at Alice Arm. All other freight, supplies, and the shipping of concentrate are done by barge from Vancouver.

OWNER: British Columbia Molybdenum Limited, 801, 402 West Pender Street, Vancouver 3; mine office, Kitsault; C. T. Penney, general manager; J. H. Foreman, general superintendent; A. E. E. Mitchell, mine superintendent; C. B. Smith, mill superintendent; R. D. Cowper, services superintendent.

METAL: Molybdenum (*see* Table 12 for production).

WORK DONE: Ore shipped or treated, 2,147,994 tons; waste mined, 4,632,094 tons; diamond drilling, 1,294 feet. During the year the single men's camp was moved from the mill-site to the townsite near the waterfront of Alice Arm. At the townsite 15 additional prefabricated homes were added for a total of 44; there are also some employee-owned mobile trailer homes. Electrical installations made during 1968 consisted of replacing the 30-horsepower motors on the secondary screens with 40-horsepower motors, replacing the No. 6 20-horsepower conveyor motor with a 40-horsepower, and increasing the horsepower of the dust-collecting system in the secondary crusher to 100 horsepower.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1964, pp. 30–36; 1967, p. 47.

Plate IA. Granduc mine, looking south to mill under construction and portal of Granduc tunnel in June, 1968.

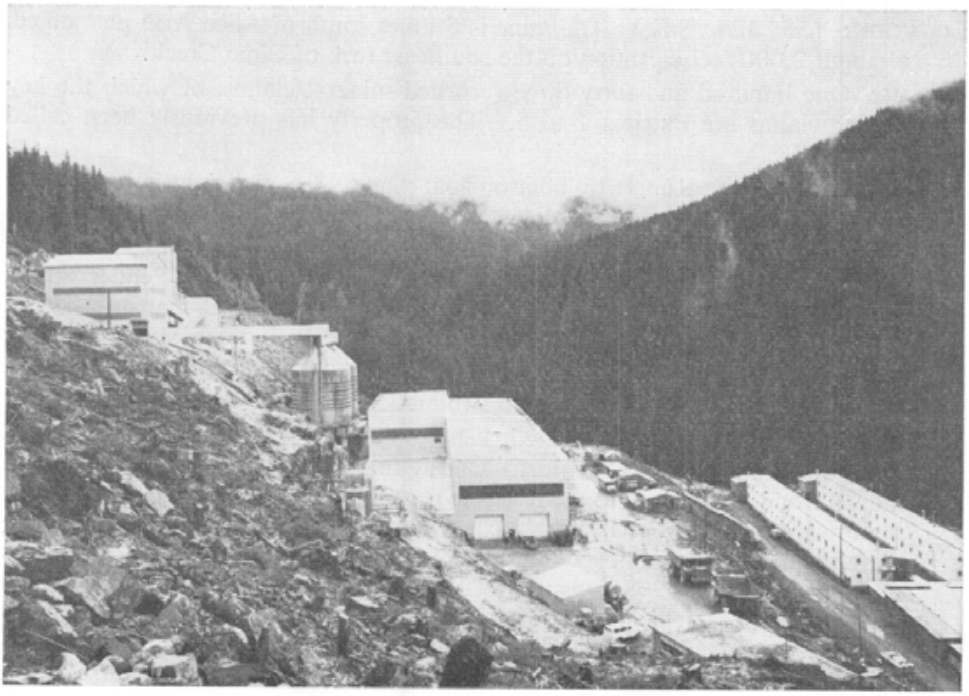


Plate IB. British Columbia Molybdenum Limited, concentrator at Lime Creek.

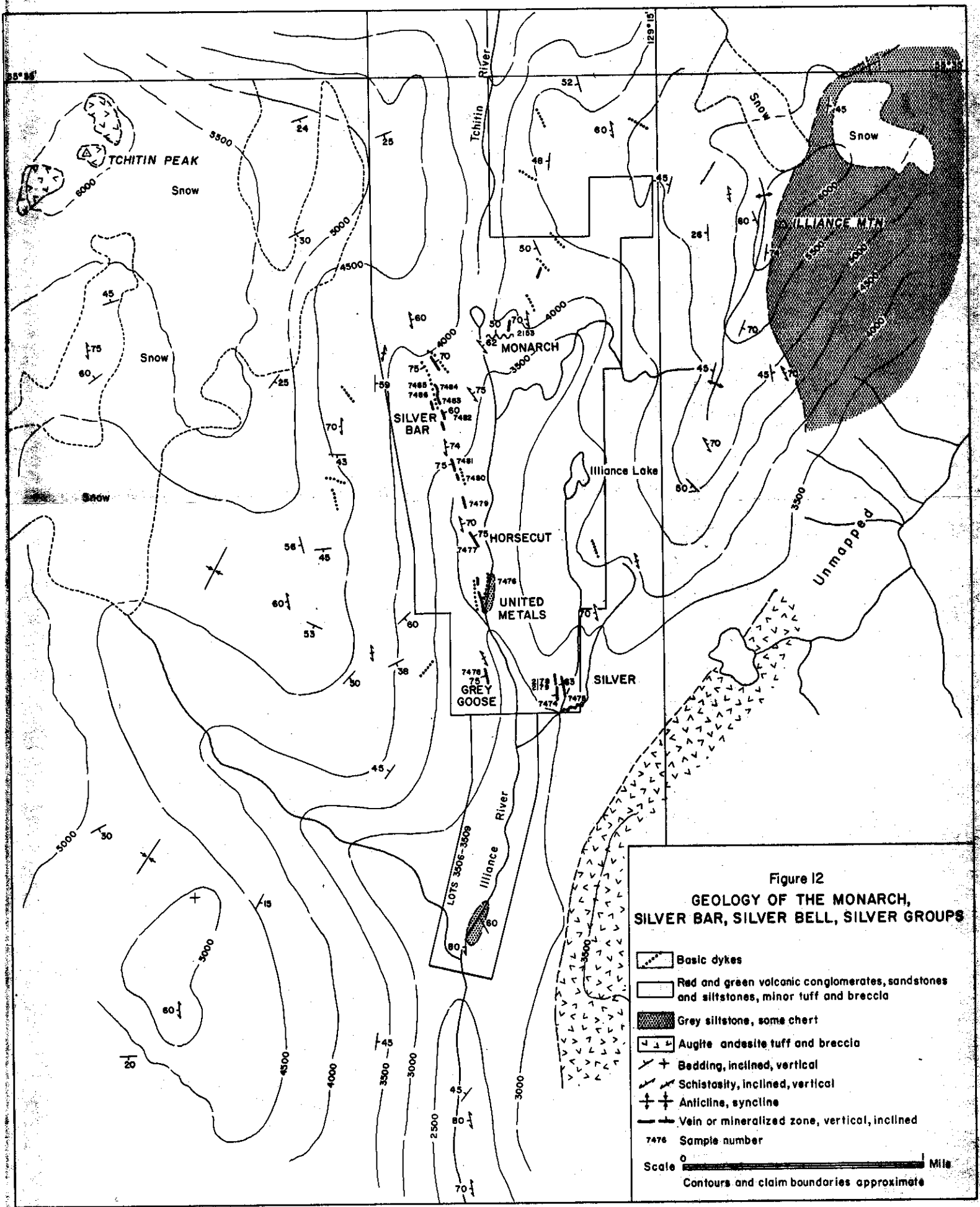


Figure 12

GEOLOGY OF THE MONARCH, SILVER BAR, SILVER BELL, SILVER GROUPS

Verona, Basin, Theda Bara, Silver Bow, Sunset, Lori By N. C. Carter

LOCATION: (55° 129° S.E.) Five miles south of Alice Arm, near the headwaters of Roundy Creek, between elevations of 2,500 and 3,500 feet.

CLAIMS: Reverted Crown-granted claims, now mineral leases M91 (Lots 4076 to 4083), M93 (Lot 3190), M94 (Lot 3189); Lori group of 17 recorded claims.

ACCESS: By helicopter from Alice Arm.

OWNER: Lori Explorations Ltd., 609, 850 West Hastings Street, Vancouver 1.

METALS: Silver, gold, copper, lead, zinc.

WORK DONE: General prospecting and some blasting on the Verona vein.

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

Monarch, Silver Bar, Silver Bell, Silver, Etc. By N. C. Carter

LOCATION: (55° 129° N.E.) Thirteen miles east of Alice Arm, at the headwaters of the Illiance River, between elevations of 3,000 and 4,000 feet.

CLAIMS: Thirty-eight recorded claims, including Monarch, 6 claims; Silver Bar, 10 claims; Silver Lot claim; Silver Bell claim; Grey Goose claim; Silver, 3 claims; Pork Chop group, 12 claims; Ponder group, 4 claims; also 2 Crown-granted claims, Lots 3508 and 3509.

ACCESS: By helicopter from Alice Arm.

OWNER: Gunn Fiva, of Alice Arm, and Stanley Uruski, of Courtenay.

OPERATOR: Ponder Oils Ltd., 806 Lancaster Building, Calgary 2, Alta.

METALS: Silver, lead, zinc.

WORK DONE: Thirty-one holes totalling 2,899 feet were diamond drilled. Some hand-trenching was done and surface workings were mapped by plane-table. Four men were employed for three months under the supervision of J. S. Falconer.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1965, pp. 66–68; 1967, pp. 49–50.

DESCRIPTION:

Recent descriptions of most of the individual mineral showings are contained in the Minister of Mines and Petroleum Resources Annual Reports for 1965 and 1967. Several days during the 1968 field season were spent traversing the area shown on Figure 12 and examining drill core recovered by Ponder Oils Ltd. during the past two field seasons.

The accompanying sketch-map (Fig. 12) illustrates the regional geology and the locations of the known mineral deposits. The map should be regarded as preliminary. Since no accurate topographic maps are available for this area, the topography shown is based mainly on elevations obtained by the writer during the course of geological traverses run east and west of the Illiance River. A forest-inventory planimetric map showing drainage and air-photo centres provided a base for plotting.

Early access to the area was by horse-trail up the Illiance River from Alice Arm. Most of the showings had been located by 1916, and considerable prospecting and development work were done during the 1920's. From 1930 the area was dormant until 1951, when Transcontinental Resources Ltd. optioned several of the properties and carried out six weeks' work. Sporadic work was performed by individuals in subsequent years until Ponder Oils Ltd. optioned the properties in 1967.

Most of the mineral showings are situated a short distance south of the divide between the Illiance and Tchitin Rivers. Here the Illiance flows due south through

a broad valley in which elevations range from 2,500 feet to in excess of 6,000 feet at the summits of Tchitin Peak and Illiance Mountain. The tree line is at an elevation of 4,000 feet.

The oldest rocks in the area shown on Figure 12 include coarse green pyroclastic rocks, mainly augite andesite tuffs and breccias, in the southeastern part of the area, and sedimentary rocks as exposed on the east slope of Illiance Mountain. A cherty sedimentary horizon, up to 500 feet thick, and intercalated with dark-grey to black siltstones, underlies the summit of Illiance Mountain.

Overlying these rocks more or less conformably and interbedded with them locally along the Illiance River are red and green well-stratified volcano-sedimentary rocks including volcanic conglomerates, sandstones, and siltstones. Coarse varieties predominate, in which rounded fragments range in size from one-quarter inch to 1 foot, the most common size range being between 1 and 3 inches. Local intercalations of red and green breccias characterized by angular fragments and a poor degree of sorting suggest a pyroclastic origin for some of the material. The fragments, which in both varieties are closely packed and best seen on weathered surfaces, consist of andesite crystal tuffs and porphyritic andesites. The matrix is generally of sand-size material with hematite dust providing the reddish coloration. The volcanic conglomerates are found in 6-inch to 3-foot thick beds, separated by 1- to 5-inch beds of red volcanic sandstone and siltstone in which graded and cross-bedding structures are commonly displayed. Fossil impressions were noted in a pebble conglomerate horizon on the west slope of Illiance Mountain.

A prominent feature of the volcanic sandstones and conglomerates is a pronounced schistosity striking slightly west of north and dipping vertically to steeply east or west. This schistosity is best developed near the Illiance River, where originally rounded fragments in the rocks are elongated in the plane of shearing.

Basic dykes, not more than 5 feet wide and post-dating the quartz-sulphide veins and mineralized zones, have been intruded mainly along shear planes. Three varieties of dykes were noted, the most common being hornblende andesite, which weathers light green and in which 1- to 2-millimetre phenocrysts of chloritized hornblende make up 10 per cent of the rock. Biotite lamprophyres, usually 1 foot wide and dark green in colour, occur in a dyke swarm near the United Metals showings. Grey andesite dykes, noted in a few locations, are characterized by the presence of 1- to 2-millimetre amygdules of carbonate in a light-grey matrix.

The red and green volcano-sedimentary rocks are contained within a broad, southerly plunging syncline, the axial trace of which parallels the Illiance River. Moderate dips prevail along both limbs of the fold and minor cross-folds were noted on the east slopes of Tchitin Peak. Minor movement has occurred along the axial plane cleavage developed during folding of the rocks, giving rise to the penetrative schistosity prevalent throughout the area. The numerous parallel northerly trending draws east and west of the Illiance River are the surface expression of the shear zones near the axial region of the fold.

The accompanying sketch-map shows the locations of most of the known mineral showings, with the exception of those of the Belleview group, which are covered by several Crown-granted claims immediately south of the claim groups described.

Silver-lead-zinc mineralization occurs in two forms, the most common type being quartz-carbonate-sulphide veins which contain fine pyrite, galena, sphalerite with tetrahedrite, and, in some places, chalcopyrite. Mineralization occurs to a lesser extent in zones in which stringers and fine disseminations of pyrite and galena occur in wallrocks altered to light-grey schists.

The veins and mineralized zones occur along shear planes near the river or the axial region of the synclinal structure and consequently are of variable width and horizontal continuity, the longest continuously exposed vein structure being 200 feet. The Silver Bar showings are perhaps typical, with veins pinching out and recurring at intervals along the same draw or shear zone over a distance of 3,000 feet. South of the Silver Bar showings, along the same trend, are the Horsecut, United Metals, and Grey Goose mineralized structures.

A prominent feature of the deposits is the alteration of the red and green volcano-sedimentary wallrocks to light-grey schists. The widths of these zones of alteration, which represent intense quartz-carbonate-sericite-pyrite alteration, range from between 10 to 30 feet outward from a single vein to an envelope several hundred feet wide adjacent to a number of closely spaced parallel veins. Intensity of alteration increases inward from narrow bands of quartz-carbonate-sericite-pyrite along cleavage planes through a mottled red and grey rock in which the original fragments are barely visible to a uniform light-grey schist.

Basic dykes may also provide a useful guide to mineralized structures in that while clearly post-dating the veins, in many cases they have been intruded along the same planes of weakness. Good examples are the numerous dykes in close spatial relationship with the mineralized structures at the United Metals and the northernmost Silver Bar showings.

Detailed descriptions of the properties may be found in the Minister of Mines and Petroleum Resources Annual Reports for 1965 and 1967. The following descriptions are revised earlier reports and review more recent works by Ponder Oils Ltd. The following table includes assay results of samples collected by the writer during the past few field seasons. The locations are indicated by sample numbers on Figure 12.

The Monarch showing is east of the divide between the Illiance and Tchitin Rivers at an elevation of 3,800 feet. The principal showing as exposed in a trench is a north-striking quartz-carbonate-barite-sulphide vein, terminated sharply at the north and south ends by faults. Copper content is higher here than in other veins of the area, occurring both as chalcopyrite and tetrahedrite along with galena, sphalerite, and some specularite. Drilling in 1967 failed to indicate any appreciable depth or width of the mineralized zone.

Northeast of the Monarch showing at an elevation of 4,250 feet, a 3-foot-wide quartz-carbonate-barite vein containing small amounts of galena, sphalerite, and tetrahedrite is exposed over a distance of 10 feet.

The Silver Bar showings are situated west of the Illiance River between elevations of 3,400 and 3,800 feet. Quartz-carbonate-sulphide veins are exposed in a series of open cuts along a major draw or shear zone parallel to the river. Vein widths vary between 1 and 5 feet, and the longest continuously exposed mineralized structure is 200 feet. Horses of country rock occur in wider parts of the veins. The veins, which contain galena, sphalerite, and tetrahedrite, are controlled by shear zones which cut grey pyritic schists. Narrow andesite dykes parallel the veins in several open cuts. Ten angle holes, drilled near the northernmost showings in 1967, intersected only narrow sections of vein material.

The Horsecut showing is exposed in a 75-foot-long trench near the Illiance River at 3,250 feet elevation. A northerly trending 4-foot-wide quartz-carbonate vein, offset slightly by a northeast-striking fault halfway along its exposed length, contains stringers of galena and sphalerite. Seven short angle drill-holes failed to trace the vein north or south of that length exposed in the trench. Down dip beneath the trench, vein widths of between 2 and 4 feet were intersected, enveloped by a 15- to 40-foot core of bleached schist.

The United Metals showings are situated on the Illiance River at an elevation of 3,100 feet. Old workings include several open cuts and six short adits driven east and west from the river bank, which expose narrow quartz-carbonate-sulphide veins cutting bleached fragmental rocks. Open cutting in 1968 exposed a number of zones 2 to 5 feet wide over a distance of 1,000 feet to the north of the old workings. The mineralized zones consist of narrow bands and stringers of galena and sphalerite occurring along shear planes in light-grey bleached schists. Drilling in 1967 and 1968 in the vicinity of the old workings indicated a zone of alteration at least 300 feet wide and bracketed on the east and west by basic dykes. Fifty-foot-wide sections of sheared graphitic siltstone were intersected near the Illiance River, and these were seen to contain 1-inch beds of coarse carbonate with 1-millimetre grains of pyrrhotite.

The Grey Goose showing is situated 1,500 feet south of the United Metals workings. A 20-foot trench exposes a northwest-striking zone of variable width in which small massive lenses of galena and sphalerite are contained in light-grey schist. Some drilling was done here late in the season.

The Silver showings are located south and east of the United Metals workings at an elevation of 3,300 feet. Original workings include a 200-foot-long adit driven northwesterly from a creek bank along a vein in a shear zone. A parallel vein structure exposed in a small creek 100 feet west is 4 feet wide and contains stringers of pyrite, galena, and sphalerite. Angle holes intersected 2-foot-wide zones of bleached schist containing stringers and disseminations of galena and sphalerite.

Sample No.	Location	Width	Gold	Silver	Copper	Lead	Zinc
		Ft.	Oz./Ton	Oz./Ton	Per Cent	Per Cent	Per Cent
2153	Monarch	10	Trace	2.5	2.92	0.48	1.70
2178	Silver	8	Trace	12.9	0.05	1.31	0.31
2179	Silver	Dump	0.01	113.2	0.92	10.08	14.40
7474	Silver	4	Trace	16.6	0.16	2.63	2.15
7475	Silver	2	Trace	5.0	0.02	2.93	0.27
7476	United Metals	5	Trace	22.3	0.32	11.60	7.00
7477	Horsecut	4	Trace	6.8	0.06	1.38	0.65
7478	Grey Goose	6	Trace	2.8	0.04	0.59	1.41
7479	Silver Bar	3	Trace	42.2	0.30	18.33	7.20
7480	Silver Bar	1	Trace	3.2	0.03	0.84	0.43
7481	Silver Bar	1	Trace	13.5	0.24	3.80	2.46
7482	Silver Bar	5	Trace	36.1	0.09	1.95	3.04
7483	Silver Bar	3	Trace	25.5	0.53	2.05	2.96
7484	Silver Bar	3	Trace	8.2	0.13	4.43	3.06
7485	Silver Bar	3	Trace	4.7	0.12	3.35	1.72
7486	Silver Bar	Dump	Trace	23.0	0.77	17.82	9.10

TERRACE

NAR

LOCATION: (54° 128° N.W. and N.E.) Six miles northeast of Terrace at elevations between 2,000 and 4,300 feet on Mount Vanarsdoll.

CLAIMS: NAR group of 25 recorded mineral claims.

ACCESS: By helicopter based at Terrace.

OWNER: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; A. Gambardello, exploration geologist.

METAL: Molybdenum.

WORK DONE: An area of 6 square miles was mapped geologically. Six men spent 10 days on the property.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 53; Assessment Report No. 1661.

DESCRIPTION: Quartz veinlets carrying molybdenite and pyrite occupy fractures in altered granite.

Allard

LOCATION: (54° 128° N.W.) On the northeast slope of Mount Allard west of Kitsumkalum Lake.
CLAIMS: Thirty-claim Allard group.
ACCESS: By Columbia Cellulose logging-road from Terrace.
OWNER: Rio Tinto Canadian Exploration Limited, 404, 1111 West Georgia Street, Vancouver 5.
METALS: Copper, molybdenum.
WORK DONE: Reconnaissance geology of the claims was mapped, and soil and silt samples were taken for geochemical analysis.

Benex

LOCATION: (54° 129° N.E.) Toward the head of May Creek.
CLAIMS: Forty-two-claim Benex group.
ACCESS: By Columbia Cellulose logging-road from Terrace.
OWNER: Rio Tinto Canadian Exploration Limited, 404, 1111 West Georgia Street, Vancouver 5.
METALS: Copper, molybdenum.
WORK DONE: Reconnaissance geology of the claims was mapped, and soil and silt samples were taken for geochemical analysis.

Macex

LOCATION: (54° 128° N.W.) On Little Cedar Creek 3 miles west of Cedar River.
CLAIMS: Fifty-claim Macex group.
ACCESS: By Columbia Cellulose logging-road from Terrace.
OWNER: Rio Tinto Canadian Exploration Limited, 404, 1111 West Georgia Street, Vancouver 5.
METALS: Copper, molybdenum.
WORK DONE: Reconnaissance geology of the claims was mapped, and soil and silt samples were taken for geochemical analysis.

ECSTALL RIVER

Horsefly

LOCATION: (53° 129° N.E.) Two miles due east of Lower Lake at the big bend of Ecstall River 60 miles south of Prince Rupert.
CLAIMS: Horsefly 1 to 6.
ACCESS: From Prince Rupert by aeroplane, or boat via Skeena and Ecstall Rivers.
OWNER: Texas Gulf Sulphur Company, 701, 1282 West Georgia Street, Vancouver 5; A. J. Schmidt, geologist.
METAL: Pyrite.
WORK DONE: The detailed geology of an area 1,000 by 1,000 feet was mapped, and magnetometer and electromagnetic surveys were also run of the same area. Five men spent two weeks on the property.

KEMANO

Joe

LOCATION: (53° 127° N.W.) Two miles east of Kemano at elevations of 2,000 to 4,000 feet on the south side of Horetzky Creek.
CLAIMS: Joe 1 to 14.

ACCESS: Two miles by road and trail from Kemano.
OWNER: United Copper Corporation Limited, 1800 One Bentall Centre, Vancouver 1; T. Lisle, geologist.
METALS: Copper, molybdenum.
WORK DONE: Surface workings were surveyed, the geology of a small area was mapped, and three trenches, total length 310 feet, were drilled and blasted. Two men were at work for a month.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1906, p. 68.
DESCRIPTION: Chalcopyrite, bornite, malachite, and molybdenite occur on fractures, joints, and small faults, occasionally in small quartz veinlets in a small monzonite intrusion.

QUEEN CHARLOTTE ISLANDS

MORESBY ISLAND

Tasu Mine By H. Bapty

LOCATION: (52° 132° N.E.) On the south side of Tasu Sound, Moresby Island, extending from sea-level to 5,000 feet.
CLAIMS: Twenty-one Crown-granted and 83 recorded claims.
ACCESS: By aeroplane or powered boat from Sandspit.
OWNER: Wesfrob Mines Limited, 504, 1112 West Pender Street, Vancouver 1; F. A. Godfrey, mine manager; P. L. Munro, production superintendent; J. E. Dodge, mine superintendent; K. Blower, concentrator superintendent; F. W. Gilbert, maintenance superintendent; N. S. Smith, chief engineer.
METALS: Iron, copper (*see* Table 12 for production).
WORK DONE: A fire hall was erected, the 120-man trailer camp was removed from the property, and a 125-horsepower direct-fired boiler was installed in the powerhouse. Two 40-horsepower pumps were installed in the mill, two 15-horsepower conveyors were installed on the waste system, and 27 10-kilowatt heaters were installed on 23 and 23A conveyors for copper-drying.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 34–36.

Garnet, Ruby

LOCATION: (52° 132° N.E.) At elevation from sea-level to 1,500 feet on Botany Inlet, Moresby Island, 37 miles southwest from Sandspit.
CLAIMS: Ruby 1 to 4, Garnet 1 to 58.
ACCESS: By float-plane or by power-boat from Sandspit.
OWNER: Moresby Mines Limited.
OPERATOR: Canadian Superior Exploration Limited, 2201, 1177 West Hastings Street, Vancouver 1; R. A. Dujardin, chief geologist.
METALS: Copper, molybdenum.
WORK DONE: Surface workings were mapped and 13 trenches, total length 204 feet, were blasted in bedrock. Six holes totalling 1,969 feet were diamond drilled. Ten men were employed for three months.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, p. 53; 1967, p. 56.

Jessie, Adonis, Rose By H. Bapty

LOCATION: (52° 131° S.W.) On Harriet Harbour, Skincuttle Inlet, at an elevation from sea-level to 2,000 feet, on the southeast coast of Moresby Island.
CLAIMS: Jessie, Adonis, and Rose were the claims from which production came. The property consisted of 10 Crown-granted claims, four mineral leases, and 61 recorded mineral claims.

ACCESS: By aeroplane from Sandspit and by boat.

OWNER: Silver Standard Mines Limited.

OPERATOR: Jedway Iron Ore Limited, 1111 West Georgia Street, Vancouver 5.

METAL: Iron (*see* Table 12 for production).

WORK DONE:

Mining at Jedway ceased February 29, 1968. The plant was removed and sold or stored in Vancouver. At the year-end, only a few buildings and the floating pontoon dock remained at Jedway. At the time of closing, 91 men were employed. Except for a caretaker, the last employees left Jedway on August 12th.

The last shipment of concentrate was on July 16th. During January and February production was as follows:—

	Tons
Ore mined from the Rose open pit	72,146
Ore mined from underground below Jessie pit	33,175
Total ore mined	105,321
Waste mined from the Rose open pit	50,260
Waste mined from underground below Jessie pit	1,999
Total waste mined	52,259
Ore milled	117,270
Iron concentrate shipped	112,589

Production from the commencement in October, 1962, to the closure was as follows:—

	Tons
Ore and waste mined	19,267,901
Ore milled	4,341,676
Iron-ore concentrate shipped	2,282,835

At the year-end the mine roads were so badly eroded by heavy rainfall and water run-off that they are no longer usable.

Three million tons of nicely crushed 2-inch waste rock has been stacked near the shoreline, and where erosional agencies rework this waste into gravel, there will exist a gravel beach where none existed previously. Also 3,000,000 tons of coarse sand which has been placed along the shoreline should provide excellent additional spawning-beds on the west side of Harriet Harbour.

It is expected that in 25 years vegetation will so have taken over the area that there will be little remaining evidence of mining at this mine-site.

When the property closed the few remaining Jedway employees were transferred to other Granby Mining Company operations elsewhere in British Columbia. Grizzly Mine Mill Equipment Company was commissioned to salvage and sell all remaining equipment and buildings at Jedway.

The pit workings have already commenced to slough back to a safe angle of repose, and in 25 years a new forest will have taken over.

The floating dock for loading concentrates at Jedway remains in place, but the mooring-buoys have been removed.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 57.

GRAHAM ISLAND

Mino

LOCATION: (53° 132° S.E.) On Miller Creek 8 miles by road and trail north from Queen Charlotte City.

CLAIMS: Mino 1 to 78.

ACCESS: By 8 miles of road and trail north from Queen Charlotte City.

OWNER: E. Specogna, of Juskatla.

OPERATOR: Falconbridge Nickel Mines Limited, 500, 1112 West Pender Street, Vancouver 1; J. J. McDougall, geologist.

METALS: Copper, molybdenum.

WORK DONE: A magnetometer survey of the Mino 1, 2, 5, and 6 was made, soils were sampled over the same four claims, and silt samples were taken over the entire group for geochemical analysis. Three men were employed for two weeks.

ARISTAZABAL ISLAND

Pacific Rim

LOCATION: (52° 129° N.E.) Between elevations of 100 and 1,085 feet on the northeast coast of Aristazabal Island at Surge Narrows on Lot 299 south of Quarry Bay.

CLAIMS: Thirty-six recorded mineral claims, including the Heather, Louise, Jozien, etc., grouped as the Pacific Rim group.

ACCESS: One hundred and ten miles by boat or aeroplane southeast of Prince Rupert.

OWNER: Pacific Rim Mines Ltd., 507, 475 Howe Street, Vancouver 1, has the mineral claims, but prior limestone rights over 139 acres are owned by Laredo Limestone Ltd.

METALS: Gold, copper.

WORK DONE: A crew of seven men spent time stripping the surface with a C6 Euclid tractor and drilling and blasting trenches; 15,000 yards of material was moved.

KAPPAN LAKE

MM

LOCATION: (52° 125° S.E.) Just west of Kappan Lake.

CLAIMS: MM 1 to 100.

ACCESS: By 16 miles of road from Nimpo Lake on the Williams Lake–Bella Coola road.

OWNER: Anaconda American Brass Limited, Britannia Beach, J. M. McAndrew, geologist.

METALS: Copper, molybdenum.

WORK DONE: The geology of the claims was mapped, magnetometer and induced polarization surveys were made, and soil and silt samples were taken for geochemical analysis. Eight men were employed for three months.

DESCRIPTION: Molybdenite and chalcopyrite are disseminated in quartz monzonite and alaskite.

VANCOUVER MINING DIVISION

BUTE INLET

Colossus

LOCATION: (50° 125° N.E.) Near Buker Creek on the north side of Estero Basin of Frederick Arm, between 1,300 and 1,600 feet elevation.

CLAIMS: Colossus (Lot 256), Portage (Lot 259), Bluebell (Lot 258), Champness Fraction (Lot 260), and Lou 1 to 29.

ACCESS: By aircraft or boat 50 miles from Campbell River.
OWNER: Alquin Mines Ltd., 290 One Bentall Centre, Vancouver 1; William Quinn, superintendent.
METALS: Copper, molybdenum.
WORK DONE: On the Colossus (Lot 256), a detailed magnetometer survey was made in the area of the No. 3 adit. Twelve holes totalling 2,997 feet were diamond drilled. Nine men were employed for three months.

TOBA INLET

R, Wapo

LOCATION: (50° 124° S.W.) Between sea-level and 1,000 feet elevation on Raza Island at the mouth of Toba Inlet.
CLAIMS: R 1 to 16, Wapo 1 to 13.
ACCESS: Twenty-five miles by boat from Campbell River.
OWNER: Rio Tinto Canadian Exploration Limited, 1111 West Georgia Street, Vancouver 5; E. W. Johnson, party chief.
METALS: Copper, molybdenum.
WORK DONE: Six men were employed for one month. Some surveying was done, two claims were mapped geologically, and soil-sampling for geochemical analysis was done on two claims.
DESCRIPTION: Pyrite, chalcopyrite, and molybdenite occur in fractures in quartz diorite and granodiorite.

POWELL RIVER

OK, In

LOCATION: (50° 124° S.W.) Between elevations of 2,800 and 3,200 feet west of Okeover Inlet.
CLAIMS: About 74 OK claims and 180 In claims.
ACCESS: By 17 miles of road from Powell River.
OWNERS: R. E. Mickel and Mrs. M. V. Boylan.
OPERATOR: American Smelting and Refining Company, 535 Thurlow Street, Vancouver 5; R. McLeod, geologist.
METALS: Copper, molybdenum.
WORK DONE: Nine men were employed for 1½ months. Seven holes totalling 3,290 feet were diamond drilled.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 58; Assessment Report No. 1573.
DESCRIPTION: Chalcopyrite, molybdenite, and pyrite occur in quartz veins and as fine disseminations near the contact between two granodiorite bodies.

Nic

LOCATION: (49° 124° N.E.) Above the west side of Haslam Lake between 1,000 and 2,550 feet elevation, 4 miles east of Powell River.
CLAIMS: Nic 1 to 4.
ACCESS: By 6 miles of road from Powell River.
OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; W. W. Osborne, geologist.
METALS: Copper, molybdenum.
WORK DONE: Two men were employed for one month. Three claims were mapped geologically, some magnetometer work was done, and geochemical soil-sampling was done on the four claims.

ALTA LAKE

London, Axe

By A. R. C. James

LOCATION: (50° 122° S.W.) On southwest side of Fitzsimmons Creek about 5 miles from Alta Lake, at an elevation of from 4,000 to 4,400 feet.

CLAIMS: The company holds mineral lease M9, comprising the London, Royal Edward, Hard Cash, Iron Hat, Tonopah, and Iron Wedge Fraction Crown grants, and other claims, including the Axe group, totalling 20 claims in all.

ACCESS: By old logging-road from the Squamish–Pemberton highway.

OWNER: New Jersey Zinc Exploration Company (Canada) Ltd., 905, 525 Seymour Street, Vancouver 2.

METAL: Copper.

WORK DONE: In June, 1968, work was resumed in the adit, which was driven a further 555 feet to a total of 1,493 feet. Six men were employed for 5½ months under the supervision of S. M. Karara.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1910, pp. 147–149; 1930, p. 312; 1963, p. 94; 1967, p. 60.

DESCRIPTION: Copper mineralization, including chalcopyrite and malachite, occurs near the westerly dipping contact of green schistose tuffs and underlying granodiorite. The present company has been active since 1963. In 1966 an exploration adit was driven at 3950 level. By January, 1967, when work was stopped, it had been driven 917 feet.

Elk

LOCATION: (50° 123° S.E.) North side of Millar Creek, between 2,500 and 4,000 feet elevation on the southwest slope of Mount Sproat, 4 miles northeast of McGuire.

CLAIMS: Elk 17 to 24, 26, 33, 35 to 41.

ACCESS: By 3-mile logging-road from the Squamish–Pemberton highway.

OPERATOR: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; W. W. Osborne, geologist.

METAL: Copper.

WORK DONE: The geology on four claims was mapped and an induced polarization survey was made along 2,000 feet of line; three holes totalling 271 feet were diamond drilled. Three men were employed for two weeks.

REFERENCE: Assessment Report No. 1562.

DESCRIPTION: Chalcopyrite and pyrite mineralization is disseminated in granodiorite intruding acid volcanic rocks.

CHEAKAMUS RIVER

Van

LOCATION: (50° 123° S.E.) Near Brandywine Falls between elevations of 1,750 and 3,500 feet.

CLAIMS: Total of 132 claims comprising Van 1 to 90, Sunny Cave 1 to 32, and others. Work done on Vern 8, Sunny Cave 4, and Van 10.

ACCESS: By road, 26 miles north of Squamish on Squamish–Pemberton highway.

OWNER: Van Silver Explorations Ltd., 1661 Victoria Drive, Vancouver 6; J. McIntyre, mining engineer.

METALS: Gold, silver, copper, lead, zinc.

WORK DONE: An area of bedrock 600 by 200 feet was stripped by D7 bulldozer. Three miles of access road was constructed, two adits were reopened, total length 75 feet, and four holes totalling 675 feet were diamond drilled. Six men were employed for six months.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 61.

Callaghan, Tarn

LOCATION: (50° 123° S.E.) 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 flows into Cheakamus River.

CLAIMS: Callaghan, Tarn 1 to 11.

ACCESS: By road and trail from McGuire on the Squamish–Pemberton highway.

OPERATOR: Barkley Valley Mines Ltd., 96—67th Street, Ladner.

METALS: Gold, silver, copper, lead, zinc.

WORK DONE: Electromagnetic and magnetometer surveys on Callaghan and Tarn claims; one 125-foot trench by bulldozer; three holes totalling 125 feet diamond drilled. Three men worked for eight months under the supervision of T. Barkley.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1936, pp. F 53–F 56; 1967, p. 61; Assessment Report No. 1577.

DESCRIPTION: This property is a restaking of the old Astra and Cambria property. 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.

HOWE SOUND

Britannia Mine By A. R. C. James

LOCATION: (49° 123° N.E.) Britannia mine is on the east side of Howe Sound 40 miles by road from Vancouver.

OWNER: Anaconda Britannia Mines Ltd., 1600, 409 Granville Street, Vancouver 2; B. B. Greenlee, vice-president and manager; J. F. Anderson, general superintendent; R. T. Baverstock, mine superintendent; E. R. Parker, mill superintendent.

METALS: Copper, zinc (*see* Table 12 for production).

WORK DONE:

Early in the year a decision was made to sink a new shaft from 4100 level to facilitate development and mining of the very substantial reserves of ore indicated in the –040 zone. This ore zone lies to the west of No. 8 section and has been explored over the past few years by drifting and diamond drilling from several levels of No. 8 section, mainly 4700 and 5250 levels.

The new shaft, to be known as No. 10 shaft, is sited 4,000 feet west of No. 8 shaft and 500 feet south of the 4100 main haulage. The shaft is to be sunk 2,200 feet below 4100 level; the bottom of the sump will be at 6300 level. During 1968, access laterals were driven to the shaft-site, a shaft pilot raise driven above 4100 level, the main Koepe hoist room excavated, a service hoist room cut, a service hoist rope raise driven, and other excavations for associated facilities were made preparatory to sinking the shaft.

The following is a summary of development work done in 1968: Drifting and crosscutting, 11,208 feet; raising, 5,107 feet; diamond drilling, 50,068 feet.

New switchgear was installed in the mill for the 200-horsepower blower motors and the 125-horsepower crusher motors.

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, with important development in the No. 10 section to the west of No. 8. The Victoria section is serviced from 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 are now mainly confined to the 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 No. 4 shaft. The No. 8 section is mined from No. 8 shaft, 1.8 miles from the portal. The major part of the production from this section is from stopes between 5100 and 5400 levels. Development was begun during the year on the 5500 level. The method of mining at Britannia is mainly long-hole blasting with a very few shrinkage and square-set stopes.

The accident rate for compensable accidents was 32.0 per million man-hours, a substantial improvement on the rates for 1966 and 1967, which were 50.0 and 53.0 respectively. A commendable feature of this operation is the careful investigations by special committees representative of both management and the union into all serious accidents and any unusual occurrences or accidents.

NEW WESTMINSTER MINING DIVISION

HOPE

Pride of Emory Mine By T. M. Waterland

LOCATION: (49° 121° S.W.) At the head of Stulkawhits (Texas) Creek, which flows eastward into the Fraser River 8 miles north of Hope.

ACCESS: By a gravel road about 5 miles long which leads from the Trans-Canada Highway 8 miles north of Hope to the mine plant at the 2600 level.

OWNER: Giant Mascot Mines Limited, 1825, 355 Burrard Street, Vancouver 1; mine address, P.O. Box 1060, Hope; L. P. Starck, vice-president and general manager; F. Holland, resident manager; G. D. Bosnich, general superintendent; G. Hungle, mine superintendent; M. Ould, mill superintendent.

METALS: Nickel, copper (*see* Table 12 for production). Concentrates are sold to Sumitomo Metal Mining Co. of Canada Ltd.

WORK DONE:

During 1968 extraction was completed in the Pride of Emory " C " and Hangingwall zones.

Development and long-hole drilling of the Brunswick 8 stope was completed and production started. A major cave over the Brunswick 2 stope forced suspension of work in the Brunswick 8 stope.

Production from the Brunswick 2A stope continued until suspension was forced by the major cave in the Brunswick 2 stope.

On 3550 level an access drift was driven from the 1900 orebody to the new 4600 orebody. Extraction of the Brunswick 10 stope was completed. Production continued intermittently from the Brunswick 1 stope. The 1400 and 600 stopes were drawn empty.

On the 3250 level a crosscut was driven north to intercept the 4600 orebody. Diamond drilling is under way in this area.

On the 2950 level a crosscut was driven east to the 1400-1600 area and a raise was being driven to the 3250 level at year-end. Stope development of the new 4600 orebody was carried out from the 2950 level. This orebody has indications of exceeding 500,000 tons of greater than 1 per cent nickel.

On the 2600 level, production has continued from the 1500 orebody and the 2200 stope has been returned to production. Development of the Brunswick 29 stope has been completed and the stope placed in production. At year-end a crosscut had been started to the area of the 4600 orebody.

A summary of development work in 1968 is as follows:—

	Ft.
Drift and crosscut	3,450
Raising (conventional)	3,941
Raising (boring)	623
Blast-hole drilling	161,000
Diamond drilling	45,400

During 1968 a new 150,000-cubic-feet-per-minute capacity axial-flow fan was installed on 3550 level to improve mine ventilation. In the crushing plant the 440-volt bus was increased to 600 amperes and an air circuit-breaker installed. To raise the power factor, 270 k.v.a.r. in capacitors was connected to the mill 2,300-volt bus.

The surface geological and geochemical survey started in 1967 was completed in 1968, with the result that several anomalous areas are to be investigated.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1954, p. 161; 1964, p. 137; 1965, p. 213; 1966, p. 58; 1967, p. 63.

DESCRIPTION:

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, the 3550 level, and the 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 the 2600 level.

The ore is mined by horizontal and vertical blast-hole stoping methods with method and equipment being essentially unchanged from 1966.

Near the end of 1968 a major ground movement took place over the Brunswick No. 2 stope. This movement caused an interruption of normal work in the parts of the mine serviced from the main service shaft and forced the abandonment of the top 100 feet of the shaft (*see* Dangerous Occurrences).

Clover Leaf

LOCATION: (49° 121° S.W.) About 1½ miles upstream from the mouth of Ruby Creek and about 8 miles west of Hope.

CLAIMS: Clover Leaf 1 to 4.

ACCESS: By road from Ruby Creek station.

OWNERS: J. White and W. E. Harvey.

OPERATOR: Black Mastodon Minerals Ltd., 3450 West 35th Avenue, Vancouver 13.

METALS: Gold, silver, copper.

WORK DONE: Three holes totalling 80 feet were diamond drilled.

MA

LOCATION: (49° 121° S.E.) On the east side of Fraser River, 10 miles north of Hope on the west side of Squeah Mountain.

CLAIMS: MA 1 to 28.

ACCESS: By road from Hope.

OWNER: Mount Agnes Mines Ltd., 622, 510 West Hastings Street, Vancouver 2; L. J. Manning and Associates, consulting engineers.

WORK DONE: Five men worked for one month. A magnetometer survey was made on the MA 21 and 22 claims and 5,000 feet of access road was built.

REFERENCE: Assessment Report No. 1226.

Eureka, Victoria

By T. M. Waterland

LOCATION: (49° 121° S.E.) On the northeast side of Isolillock Peak south of Hope.

CLAIMS: Grey Copper, Alfie, Crown-granted Lot 25, Mo 1 to 20.

ACCESS: From Highway No. 1 at Silver Creek by forestry access roads thence by 1½ miles of difficult new road built in 1968.

OWNER: Holy Cross Mountain Mines Ltd., 705, 850 West Hastings Street, Vancouver 1.

METAL: Silver.

WORK DONE: Some bulldozer trenching and stripping was done, and 205 feet of 6- by 7-foot adit was driven. Ten men were employed for six months under the direction of A. Aalde.

A.M.

By T. M. Waterland and G. E. P. Eastwood

LOCATION: (49° 121° S.E.) Near the western boundary of Manning Park.

CLAIMS: Seventy claims.

ACCESS: Via the Hope–Princeton highway from Hope a distance of 31 miles thence 3 miles south by mine road.

OWNER: Giant Mascot Mines Limited (formerly owned by Canam Copper Company Ltd.).

OPERATOR: G.M. Explorations Limited, 1825, 355 Burrard Street, Vancouver 1; F. Holland, manager; G. Hungle, property superintendent.

METALS: Copper, silver, molybdenum.

WORK DONE:

Drifting and crosscutting, 1,140 feet; raising, 728 feet; diamond drilling, 4,352 feet.

The crosscut to the southeast on No. 10 level was continued through the ore zone, and drifts were then driven along the ore to the northeast and southwest. No. 10 level was completely resampled and mapped.

A raise was driven from No. 10 level to No. 6 level, providing through ventilation in the mine.

Surface geological mapping, geochemical surveys, and geophysical surveys were carried out. The present phase of evaluation of the property was completed and work was suspended in October.

REFERENCES: Kents, Paul, 1964, Special Breccias Associated with Hydrothermal Developments in the Andes, *Econ. Geol.*, Vol. 59, pp. 1551–1563; *Minister of Mines, B.C.*, Ann. Rept., 1965, pp. 206–212.

DESCRIPTION:

The geology is outlined in the Annual Report for 1965. The mineralization occurs in a body of breccia in siliceous and argillaceous sediments of the Dewdney Creek Group. The breccia, as exposed on the south part of No. 10 level, comprises siliceous fragments in a grey matrix. Some of the fragments have rounded ends or corners, but most are sharply angular. They range in size from 50 mm. or more in length down to about 1 mm. in diameter. The larger fragments consist essentially of fine to very fine-grained quartz and ultra-fine-grained material that is probably sericite in some fragments but more likely consists of clay minerals in others. The larger fragments have a shell, 1 to 4 mm. thick, marked by a change of colour on the sawn and lacquered surface, through which the grain size of the quartz, but not the ultra-fine material, increases about tenfold from core to outer surface of the fragment; the ultra-fine material decreases in amount toward the outer surface. Smaller fragments are medium grained throughout, and consist almost entirely of quartz. The smallest fragments are anhedral single crystals of quartz isolated in the matrix. In short, quartz is intensely recrystallized, and sericite and clay minerals are partly absorbed adjacent to the matrix, and the changes are greatest in the smallest fragments. The matrix consists of fine- to medium-grained epidote, fibrous amphiboles, chlorite, and tourmaline. Tongues and veinlets of this matrix penetrate the fragments, and isolated grains and patches of the matrix minerals are scattered through the fragments.

A band of much coarser breccia occurs near the contact of the main breccia body in the southwest part of No. 10 level. Well-rounded, cobble-sized, tourmalinized quartzite fragments are set in a matrix of medium-grained quartz and fine- to medium-grained muscovite. Both the matrix and the fragments contain masses of pleochroic siderite 1 to 4 mm. across. The size and shape of the fragments and the absence of tourmaline from the matrix suggest that this breccia band is not part of the main breccia body. However, the contact with the main breccia body was not exposed when the mine was visited, and the relationship between the breccias was not determined.

The south part of the breccia body on No. 10 level is extensively intruded by irregular masses of hornblendite. In part the hornblendite is massive and uniformly medium grained, and in part it is fine grained, crowded with inclusions, and slightly schistose. The medium-grained hornblendite is greenish-black, whereas the fine-grained phase is distinctly lighter green. Patches of the medium-grained phase are scattered through the fine-grained phase. They are commonly from 5 to 10 inches across, rounded, and have gradational borders. They would appear to represent an early stage of the hornblendite that was brecciated and engulfed by a later surge of magma. The hornblendite consists of medium- to coarse-grained orange-brown amphibole, probably lamprobolite, in a fine-grained groundmass of pale-green amphibole and accessory feldspar. One thin-section contained a very few coarse crystals of plagioclase. In another the lamprobolite was crowded with inclusions of deeply coloured biotite. The lamprobolite is slightly altered to the pale-coloured amphibole, and the feldspar is partly altered to clay minerals; this alteration is probably deuteric. Tourmaline, epidote, and chlorite were not found in the hornblendite itself, although epidote occurs in a few quartz-plagioclase veinlets that traverse the hornblendite.

Blocks of bedded sediment and breccia are included in both the medium- and fine-grained phases of the hornblendite. Some of the unitary inclusions of sedimentary rock are large—one slab is 4 feet long—and clearly did not form part of the breccia. Bedding attitudes in them show that they have been rotated.

The inclusions of breccia in the hornblendite consist of the normal quartzitic fragments in a fine-grained green to greenish-black matrix. In part, and macroscopically, this matrix resembles the fine-grained hornblendite, suggesting the possibility that the rock may be merely a cluster of unitary inclusions in the hornblendite rather than an inclusion of breccia. In the three thin-sections of this matrix examined, however, it consists of chlorite, epidote, and tourmaline. The tourmaline is also identifiable macroscopically in parts of the matrix. Its presence in the matrix is considered to be significant because it has not been found in hornblendite. Another feature tending to confirm these inclusions as breccia is a spacing of fragments comparable with that in breccia not associated with hornblendite; they show no indication of having been dispersed in the hornblendite magma. The breccia inclusions are commonly from 1 to 5 feet across.

A fine-grained grey rock, encountered at two places in the breccia, consists of pseudomorphs of sericite after large plagioclase phenocrysts set in a matrix of antigorite and chlorite. It may be intensely altered mafic feldspar porphyry. Porphyry has not otherwise been identified in the breccia, although a small body of feldspar porphyry was indicated by Canam Copper geologists to intrude the sediments northwest of the old No. 6 camp.

The rocks are traversed by many large shear zones which strike approximately northwest and northeast. Displacement on the zones cannot be estimated in the absence of other planar structures. The shear zones contain little sulphide, and they may be largely or entirely post-mineral.

The principal sulphides on No. 10 level are pyrite, arsenopyrite, and chalcopyrite. In the breccia, chalcopyrite and minor pyrrhotite form blebs and small lenses replacing the matrix. Arsenopyrite and pyrite form more or less massive veins or lenses in a few places in the breccia, but arsenopyrite, in particular, is more commonly disseminated through the fragments. In the hornblendite, chalcopyrite and minor pyrrhotite occur in or around quartz-calcite-ankerite lenses. A few of these lenses contain sphalerite. This mineralogy differs somewhat from that on No. 15 level, where arsenopyrite is rare and sphalerite was not found.

The mineralization is not uniformly distributed through the breccia body but rather is concentrated along marginal sections. At the northwest tip of the breccia body a pipe-like orebody, crescentic in plan, plunges almost vertically for more than 1,500 feet. At the south end of the breccia body another zone of more concentrated mineralization is exposed in an old working (No. 7 adit) and in the new workings on No. 10 level. Two further zones of more concentrated mineralization are exposed by the No. 10-level workings, near the east and west margins of the breccia body, but they received little attention in 1968.

Some theories of origin of the breccia body were discussed briefly in the 1965 report. Information accumulated since then that bears on this question may be summarized as follows:—

(1) Bedding in enclosing sediments at the south end of No. 10 level strikes perpendicular to the boundary of the breccia body.
(2) Thin outer shells of the larger fragments and the whole of the smaller fragments have been intensely recrystallized, and the non-silica constituents have been removed from the smaller fragments.
(3) The matrix of the breccia, at least on the south part of No. 10 level, consists of epidote, fibrous amphibole, chlorite, and tourmaline.
(4) There is slight evidence of a much-altered mafic feldspar porphyry in the breccia.
(5) Masses of hornblendite contain inclusions of breccia, indicating that the hornblendite was intruded after the breccia was consolidated.

The thin shells of intense recrystallization would indicate that the fragments were subjected to a high temperature for a rather short time. The carrier of this heat must have been a fluid which passed rapidly through the breccia and (or) lacked the mass, and consequently the heat content, to maintain its temperature. This fluid absorbed alumina from sericite and clay minerals in the smaller fragments, and probably used it in the formation of epidote and tourmaline.

The breccia may be (*a*) a mechanical breccia, (*b*) a replacement pseudobreccia, (*c*) an intrusive breccia, or (*d*) an explosion breccia. Difficulties in reconciling the observations with various types of mechanical brecciation have been pointed out previously; the high discordance between bedding and the breccia boundary is further evidence against a fold-related origin of the breccia. It is possible that the rock was intensely fractured and that replacement by a percolating fluid spread out from the fractures, but this hypothesis does not explain the relative sharpness of the boundaries of the breccia body or the rotation of fragments of a disrupted bed on No. 15 level.

If the breccia were intrusive it would imply either stoping by a magma or considerable prior fracturing. In either process the quantity of heat available and the duration of application of elevated temperature should have produced recrystallization shells on the fragments more similar to those on normal xenoliths. The assemblage epidote-fibrous amphibole-chlorite-tourmaline is not known as an igneous rock, and the minerals individually are common alteration minerals. If an igneous rock once ramified among the fragments, it has been altered beyond recognition. Presumably the rock would have been relatively tight after solidification of the intrusive, and the fragments should have been as susceptible to alteration to aluminous minerals as the intrusive. The indications of an altered porphyry are provided by a different suite of alteration minerals. It is unlikely that the common matrix of the breccia is an altered igneous rock.

Kents (1964) uses the concepts of magma pulsation and separation of volatile constituents from the magma to explain several types of breccia. His burst breccia resembles the A.M. breccia more closely than his other types. Briefly, he postulates hydrothermal solutions migrating toward the surface under decreasing pressure and changing explosively to steam at a certain pressure. The explosion shattered the rock, and the boiling solutions elutriated the fragments. Additional fragments spalled from the walls of the conduit. "After the supply of boiling water was exhausted, the loose rock fragments settled down into the vent and formed a breccia." The matrix is fine-grained quartz and tourmaline.

The A.M. breccia differs principally in having epidote, amphibole, and chlorite instead of quartz in the matrix. This would be accounted for if the hydrothermal solutions carried iron, magnesium, and some calcium. Aluminum would be supplied by the clay minerals of the smaller fragments.

The process postulated by Kents would appear to account for the features of the A.M. breccia better than any other process that has been suggested. A steam-burst brecciation would explain, in particular, the flash-like alteration of the fragments. The fine to medium grain size of the matrix is at first sight inconsistent with this process: rapid boiling away of the solvent should throw down the solutes as exceedingly fine grains. However, the emanation of hydrothermal fluid may have continued for some considerable time after the explosion, augmenting and recrystallizing the matrix and introducing a small amount of the matrix minerals into the fragments. The pressure would have been greatly reduced, and the temperature would have been lowered by the loss of the heat used in vaporizing the water. Under these conditions the hydrothermal fluid was apparently incapable of further recrystallizing the quartz and absorbing clay minerals.

In the Highland Valley, at Boss Mountain, and at other places probable explosion breccia contains feldspar porphyry which both ramifies through the breccia and contributes fragments to it. It has been postulated that the brecciation was caused by explosive separation of volatiles from the porphyry magma. If feldspar porphyry is indeed present in the A.M. breccia, it would constitute a further line of evidence suggestive of an explosive origin.

LAIDLAW

Diane

LOCATION: (49° 121° S.W.) On the east side of the Fraser River at the mouth of Wahleach Creek. The claims are at an elevation of from 600 to 750 feet above sea-level on the north-facing slopes of the mountains between Wahleach Creek and Lorenzetta Creek.

CLAIMS: Diane 1 to 6.

ACCESS: By logging and company road from Laidlaw.

OPERATOR: Almaza Mining Co. Ltd., 3797 Kingsway, Burnaby.

METAL: Gold.

WORK DONE: In 1968 the company stripped 2 acres of overburden by hydraulic methods, blasted an open cut 20 feet long by 8 feet wide by 6 feet deep, and constructed half a mile of access road. The work was supervised by E. E. Greensides.

DESCRIPTION: The principal showings consist of quartz veins in granodiorite, the latter intruding steeply dipping metasediments of the Chilliwack Group. Several high gold assays have been obtained from samples taken from a 40-foot length of vein.

HARRISON LAKE

Meg, Bailey, Sash

LOCATION: (49° 121° N.W.) Near the crest of the Lillooet Range at the head of Clear Creek, a tributary of Big Silver Creek, which flows south into Harrison Lake. The camp-site at Clear Creek is at about 2,500 feet elevation.

CLAIMS: One hundred recorded claims, comprising the Meg, Bailey, and Sash groups.

ACCESS: A series of logging-roads on the east side of Harrison Lake gives access to the property for four-wheel-drive vehicles from Harrison Hot Springs.

OWNER: Consolidated Gem Explorations Limited.

OPERATOR: Utah Construction & Mining Co., 718, 510 West Hastings Street, Vancouver 2; R. C. Johnson, geologist.

METAL: Molybdenum.

WORK DONE: One hole was diamond drilled to 1,493 feet. A crew of 10 men was employed for six weeks. The present company has been exploring the property since 1964.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 219.

DESCRIPTION: Molybdenite occurs with quartz stringers in the rocks peripheral to a quartz monzonite breccia pipe and in the metamorphic rocks, which are intruded by quartz monzonite and other intrusives.

CHILLIWACK LAKE

Jon

LOCATION: (49° 121° S.E.) On the southwest side of Chilliwack Lake and on the east slopes of Macdonald Peak and Mount Lindeman.

CLAIMS: Jon 1 to 16.

ACCESS: By road and water (40 miles) from Vedder Crossing.

OWNER: John M. Macandrew.

OPERATOR: Gunnex Limited, 1019, 409 Granville Street, Vancouver 2; A. McGain, geologist.

METALS: Copper, molybdenum.

WORK DONE: Soil and silt samples were taken for geochemical analysis, and reconnaissance geology of the claims was mapped. Two men were employed for one month.

REFERENCE: Assessment Report No. 1604.

DESCRIPTION: Chalcopyrite and molybdenite are disseminated in quartz diorite.

SNASS CREEK

Chapman & Wort

LOCATION: (49° 121° S.E.) North slope of Silver Daisy Mountain on the east side of the Skagit River opposite the mouth of Snass Creek.

CLAIMS: Twelve claims—Chapman & Wort group.

ACCESS: One and one-half miles by road from the Hope–Princeton highway.

OWNERS: J. A. Chapman and W. J. Wort, P.O. Box 136, Hope.

METALS: Copper, lead, zinc, silver.

WORK DONE: A 55-foot adit was driven, and some diamond drilling was done.

PITT LAKE

Bounty, Expo

LOCATION: (49° 122° N.W.) Near the head of Pitt Lake at the mouth of Vickers Creek.

CLAIMS: Bounty 1 to 8, Expo 1 to 14, LJ 1 to 5 (formerly known as Katanga and Maple Leaf).

ACCESS: By boat (20 miles) up Pitt Lake from Grants Landing.

OWNER: Kennedy Silver Mines Ltd., 470 Granville Street, Vancouver 2; W. M. Sharp, consulting geologist.

METALS: Gold, silver, copper, zinc.

WORK DONE: Geological mapping, magnetometer survey, and soil-sampling on the Bounty 3, 4, and 5 claims; eight trenches totalling 150 feet; 400 square feet of hand stripping; two holes totalling 317 feet diamond drilled. Three men were employed for four months.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1926, p. 323; 1929, p. 399; 1930, p. 313.

DESCRIPTION: Veins, lenses, and disseminations of chalcopyrite and sphalerite in shear zones in quartz diorite, diorite, and greenstone.

NANAIMO MINING DIVISION

PORT HARDY-COAL HARBOUR

GEOLOGY OF THE PORT HARDY-COAL HARBOUR AREA

By K. E. Northcote

Table of Contents

Introduction

The following is a progress report on the geology of the Port Hardy-Coal Harbour area and is based on the results of geological mapping done in 1968. The mapped area covers about 125 square miles (*see* Fig. 13). Mapping, scale 1 inch to 1 mile, is expected to be extended to the northwest to Cape Scott prior to detailed mapping of certain mining properties in the Port Hardy-Cape Scott area.

Utah Construction & Mining Co. is carrying out an extensive exploration and testing programme and is making feasibility studies of a major copper-molybdenum discovery situated on the north side of Rupert Arm 10 miles south of Port Hardy. The company reports estimated reserves of approximately 280 million tons of 0.522 per cent copper and 0.028 per cent molybdenum sulphide. Exploration activity stimulated by this discovery has, over the past few years, resulted in more than 4,000 claims being located within a 400-square-mile area extending from Port McNeill to the reserved area at Cape Scott. Claims were located in order to ensure acquisition of ground prior to conducting any exploratory work. About 50 organizations, consisting of major and minor companies, and individual prospectors, have carried out mining exploration. Programmes range from modest, though effective, individual efforts to intensive geological, geochemical, geophysical surveys, diamond drilling, and test mining, milling, and metallurgical programmes costing thousands of dollars per day.

The area of intense mineral exploration activity is centred on a belt of Upper Triassic to Lower Jurassic rocks of the Vancouver Group and includes the Karmutsen and Quatsino Formations and Bonanza Subgroup. The series is eugeosynclinal and consists largely of volcanic rocks, tuff, some sedimentary rocks of volcanic origin, and limestone deposited during periods of volcanic quiescence. Because of incomplete exposure of the Vancouver Group and structural complexities, the total thickness of the group is not known (*see* Hoadley, 1953, p. 22). The Karmutsen,

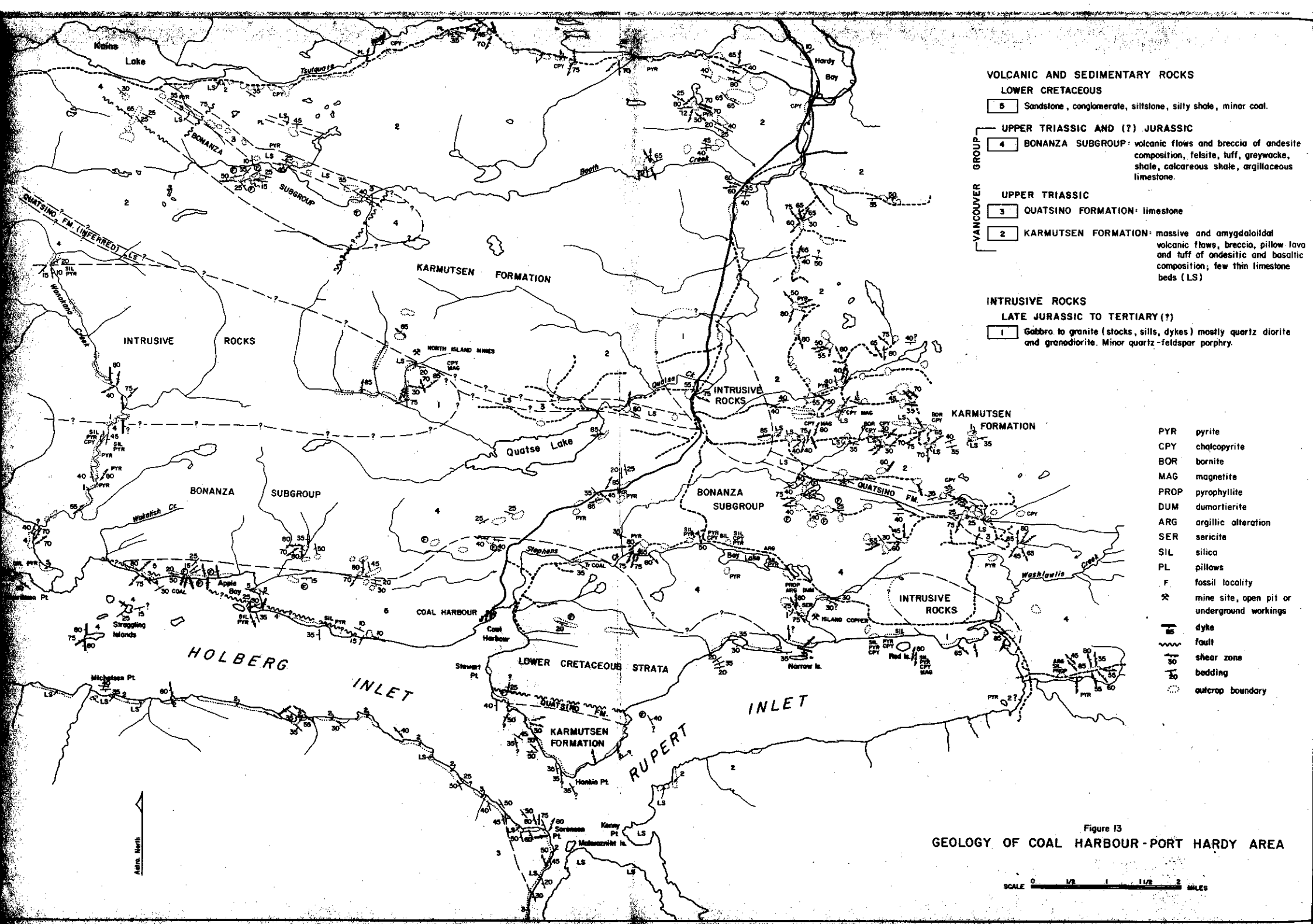


Figure 13

GEOLOGY OF COAL HARBOUR - PORT HARDY AREA

Quatsino, and Bonanza rocks have been intruded by igneous stocks, sills, and dykes of a wide range of composition, and some of these intrusions probably were sources of mineralization.

(NOTE.—The terminology Karmutsen Formation and Bonanza Subgroup are in accordance with the usage of J. E. Muller, of the Geological Survey of Canada.)

Karmutsen Formation

The Karmutsen Formation consists largely of volcanic flows and fragmental volcanic beds, and a few poorly developed pillow lavas. Thin-sections of a variety of rocks of Karmutsen Formation were examined as a guide for field identification. The thin-sections so far examined are from andesitic rocks near the top of the formation. It is probable, however, as additional thin-sections are examined, particularly those from rocks lower in the section, that flows and fragmental rocks of basaltic composition will also be identified (*see* Hoadley, J. W., 1953, p. 10).

The Karmutsen volcanic rocks are characteristically medium to dark green-grey, interbedded, massive to porphyritic and amygdaloidal flows. Locally beds of volcanic rock show poorly developed pillows and breccias. Amygdules are filled by quartz, epidote, chlorite, and less commonly by calcite, pumpellyite, and minerals possibly of the zeolite group. The Karmutsen volcanic rocks commonly are altered to epidote, chlorite, sericite, and calcite. Epidote characteristically stands in relief as nodules on weathered surfaces and occurs in veins with quartz and calcite.

One or more thin limestone beds (25 to 50 feet thick) occur near the top of the Karmutsen Formation. The limestones are medium to dark grey, less commonly buff, and are slightly argillaceous. They range from very fine to medium grained. In some beds irregular siliceous nodules stand in relief on weathered surfaces.

In the vicinity of plutons the limestones are recrystallized to coarse-grained sugary-textured marble which may lie within the limestones or at their contacts with volcanic rocks. Skarn minerals include garnet, epidote, ilvaite, and hedenbergite. Chalcopyrite and magnetite are commonly associated with such skarns.

Quatsino Formation

The Quatsino Formation, in the area mapped, is estimated to be 500 feet thick. The top of the Quatsino Formation has been picked tentatively at the top of the limestone. It commonly consists of medium-grey to brown-grey fine-grained limestone, is slightly argillaceous, and contains scattered irregular siliceous nodules and lenses. Locally the Quatsino limestone is fine to medium grained and is light cream-grey in colour. Although the Quatsino limestone is not abundantly fossiliferous, fossils are found locally.

In the vicinity of plutons and at contacts with plutonic rocks, Quatsino limestone is commonly metamorphosed to medium- and coarse-grained marble. Skarns similar to those in thin limestones near the top of the Karmutsen are developed in Quatsino limestone.

Bonanza Subgroup

The Bonanza Subgroup is dominantly andesite breccia, porphyritic andesite flows, and amygdaloidal andesite, with minor tuffaceous beds. The base of the subgroup is composed of thin-bedded, fossiliferous, calcareous shale and argillaceous limestone which are overlain by light-coloured tuffaceous beds, laminated shale, siltstone, and greywacke composed of volcanic fragments. The sedimentary rocks are interbedded with scattered volcanic breccia and andesite flows which become progressively more abundant higher in the section until they are dominant.

Light-coloured, very fine-grained, highly siliceous beds tentatively called felsite are most abundant on the west side of the area mapped. The felsite is commonly pyritized and is therefore abundantly iron-stained in fractures and on weathered surfaces. In thin-section it commonly contains fine- to medium- and coarse-grained fragments in a groundmass too fine grained for mineral identification. Some outcrops show very thin, undulating, irregular laminations suggestive of welded tuffs. The relationship of the felsite to Bonanza rocks is not known. In some places, outside the area mapped, the felsites are a few feet wide, cut across bedding, and appear to be intrusive into the Bonanza Subgroup and Karmutsen Formation. In other places they constitute entire outcrop areas and apparently are several hundred feet thick. The felsite was not observed in association with rocks younger than the Bonanza Subgroup and is therefore tentatively included with the Bonanza Subgroup.

Rocks of the Bonanza Subgroup show an increasing amount of silification, quartz veining, and pyritization in exposures from west to east on the Coal Harbour–Rupert Arm logging-road. Original rock textures on the east are obliterated by quartz, sericite, calcite, and locally show clay and pyrophyllite(?) alteration. Copper mineralization is evident in certain of these exposures. Similar silicified, pyritized rocks containing quartz vein stockworks, accompanied by copper mineralization, occur on Red Island and on the north shore of Rupert Inlet opposite Red Island. Similarly altered Bonanza rocks are exposed along the Rayonier logging access road ½ to 1 mile east of Rupert Inlet. Rocks of the Bonanza Subgroup are abundantly silicified, pyritized, and cut by quartz veins at Wanokana Creek, on the west side of the map-area, where some copper mineralization was observed.

Lower Cretaceous Strata

The Lower Cretaceous strata consist of sandstone, conglomerate, argillaceous shale with carbonaceous horizons, and a few thin coal seams. These rocks crop out in the vicinity of Coal Harbour and Apple Bay on the north shore of Holberg Inlet and are regarded as Lower Cretaceous by J. A. Jeletzky and J. E. Muller, of the Geological Survey of Canada. Locally these rocks are abundantly fossiliferous. Fossil collections have been made for study. Lithologically similar rocks occur at Port Hardy on the west side of Hardy Bay, but, because these rocks are unfossiliferous, their age is not known (*see* Jeletzky, 1969, p. 132).

Intrusive Bodies

Intrusive bodies ranging in size from narrow dykes to stocks one-half to several miles in longest dimension occur in the area and appear to be elongate in a northwesterly direction. They range in composition from diorite to quartz diorite, but the larger stocks are granodiorite to quartz monzonite in composition. These rocks elsewhere on Vancouver Island are said to range in age from middle to early Late Jurassic and early Tertiary time (Carson, D. J. T., 1968). Samples have been collected for potassium-argon age determinations.

Quartz feldspar porphyries southeast of Bay Lake have coarse plagioclase and rounded quartz phenocrysts in a very fine-grained groundmass and are locally extensively altered to sericite, dumortierite, and possibly pyrophyllite. The porphyry was brecciated after dumortierite formed and was healed by pyrophyllite(?) and sericite.

Dark green-grey medium-grained augite gabbro dykes and sills cut Bonanza Subgroup and Karmutsen Formation.

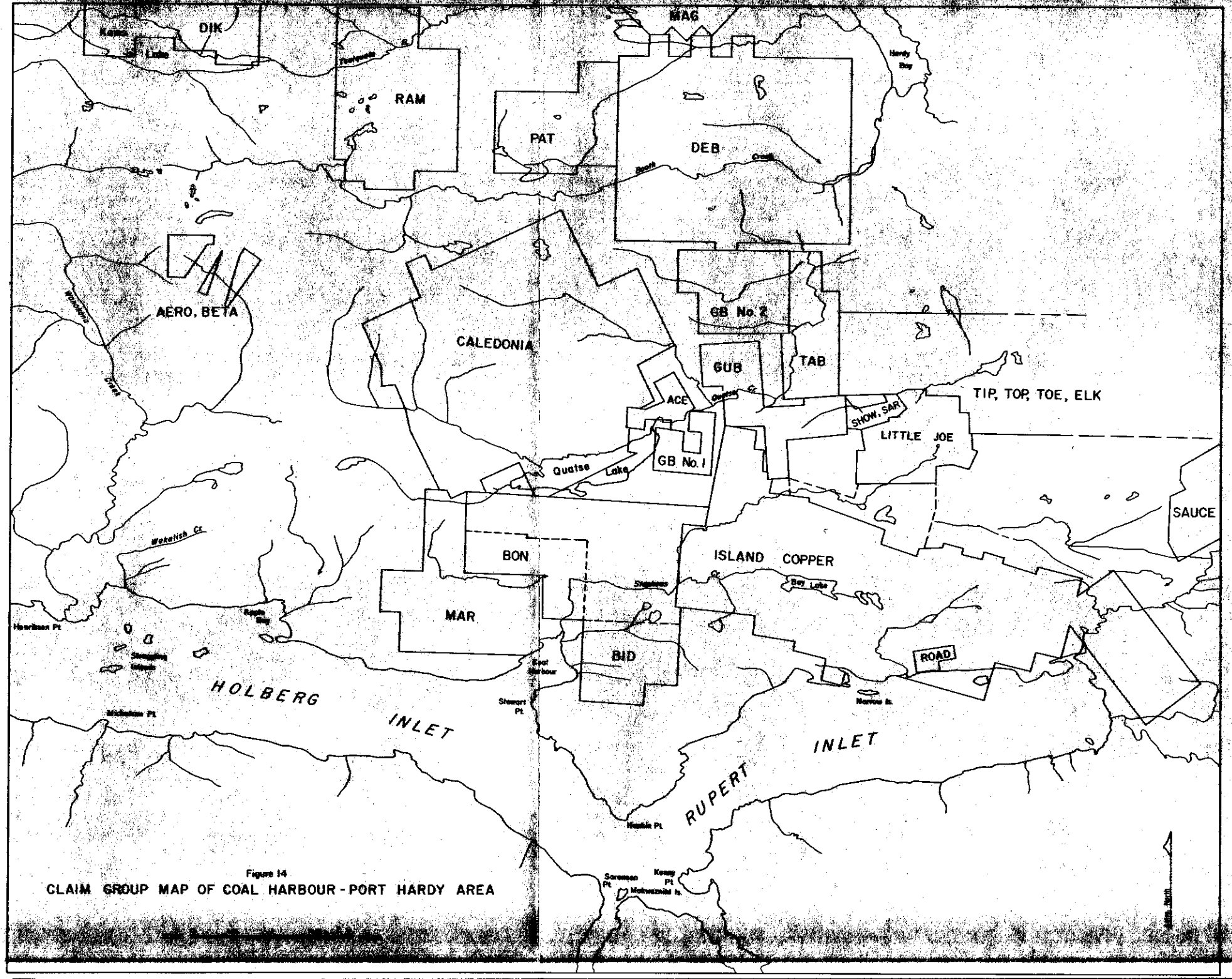


Figure 14

CLAIM GROUP MAP OF COAL HARBOUR - PORT HARDY AREA

Numerous hornblende-augite lamprophyre dykes occur on the east side of the map-area. They range from a few feet to more than 100 feet thick. Commonly entire outcrop areas are composed of hornblende-augite lamprophyre. Samples have been collected for potassium-argon age determinations.

Dark-grey fine-grained basalt dykes cut Lower Cretaceous and older rocks.

Structure

The map-area appears to be in an environment of block faulting. Folding is minimal; fault structures predominate. A preliminary study of air photographs shows strong northwest by west, north-northeast, and lesser north-northwest trending linears. Offset of formations and shearing are visible in outcrops enclosed by such linears.

North of Rupert and Holberg Inlets the strata dip gently to moderately to the south-southwest except for local variations in the vicinity of fault zones. Such an area is Hankin Point, which appears to be the locus of a fault system passing through Holberg and Rupert Inlets.

Mineralization

(*a*) *Silicification and Mineralization.*—Volcanic breccias, andesite flows, and tuffs are altered by silica, sericite, carbonate, epidote, pyrophyllite(?), and clay minerals. Quartz veins locally form stockworks. The altered rocks and veins are mineralized by pyrite, chalcopyrite, and molybdenite.

(*b*) *Contact Metamorphic Deposits.*—Chalcopyrite and magnetite occur in skarn and coarsely crystalline marble which formed at contacts between intrusive rocks and limestone.

(*c*) *Skarn Deposits.*—Chalcopyrite and magnetite occur in skarn and coarsely crystalline marble at some distance from known intrusive contacts. Skarn is erratically developed within limestone and along limestone-volcanic rock contacts and probably is genetically related to intrusive rocks. Skarn minerals are epidote, garnet, ilvaite, and hedenbergite.

(*d*) *Disseminated Occurrences.*—Widespread disseminated bornite or chalcopyrite, or bornite and chalcopyrite occurs in the matrix and in amygdules of Karmutsen volcanic rocks. This kind of mineralization is generally sparse but enrichments occur locally.

[References: Carson, D. J. T., Metallogeny of Vancouver Island, a paper presented at *C.I.M.* Annual General Meeting, Vancouver, April 22, 1968; Hoadley, J. W., Geology and Mineral Deposits of the Zeballos-Nimpkish Area, Vancouver Island, British Columbia, *Geol. Surv., Canada,* Mem. 272, 1953; Jeletzky, J. A., Mesozoic and Tertiary Stratigraphy of Northern Vancouver Island, *Geol. Surv., Canada,* Paper 69-1, Pt. A.]

Sauce

LOCATION: (50° 127° N.E.) The Sauce group is 3 miles northeast of the head of Rupert Inlet (*see* Figs. 13 and 14).

CLAIMS: Sauce 1 to 40.

ACCESS: By 15 miles of road from Port Hardy.

OWNER: I. Shulman.

OPERATOR: Newmont Mining Corporation of Canada Limited, 744 West Hastings Street, Vancouver 1; R. F. Sheldon, exploration manager.

METAL: Copper.

WORK DONE: Induced polarization and magnetic surveys; soil samples were taken for geochemical analysis.
REFERENCE: Assessment Report No. 1685.

Island Copper (formerly Bay)

By W. C. Robinson and K. E. Northcote

LOCATION: (50° 127° N.W.) Between sea-level and 500 feet elevation on the north side of Rupert Inlet, 8 miles south of Port Hardy (*see* Fig. 14).
CLAIMS: One hundred and eighty recorded claims, including the Bay, Cove, Rupert, Jim, and Art groups.
ACCESS: Ten miles by road from Port Hardy.
OWNER: Utah Construction & Mining Co., 718, 510 West Hastings Street, Vancouver 2; A. G. Humphrey, project geologist. (The original Bay group is under agreement from G. Milbourne.)
METALS: Copper, molybdenum.
WORK DONE: Seventy-five men were employed for the full year. A shaft was sunk to a depth of 225 feet and 990 feet of drifting, crosscutting, and raising was done. Other work included geological and topographic mapping, 2½ miles of road construction, and 80,000 feet of diamond drilling in 100 holes. A 100-kilowatt Northlite diesel-driven generator, model 100 VTRP39D, was installed to supply power for lighting during exploration work.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 68; Assessment Reports Nos. 710, 731, and 738.
DESCRIPTION: Chalcopyrite, molybdenite, and pyrite occur with quartz as fracture fillings and disseminations in altered Bonanza Subgroup andesite flows, breccia, and tuff. The Bonanza rocks are silicified, carbonatized, epidotized, and locally are altered to clay minerals.

Road

LOCATION: (50° 127° N.E.) North side of Rupert Inlet, 9 miles south of Port Hardy (*see* Fig. 14).
CLAIMS: Road 1 and 2.
ACCESS: MacMillan-Bloedel Rupert Inlet haulage road.
OWNER: Western Canada Steel Limited.
OPERATOR: Cominco Ltd., 1199 West Pender Street, Vancouver 1; I. R. Chisholm, senior geologist.
METALS: Copper, molybdenum.
WORK DONE: Five holes totalling 2,900 feet were diamond drilled and 1,600 feet of drill access road was built.
REFERENCE: Assessment Report No. 1079.
DESCRIPTION: Claims lie within Bonanza Subgroup (*see* Figs. 13 and 14). Mineralization consists of disseminated pyrite, chalcopyrite, and molybdenite in silicified, andesite breccia, andesite flows, and tuffs.

Caledonia

LOCATION: (50° 127° N.W.) Northwest side of Quatse Lake, 7 miles southwest of Port Hardy (*see* Fig. 14).
CLAIMS: Crown grants—Caledonia (Lot 1294), Cascade (Lot 1295), and Bluebell (Lot 1296), and Don, Wet, B.A., etc., groups totalling 170 claims.
ACCESS: Port Hardy–Coal Harbour road, access road, and " Cat " road totalling 10 miles from Port Hardy.

Plate IIA. Test shaft at the Island Copper property.

Plate IIB. Crushing and splitting bulk samples at sampling plant at Island Copper.

OWNER: North Island Mines Ltd., 574 Yates Street, Victoria; D. C. Malcolm, consultant.

METALS: Copper, zinc, silver, iron.

WORK DONE: A crew of 10 men spent eight months diamond drilling 15 holes totalling 2,300 feet, making a geochemical soil survey, trenching by bulldozer, maintaining and extending access roads, and enlarging the camp.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1923, p. 253; 1926, p. 322; 1927, p. 352.

DESCRIPTION: The mineralization occurs at a contact between Quatsino limestone, Karmutsen volcanic rocks, and granodiorite (*see* Figs. 13 and 14). Limestone is recrystallized to coarse-grained marble, and garnet-epidote skarn is developed in the contact zone.

Little Joe, Ann, Alice

LOCATION: (50° 127° N.E.) Six miles south of Port Hardy and 3 miles north of Rupert Inlet, at elevations of 200 to 500 feet (*see* Fig. 14).

CLAIMS: Little Joe, Ann, Alice groups totalling 22 claims. Claims were surveyed in 1963.

ACCESS: Logging-roads; branch road No. 6 leading east from MacMillan-Bloedel Rupert Inlet logging-road, 8 miles from Port Hardy.

OWNER: Port Hardy Copper Co.

OPERATOR: Silver City Petroleums Ltd., 802 Fina Building, Calgary, Alta.; J. A. Brown, geologist.

METALS: Copper, silver, iron.

WORK DONE: Three months were spent by three men geologic mapping and making magnetometer and geochemical soil surveys.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1963, p. 99.

DESCRIPTION: Chalcopyrite and magnetite occur in coarsely crystalline marble and skarn formed in thin limestone beds near the top of the Karmutsen Formation (*see* Figs. 13 and 14). The skarn is composed of epidote, garnet, ilvalte, and hedenbergite, and appears to be erratically developed within the limestone and along limestone-volcanic rock contacts.

Show, Sar

LOCATION: (50° 127° N.W.) Five miles south of Port Hardy (*see* Fig. 14).

CLAIMS: Show and Sar groups totalling eight claims and fractions.

ACCESS: MacMillan-Bloedel logging-roads, branch road No. 6.

OWNER: Golden West Mines Ltd., 211, 717 West Pender Street, Vancouver 1; W. R. Newman, consultant.

WORK DONE: Geochemical soil survey, magnetometer survey, two diamond-drill holes.

Gub, Tab

LOCATION: (50° 127° N.W. and N.E.) One to three miles northeast of Quatse Lake straddling Quatse River (*see* Fig. 14).

CLAIMS: Gub 1 to 20, Tab 1 to 20.

ACCESS: Port Hardy–Coal Harbour road 5 miles from Port Hardy.

OWNER: Brettland Mines Ltd., 789 West Pender Street, Vancouver 1; F. Brett, field supervisor.

WORK DONE: Magnetometer and geochemical soil surveys were made, five diamond-drill holes totalling 1,000 feet were drilled, five trenches totalling 50 feet in length were hand dug, and 1 mile of drill access road was built.
REFERENCES: Assessment Reports Nos. 1692 and 1749.
DESCRIPTION: The Gub and Tab claim groups are located over Karmutsen Formation and intrusive rocks (*see* Figs. 13 and 14).

Tip, Top, Toe, Elk

LOCATION: (50° 127° N.E.) Between elevations of 200 and 1,000 feet and from 4 to 5 miles east of Quatse Lake (*see* Fig. 14).
CLAIMS: One hundred and thirty-four recorded claims comprising the Tip, Top, Toe, and Elk groups.
ACCESS: By 8 miles of logging-roads from Port Hardy using branch road No. 6 leading east from MacMillan-Bloedel Rupert Inlet road.
OWNERS: Emperor Mines Ltd. and Winco Mining & Exploration Ltd., 1111 West Hastings Street, Vancouver 1; D. Rees, field manager.
METAL: Copper.
WORK DONE: Two men spent two months stripping 2,000 square feet of bedrock. An airborne magnetometer survey was also made of entire claim area.
REFERENCE: Assessment Report No. 1709.

Dik

LOCATION: (50° 127° N.W.) On the north side of Kains Lake, approximately 8 miles west of Port Hardy (*see* Fig. 14).
CLAIMS: Dik 1 to 14, 51 to 64, 101 to 114.
ACCESS: British Columbia Forest Service access road to Kains Lake, thence by foot around, or small boat across, Kains Lake.
OWNERS: K. Saunders, A. Derry, A. Clemiss.
OPERATOR: Laura Mines Ltd., c/o MacDonald Consultants Ltd., 12, 425 Howe Street, Vancouver 1; E. D. Dodson, consulting geologist.
WORK DONE: A geochemical soil survey was made.
REFERENCE: Assessment Report No. 1738.
DESCRIPTION: The claim group lies largely in the Karmutsen Formation with the south end of the group close to a Karmutsen-Quatsino contact (*see* Figs. 13 and 14).

Ace, Beta

LOCATION: (50° 127° N.W.) Northeast end of Quatse Lake, 6 miles southwest of Port Hardy (*see* Fig. 14).
CLAIMS: Beta 1 to 6 and Ace Fraction.
ACCESS: Port Hardy–Coal Harbour road and old Quatse Lake road.
OWNER: Western Canada Steel Limited.
OPERATOR: Cominco Ltd., 1199 West Pender Street, Vancouver 1; I. R. Chisholm, senior geologist.
WORK DONE: One diamond-drill hole of 57 feet.
REFERENCE: Assessment Report No. 1060.
DESCRIPTION: Claims cover the Quatsino-Karmutsen contact (*see* Figs. 13 and 14).

Deb

LOCATION: (50° 127° N.W.) Centre of block is 2½ miles southwest of Port Hardy, south of Glenlion River, between elevations of 500 and 600 feet (*see* Fig. 14).

CLAIMS: Deb 1 to 115.
ACCESS: North part of claim block accessible from British Columbia Forest Service Nahwitti Lake access road and branch logging-roads; south part of claim block accessible from Port Hardy–Coal Harbour road.
OWNER: Utah Construction & Mining Co., 718, 510 West Hastings Street, Vancouver 2; A. G. Humphrey, project geologist; M. J. Young, senior geologist.
METAL: Copper.
WORK DONE: Two and one-half months were spent by a crew of nine making a geochemical soil survey and diamond drilling four holes totalling 646 feet.
REFERENCE: Assessment Report No. 1671 (Deb groups 1, 2, and 3).
DESCRIPTION: The Deb block is underlain by Karmutsen Formation (*see* Figs. 13 and 14). Mineralization consists of chalcopyrite and pyrite in quartz fracture fillings in epidotized volcanic rocks.

Ram

LOCATION: (50° 127° N.W.) On British Columbia Forest Service Nahwitti Lake access road 5 miles west-southwest of Port Hardy.
CLAIMS: Ram group totalling 51 claims.
ACCESS: British Columbia Forest Service Nahwitti Lake access road.
OWNERS: Adam Derry and Richard Thomas.
OPERATOR: Kennco Explorations, (Western) Limited, 730 One Bentall Centre, 505 Burrard Street, Vancouver 1; P. T. Black, supervisor.
METAL: Copper.
WORK DONE: Geological mapping and a silt and soil geochemical survey.
REFERENCE: Assessment Report No. 1706.
DESCRIPTION: Claim group lies mainly in Karmutsen Formation with the Karmutsen-Quatsino contact at the south end of the claim group (*see* Figs. 13 and 14). Some copper mineralization is disseminated in the matrix and occurs in amygdules of Karmutsen volcanic rocks.

Pat

LOCATION: (50° 127° N.W.) North of Quatse Lake in vicinity of Dickbooth Creek (*see* Fig. 14).
CLAIMS: Pat 31 to 66.
ACCESS: By British Columbia Forest Service Nahwitti Lake access road and trail, approximately 4 miles southwest of Port Hardy.
OWNER: Tro-Buttle Exploration Limited, 118, 815 West Hastings Street, Vancouver 1; G. A. Dirom, consulting engineer.
WORK DONE: Geochemical soil survey.
REFERENCE: Assessment Report No. 1759.
DESCRIPTION: In Karmutsen Formation (*see* Figs. 13 and 14).

GB No. 1 Group

LOCATION: (50° 127° N.W.) Six and one-half miles south-southwest of Port Hardy at east end of Quatse Lake; elevation 250 to 600 feet.
CLAIMS: GB 1 Fraction and GB 2 to 12 recorded claims.
ACCESS: Quatse Lake road and logging-roads leading off Port Hardy–Coal Harbour road.
OWNER: Tro-Buttle Exploration Limited, 118, 815 West Hastings Street, Vancouver 1; G. A. Dirom, consulting engineer; G. A. Burdett, exploration manager.
METALS: Copper, zinc.

WORK DONE: Geochemical soil survey.
REFERENCE: Assessment Report No. 1731.
DESCRIPTION: In contact area of Karmutsen Formation, Quatsino Formation, and Bonanza Subgroup (*see* Figs. 13 and 14).

GB No. 2 Group

LOCATION: (50° 127° N.W.) Five miles south-southwest of Port Hardy, extending five claim lengths west from the Port Hardy–Coal Harbour road (*see* Fig. 14).
CLAIMS: GB 15 to 30, 69, 70, 77 to 80.
ACCESS: By Port Hardy–Coal Harbour road and a branch road off the Quatse Lake road.
OWNER: Tro-Buttle Exploration Limited, 118, 815 West Hastings Street, Vancouver 1; G. A. Dirom, consulting engineer; G. A. Burdett, exploration manager.
METALS: Copper, zinc.
WORK DONE: Geochemical soil survey.
REFERENCE: Assessment Report No. 1732.
DESCRIPTION: In Karmutsen Formation (*see* Figs. 13 and 14).

Mar

LOCATION: (50° 127° N.W.) Coal Harbour, claims extend 2½ miles to the northwest from sea-level to 800 feet elevation.
CLAIMS: Mar 1 to 36.
ACCESS: By logging-roads leading westerly from Port Hardy–Coal Harbour road and by boat.
OWNER: T. H. Cross.
OPERATOR: Marshall Creek Copper Co. Ltd., c/o MacDonald Consultants Ltd., 12, 425 Howe Street, Vancouver 1; R. T. Heard, field superintendent.
WORK DONE: A crew of six spent three months geological mapping and making a geochemical soil survey.
REFERENCE: Assessment Report No. 1708.
DESCRIPTION: The Mar claims are underlain by sedimentary and volcanic rocks of the Bonanza Subgroup on the north and Lower Cretaceous sediments on the south (*see* Figs. 13 and 14). Mineralization consists of pyritized Bonanza sedimentary and volcanic rocks.

Bid, Bon

LOCATION: (50° 127° N.W.) At 400 to 800 feet elevation, immediately east and north of Coal Harbour.
CLAIMS: Bid 11 to 25, Bon 1 to 14, 53 to 56.
ACCESS: By road, 2 miles from Coal Harbour.
OWNER: T. H. Cross.
OPERATOR: Altair Mining Corporation Ltd., c/o MacDonald Consultants Ltd., 12, 425 Howe Street, Vancouver 1; R. T. Heard, field superintendent.
WORK DONE: A crew of five spent four months preparing a geological map and making a geochemical soil survey of 30 claims.
REFERENCE: Assessment Report No. 1720.
DESCRIPTION: Claims are over pyritized Bonanza sedimentary and volcanic rocks and unaltered Upper Jurassic-Lower Cretaceous sedimentary rocks (*see* Figs. 13 and 14).

Aero, Beta

LOCATION: (50° 127° N.W.) At headwaters of Wanokana Creek, 2½ miles south of Kains Lake and 9 miles southwest of Port Hardy (*see* Fig. 14).
CLAIMS: Beta 1 to 4, Aero 1 to 6.
ACCESS: British Columbia Forest Service access road from Port Hardy to Kains Lake and 1½ miles of flagged trail south from a logging-road on a branch of Dickbooth Creek.
OWNER: Western Canada Steel Limited.
OPERATOR: Cominco Ltd., 1199 West Pender Street, Vancouver 1; I. R. Chisholm, exploration geologist.
WORK DONE: A crew of three spent one month making geological and geochemical soil surveys.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 69; Assessment Reports Nos. 1033, 1050, and 1582.

Mag

LOCATION: (50° 127° N.W.) Two miles west of Port Hardy (*see* Fig. 14).
CLAIMS: Mag group totalling 22 claims.
ACCESS: British Columbia Forest Service Nahwitti Lake access road.
OWNER: Golden West Mines Ltd., 211, 712 West Pender Street, Vancouver 1; W. R. Newman, consultant.
WORK DONE: Geochemical soil survey.

Tub

LOCATION: (50° 127° N.W.) On Georgie Lake branch road between Georgie Lake and British Columbia Forest Service Nahwitti Lake access road.
CLAIMS: Tub 1 to 44.
ACCESS: Seven miles along British Columbia Forest Service Nahwitti Lake access road then along the Georgie Lake branch road which traverses the claims.
OWNER: Brettland Mines Ltd., 789 West Pender Street, Vancouver 1; R. H. D. Philp, consultant.
WORK DONE: Reconnaissance geochemical soil and silt sampling.
REFERENCE: Assessment Report No. 1749.

Pip

LOCATION: (50° 127° N.W.) Four and one-half miles west of Port Hardy on Jenkinson Creek.
CLAIMS: Pip group totalling 33 claims.
ACCESS: British Columbia Forest Service Nahwitti Lake and Georgie Lake access roads.
OWNER: Golden West Mines Ltd., 211, 712 West Pender Street, Vancouver 1; W. R. Newman, consultant.
WORK DONE: Geochemical silt survey.

Lake, F.T.R., Jean

LOCATION: (50° 127° N.W.) Northwest end of Nahwitti Lake, 20 miles west of Port Hardy at elevations 600 to 1,500 feet.
CLAIMS: Forty recorded claims comprise the Lake, F.T.R., Jean, Ken, Hill, and Frank groups.
ACCESS: British Columbia Forest Service Nahwitti Lake access road, 20 miles from Port Hardy.

OWNER: F. T. Russell.
OPERATOR: Kodiak Mines Ltd., P.O. Box 181, Station A, Vancouver; W. G. Stevenson, consultant.
METALS: Copper, lead, zinc.
WORK DONE: Four men spent nine months geologic mapping, making magnetometer and geochemical soil surveys, and hand trenching a total length of 400 feet. A topographic map was made.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 65; Assessment Report No. 1610.
DESCRIPTION: The claims are located over basic volcanic rocks of the Karmutsen Formation and limestone of the Quatsino Formation. Most mineralization on these claims consists of chalcopyrite and magnetite in skarn formed at limestone-volcanic rock contacts and in skarn apparently associated with a porphyry dyke. Narrow veins of galena and sphalerite replacing limestone are also reported.

Hep

LOCATION: (50° 127° N.W.) Between 1,300 and 1,800 feet elevation at Hepler Creek southwest of Nahwitti Lake.
CLAIMS: The Hep group consists of 101 claims.
ACCESS: Twenty miles from Port Hardy by British Columbia Forest Service Nahwitti Lake access road and logging-roads northeast of Holberg.
OWNER: Utah Construction & Mining Co., 718, 510 West Hastings Street, Vancouver 2; field office, Port Hardy airport; C. A. Aird, senior geologist.
METALS: Copper, molybdenum.
WORK DONE: Three and one-half months were spent by a crew of nine. A geological map and a geochemical soil survey were made of the entire claim holding.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, p. 64; 1967, p. 68; Assessment Reports Nos. 684, 1621A, and 1621B.
DESCRIPTION: Chalcopyrite, molybdenite, and pyrite mineralization occurs in quartz-filled fractures and as disseminations in silicified, argillic, epidotized andesite of the Bonanza Subgroup and diorite.

HPH, Norman

LOCATION: (50° 127° N.W.) Between 800 and 1,100 feet elevation in vicinity of Nahwitti Lake.
CLAIMS: One hundred and nine recorded claims, HPH No. 1, HPH No. 3, and Norman groups, covering showings formerly known as the HPH group.
ACCESS: By 17 miles of logging-road.
OWNERS: Pugh, Hepler, and Philp.
OPERATOR: Giant Explorations Limited, 355 Burrard Street, Vancouver 1; C. Redden, party chief.
METAL: Zinc.
WORK DONE: Six men were employed for nine months. Geological and magnetometer surveys were made on the Amy 1 to 16, Shiela 1 to 14, Norman 1 and 2, and HPH 1 to 3, 4,000 square feet of bedrock was stripped by pick and shovel, 10 pits totalling 235 feet were dug, and 17 holes totalling 1,870 feet were diamond drilled.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1930, p. 297; 1931, p. 171; 1932, p. 207; 1936, pp. F 47, F 49; 1966, pp. 63–64; *Geol. Surv., Canada,* Sum. Rept., 1931, Pt. A, pp. 36–45; Assessment Report No. 30.

Expo

LOCATION: (50° 127° N.W. and 50° 128° N.E.) Between north side of Holberg Inlet and Nahwitti Lake.

CLAIMS: Expo block totalling 711 claims.

ACCESS: Accessible on the west end by logging-road from Holberg, otherwise by helicopter 10 to 25 miles from Port Hardy.

OWNER: Utah Construction & Mining Co., 718, 510 West Hastings Street, Vancouver 2; C. A. Aird and M. J. Young, senior geologists.

METAL: Copper.

WORK DONE: Seven months were spent by a crew of 36 preparing geological maps, making geochemical soil surveys, and diamond drilling 50 holes totalling 7,000 feet.

DESCRIPTION: Mineralization consists of chalcopyrite and pyrite in quartz-filled fractures in andesite showing argillic, carbonate, and epidote alteration.

C.S.

LOCATION: (50° 128° N.E.) Between sea-level and 850 feet elevation in the vicinity of Stranby River.

CLAIMS: Nine hundred and eighty-three recorded claims, C.S. group.

ACCESS: By helicopter from Port Hardy, a distance of 35 miles.

OWNER: Quintana Minerals Corporation, 2160, One Bentall Centre, Vancouver 1; R. B. Stokes, consultant.

METALS: Copper, molybdenum.

WORK DONE: Ten men were employed for six months making a geological map and a reconnaissance geochemical soil survey of most of the claims.

Red Dog

LOCATION: (50° 127° N.W.) Between 300 and 1,500 feet elevation about 4½ miles north-northeast of Holberg.

CLAIMS: Red Dog 1 to 12, 14 to 26, 31 to 46, and two fractions.

ACCESS: By road from Holberg, a distance of about 7 miles.

OWNER: D. L. Moore.

OPERATOR: West Coast Mining & Exploration, 904 Helmcken Street, Vancouver 1; W. G. Botel, geologist.

METAL: Copper.

WORK DONE: Eight men were employed for 10 months. Some surveying, geological mapping, and geochemical soil-sampling were done, and 20 holes totalling 6,000 feet were diamond drilled.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 69.

DESCRIPTION: Chalcopyrite and pyrite mineralization occurs in rhyolite(?) and volcanic rocks of the Bonanza Subgroup.

Ti, Mom, Mon

LOCATION: (50° 127° N.W.) Two miles northwest of Nahwitti Lake, between 400 and 2,000 feet elevation.

CLAIMS: Ti, Mom, and Mon groups, totalling 54 recorded claims.

ACCESS: Twenty miles from Port Hardy by British Columbia Forest Service Nahwitti Lake access road and by foot.

OWNER: Acheron Mines Ltd.

OPERATOR: Agilis Exploration Services Ltd., 714 West Hastings Street, Vancouver 1; R. H. D. Philp, consultant.

METALS: Copper, zinc.
WORK DONE: Five men were employed for one month geological mapping and making a geochemical soil survey of 17 claims.
DESCRIPTION: Chalcopyrite and sphalerite mineralization occurs in skarn developed in limestone.
REFERENCE: Assessment Report No. 1762.

WM

LOCATION: (50° 127° S.W.) Between elevations of 500 and 800 feet about 1 mile west of Mahatta River settlement.
CLAIMS: WM 1 to 24.
ACCESS: By helicopter from Port Hardy.
OWNER: Urcan Mines Ltd., 1550 West Georgia Street, Vancouver 5; J. McGoran, field superintendent.
METAL: Copper.
WORK DONE: Two men were employed for one month. Geochemical work was done on the WM 1 to 6 claims and one trench 800 feet long was dug by hand.
DESCRIPTION: Mineralization is associated with a quartz vein stockwork.

D.P., Maggie, Anna

LOCATION: (50° 127° S.W.) Between sea-level and 1,500 feet elevation at Klootchlimmis Creek on south side of Quatsino Sound 4 miles southwest of Quatsino.
CLAIMS: D.P. 1 to 35, 37, Maggie 1 and 2, Anna 1 and 2.
ACCESS: By boat from Coal Harbour, a distance of 10 miles.
OWNER: Highpoint Mines Limited, c/o MacDonald Consultants Ltd., 12, 425 Howe Street, Vancouver 1; R. T. Heard, field superintendent.
METAL: Copper.
WORK DONE: Five months were spent by a crew of eight geologic mapping, making magnetometer and geochemical soil surveys, and diamond drilling three holes totalling 840 feet.
DESCRIPTION: Mineralization consists of pyrite and chalcopyrite in skarn developed in limestone.

FGP

LOCATION: (50° 127° N.W.) In the vicinity of Atkins Cove on the east side of Neroutsos Inlet, east of Drake Island.
CLAIMS: FGP, FGP 2 to 12, 20 to 31.
ACCESS: By boat from Coal Harbour.
OWNER: Knut Akre.
OPERATOR: Giant Explorations Limited, 355 Burrard Street, Vancouver 1; D. M. Wilson, field supervisor.
METAL: Copper.
WORK DONE: Three months were spent by a crew of three geological mapping and diamond drilling 15 holes totalling 835 feet.
DESCRIPTION: Chalcopyrite mineralization occurs in stringers in limestone.

Koerner

LOCATION: (50° 127° N.E.) West end of block is 1 mile east of southeast end of Rupert Inlet and extends 13 miles to the east to Port McNeill.
CLAIMS: Claim block consists of 43 square miles of Crown grants.

ACCESS: A system of logging-roads traverses parts of the area.
OWNER: I. Shulman.
OPERATOR: Newmont Mining Corporation of Canada Limited, 604, 744 West Hastings Street, Vancouver 1; R. F. Sheldon, exploration manager.
METAL: Copper.
WORK DONE: Six months were spent by 12 men geological mapping, making magnetic and induced polarization and geochemical soil surveys on parts of the area.

Kar, Kam

LOCATION: (50° 127° N.E.) On Marble River 4 miles south of Rupert Inlet at elevation 200 feet.
CLAIMS: Kar 1 to 28, 31, 35 to 38 and Kam 63 to 67.
ACCESS: By 25 miles of road and trail from Port Hardy.
OWNER: G. Milbourne.
METAL: Copper.
WORK DONE: Three holes totalling 692 feet were diamond drilled.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1930, pp. 295–296; 1967, p. 69.

Walt

LOCATION: (50° 127° N.E.) About 6 miles southwest of Port McNeill in the vicinity of Keogh River.
CLAIMS: Walt 1 to 8, Lon 1 to 9, Cub 1 to 4.
ACCESS: By 10 miles of road from Port McNeill.
OWNER: J. L. Walton.
OPERATOR: Cominco Ltd., 1199 West Pender Street, Vancouver 1; M. M. Murrell, geologist.
METAL: Copper.
WORK DONE: Two men were employed for one month. Some detailed geological mapping was done and three trenches totalling 1,000 feet in length were bulldozed.
DESCRIPTION: Bornite and chalcocite are disseminated in andesitic volcanic rocks.

Blue

LOCATION: (50° 127° S.E.) Two miles east of Alice Lake, on the west side of Twin Peaks.
CLAIMS: Forty-eight claims recorded as the Blue group.
ACCESS: By 28 miles of road from Port Hardy.
OWNER: Alpha Mines Ltd., 409 Granville Street, Vancouver 2; A. P. Fawley, consultant.
METAL: Copper.
WORK DONE: Two men were employed for two months making a geochemical survey.
REFERENCE: Assessment Report No. 1662.
DESCRIPTION: Mineralization consists of disseminated chalcopyrite and bornite in andesite and basalt of the Karmutsen Formation.

Old Sport Mine

By W. C. Robinson

LOCATION: (50° 127° S.E.) South end of Benson Lake on the west side of Benson River.

CLAIMS: Forty-eight Crown-granted claims, 16 recorded claims, and one mineral lease.

ACCESS: By 26 miles of road from Port McNeill.

OWNER: Coast Copper Company Limited (controlled by Cominco Ltd.), Port McNeill; H. G. Barker, property superintendent.

METALS: Copper, iron (*see* Table 12 for production).

WORK DONE:

Drifting and crosscutting, 4,975 feet; raising, 6,968 feet; diamond drilling, 36,909 feet. An 8- by 22-foot decline, being driven at minus 14 degrees and equipped with a conveyor system, had advanced 3,433 feet at the end of the year. The decline and conveyor system will be used for production from the south area of the mine.

Four conveyor belts driven by 200-, 125-, 20-, and 10-horsepower motors and a 200-kva. 6,900–550-volt transformer were installed in No. 1 decline. Two 125-horsepower sump pumps and three 20-horsepower ventilating-fans were installed in No. 2 decline, and a temporary substation was built for a 6,900–2,300/550-volt transformer. A new powerhouse was built to house three 1,000-kva. diesel-driven generators, and a new substation was built adjacent to this powerhouse.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 71.

Star

LOCATION: (50° 127° S.W.) In the vicinity of Teeta Creek between elevations of 300 and 1,000 feet above the westerly shore of Neroutsos Inlet.

CLAIMS: Sixty-two claims located as the Star group.

ACCESS: Four miles by boat and tote-road from Jeune Landing.

OWNER: Quatsino Syndicate.

OPERATOR: Newmont Mining Corporation of Canada Limited, 744 West Hastings Street, Vancouver 1; R. F. Sheldon, exploration manager.

METALS: Copper, molybdenum.

WORK DONE: Eight men were employed for seven months. Some topographic mapping was done, 3 square miles was mapped geologically, a magnetometer survey was made of 1 square mile, a geochemical soil survey was made over about 1 square mile, eight trenches totalling 1,000 feet in length were blasted, and 5,000 square feet of stripping was done. Five holes totalling 2,910 feet were diamond drilled. A tote-road 2 miles long was built.

DESCRIPTION: Chalcopyrite, molybdenite, pyrite, and pyrrhotite occur in silicified dacite.

RH

LOCATION: (50° 127° S.W.) Between elevations of 1,400 and 3,500 feet, 1 mile south of the head of Colonial Creek and 5 miles southwest of the south end of Neroutsos Inlet.

CLAIMS: RH 1 to 24.

ACCESS: Thirty miles by aircraft from Port Hardy.

OWNER: R. Hunstone.

OPERATOR: Cambridge Mines, Limited, 102, 569 Howe Street, Vancouver 1.

METAL: Copper.

WORK DONE: Five trenches, total length 1,000 feet, were bulldozed, 850 square feet of bedrock was stripped, and six open cuts were excavated.

BONANZA LAKE

Bob (Bonanza Mine)

LOCATION: (50° 126° N.W.) At elevations of 1,000 to 1,200 feet, 1½ miles south of Bonanza Lake.
CLAIMS: Bob 1 to 40.
ACCESS: By road from Beaver Cove.
OWNER: R. A. McIver.
OPERATOR: M.B.H. Developments Ltd., P.O. Box 4183, Station D, Vancouver.
METAL: Copper (*see* Table 12 for production).
WORK DONE: On Bob 9 and 10 about 30 holes, total footage 3,000 feet, were percussion drilled, about 1 acre of bedrock was stripped, and a 40-foot open cut was blasted; 2,265 tons of ore was mined.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 71; Assessment Report No. 953.

KELSEY BAY

Boyes

LOCATION: (50° 126° S.E.) West side of Adam River 1 mile southwest of Keta Lake between 1,000 and 2,000 feet in elevation.
CLAIMS: One hundred and three claims located as the Kevin, Dennis, Bruce, Boyes, and Geo groups.
ACCESS: By 10 miles of logging-road from Sayward.
OWNER: W. R. Boyes.
OPERATOR: Western Standard Silver Mines Ltd., Moyer Road, R.R. 2, Kelowna; J. H. Johnston, president; E. P. Sheppard, consulting geologist.
METAL: Copper.
WORK DONE: Two men were employed for six months. Four claims were mapped geologically, and 10 trenches totalling 154 feet in length were dug.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 72.
DESCRIPTION: Chalcopyrite, chalcocite, and bornite occur in quartz veinlets in a shear zone in metavolcanics.

QUADRA ISLAND

Copper Road Mine

By W. C. Robinson

LOCATION: (50° 125° S.E.) On the west side of Quadra Island about 2 miles north of Deepwater Bay.
CLAIMS: Eleven recorded claims.
ACCESS: By road from the ferry terminus at Quathiaski Cove.
OWNER: E. G., John, Blanche, and Antoinette Adams.
OPERATOR: Ribco Leasing Ltd., Heriot Bay; R. I. Bennett, manager.
METAL: Copper (*see* Table 12 for production).
WORK DONE: Drifting, 100 feet; raising, 20 feet. Four men were employed; production ceased during August.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 72.

Copper Hills, Copper Bell, Colleen

LOCATION: (50° 125° S.E.) On Quadra Island about 2 miles northwest of Heriot Bay between 400 and 800 feet elevation.
CLAIMS: Thirty-two claims located as the Copper Hills, Copper Bell, and Colleen groups.
ACCESS: By road from the ferry terminus at Quathiaski Cove.
OWNERS: W. R. Hall, F. W. Baker, and W. B. Kitchen.

OPERATOR: Quadra Mining Co. Ltd., 1161 South Murphy Street, Campbell River; W. B. Kitchen, president.

METAL: Copper (*see* Table 12 for production).

WORK DONE: Two men were employed for seven months. Some trenching and stripping were done. Two holes totalling 162 feet were diamond drilled and four holes totalling 210 feet were percussion drilled.

COURTENAY

Mt. Washington Copper

LOCATION: (49° 125° N.E.) In the immediate vicinity of Mountain Washington, north of Courtenay and lying between elevations of 1,300 and 4,500 feet.

CLAIMS: An area of 7,940 acres enclosing 178 mineral claims is subject to lease agreement with Canadian Pacific Oil and Gas Limited.

ACCESS: About 15 miles by public and logging roads from Courtenay.

OWNER: Mt. Washington Copper Co. Ltd.

OPERATOR: Marietta Resources Company Ltd., 509, 475 Howe Street, Vancouver 1; W. G. Stevenson, consulting geologist.

METALS: Copper, molybdenum.

WORK DONE: Geology was mapped, and induced polarization and airborne magnetometer surveys were made of 12 square miles. Soil samples were taken for geochemical analysis, and one hole was diamond drilled to a depth of 500 feet. Ten men were employed for seven months.

REFERENCES: Assessment Reports Nos. 1145 and 1691.

DESCRIPTION: The exploration is directed toward investigating the possibility of outlining a porphyry copper-molybdenum deposit. Bedrock consists of sediments, volcanic rocks, and intrusive breccia and porphyry.

TEXADA ISLAND

By W. C. Robinson

Texada Mine

LOCATION: (49° 124° N.W.) The mine is at Welcome Bay on the southwest coast of Texada Island.

ACCESS: Eight miles by road from Vananda.

OWNER: Texada Mines Ltd., P.O. Box 10, Gillies Bay; R. E. Knight, president; A. M. Walker, general manager.

METALS: Iron, copper (*see* Table 12 for production).

WORK DONE: Drifting and crosscutting, 8,631 feet; raising, 2,052 feet; diamond drilling, 23,555 feet. The conversion to trackless mining, which involves the purchase of additional trackless equipment and the driving of access ramps to connect the main levels in the mine, was continued during the year. A 600-horsepower synchronous compressor was installed in the powerhouse, and the underground electrical system was extended.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 72–73.

Seel

LOCATION: (49° 124° N.E.) Between sea-level and 700 feet elevation on the southwesterly coast of Texada Island, 2 miles southeast of Davie Bay.

CLAIMS: Seel 1 to 18, covering ground formerly known as the Stromberg group.

ACCESS: By 8 miles of road from Gillies Bay.

OWNER: Kitimat Copper Co. Ltd., 1200 West Pender Street, Vancouver 1; R. Seel, president.

METAL: Copper.

WORK DONE: Some bedrock trenching was done, and 30 holes totalling 150 feet are reported to have been percussion drilled.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1925, pp. 287–288; 1926, pp. 317–318.

ALBERNI MINING DIVISION

ZEBALLOS

F.L. By A. R. C. James

LOCATION: (50° 126° S.W.) At elevation 2,600 feet on the west side of Zeballos River 4 miles north of Zeballos.

CLAIMS: Thirteen Crown-granted claims, Lots 1999 to 2011, the F.L., Extension, and FE claims, and two recorded claims, the Cordova and Cordova Fraction.

ACCESS: By road from Zeballos.

OWNER: Zeballos Iron Mines Limited, 504, 1112 West Pender Street, Vancouver 1; C. E. Gordon Brown, manager.

METAL: Iron (*see* Table 12 for production).

WORK DONE:

All development was completed by the autumn of 1967. In 1968 the three pillars between the stopes in "A" zone were mined. No. 2 pillar was blasted in February, No. 3 in May, and No. 1 in August. The loading out of broken ore was still in progress at the year-end, but it is expected that operations will be completed early in 1969.

The powerhouse was burned to the ground and all the machinery destroyed in the summer of 1968. A new temporary power plant was built to operate the mill until the mine is worked out, which probably will be early in 1969.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1963, p. 101; 1962, pp. 100–103; 1967, p. 73.

TOFINO

Catface

LOCATION: (49° 125° S.W.) On Catface Range on a peninsula between Bedwell Sound and Herbert Inlet, 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 about its base at about 1,600 feet elevation.

CLAIMS: Catface 1 to 133.

ACCESS: Access is by boat from Tofino, thence by old logging-road to the property.

OWNER: Catface Copper Mines Limited, 500, 1112 West Pender Street, Vancouver 1; R. N. Saukko, geologist.

METAL: Copper.

WORK DONE: Nineteen BQ-size holes totalling 22,628 feet were diamond drilled; some geological mapping and soil-sampling were done. An average crew of 20 men was employed for eight months.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 74; Assessment Reports Nos. 540, 541, and 580.

DESCRIPTION: The showings consist of disseminated chalcopyrite and bornite mineralization with extensive malachite staining in quartz monzonite.

Sydney

LOCATION: (49° 126° S.E.) On the west side of Sydney Inlet northwest of Tofino, extending from sea-level to 1,500 feet elevation.

CLAIMS: Sydney 1 to 19.

ACCESS: Twenty-three miles by boat from Tofino, or by air.

OWNER: Carol Craig and others.

OPERATOR: Cominco Ltd., 1199 West Pender Street, Vancouver 1; R. J. Nicholson, senior geologist.

METALS: Copper, molybdenum.

WORK DONE: An area 2,600 by 3,600 feet was mapped geologically, and 20 silt samples were taken for geochemical analysis. Two men worked one month.

REFERENCE: Assessment Report No. 1592.

DESCRIPTION: Chalcopyrite and molybdenite occur in a shear zone in altered andesite.

KENNEDY LAKE

By A. R. C. James

Brynnor Mine

LOCATION: (49° 125° S.E.) About 2½ miles southeast of Kennedy Lake near the head of Draw Creek.

ACCESS: By Alberni–Tofino road to Kennedy Lake, thence by logging-road to the mine.

OWNER: Brynnor Mines Limited (Kennedy Lake Division), 1050 Davie Street, Vancouver 5. This company is a wholly owned subsidiary of Noranda Mines, Limited.

METAL: Iron (*see* Table 12 for production).

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 75; *B.C. Dept. of Mines*, Bull. No. 55, 1968, pp. 52–60.

DESCRIPTION:

Production ceased in the open pit at the end of 1967, but milling of stockpiled ore continued until April, 1968. The total amount of ore milled in 1968 was 206,188 tons. This yielded 157,197 tons of concentrate.

Development of the mine was begun in 1960, and the first production was in 1962. Production has been entirely from one open pit, although extensive underground development was carried out from August, 1963, to July, 1966. The record of production is as follows:—

Year	Tons of Ore Milled	Tons of Concentrate Shipped
1962	716,054	451,623
1963	968,106	750,901
1964	1,017,343	753,732
1965	843,933	658,515
1966	369,747	321,157
1967	187,588	137,229
1968	206,188	200,121
Totals	4,308,959	3,273,278

Jack

LOCATION: (49° 125° S.E. and S.W.) In the valley of Sand River, 1½ miles north of Kennedy Lake.

CLAIMS: Jack 1 to 16.

ACCESS: Twenty-three miles of public and logging roads from Ucluelet.

OWNER: Arbutus Mining and Exploration Limited, 3680 Collingwood Street, Vancouver 8.

METALS: Copper, silver.
WORK DONE: Two men worked for two months under the supervision of T. C. Scott. A magnetometer survey was made of one claim, and soil samples for geochemical analysis were taken from 16 claims.

PORT ALBERNI

Centennial, Roseanne

LOCATION: (49° 125° S.E.) North side of Great Central Lake southwest of Moran Lake.
CLAIMS: Centennial and Roseanne, totalling 14 claims; elevation 400 to 1,000 feet.
ACCESS: Twenty-six miles by road from Port Alberni.
OWNER: A. P. Boulanger.
OPERATOR: Croydon Mines Ltd. and Madrona Exploration Co. Ltd., 610, 890 West Pender Street, Vancouver 1.
METALS: Copper, iron.
WORK DONE: Ground magnetometer survey on 1,000- by 1,200-foot area in the vicinity of a chalcopyrite showing. Two men worked five days under the supervision of M. K. Lorimer.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 76.
DESCRIPTION: Chalcopyrite, pyrite, and magnetite occur in quartz gangue in shear zone associated with fracturing in amygdaloidal basalts.

Andy, Pak

LOCATION: (49° 124° S.E.) At the headwaters of Corrigan Creek, a tributary of Franklin River, which flows into the east side of Alberni Inlet. Showings range in elevation from 1,200 to 1,800 feet.
CLAIMS: Andy 1 to 28, Pak 1 to 22.
ACCESS: Twenty-four miles of gravel road from Port Alberni.
OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; J. Knauer geologist.
METAL: Copper.
WORK DONE: Soil samples for geochemical analysis taken along 10,000 feet of line. Three men spent one week on the property.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 76.
DESCRIPTION: Chalcopyrite, molybdenite, and pyrite are associated with quartz hornblende veinlets in fracture fillings and disseminations in a stockwork structure in granodiorite.

SR, Mike

LOCATION: (48° 124° N.W.) Four miles south of Sarita River, about 8 miles east of Bamfield, elevation 500 to 900 feet.
CLAIMS: SR 3 to 46, Mike 1 to 6, P 1 to 18, and others totalling 80 claims.
ACCESS: Fifteen miles by road from Bamfield.
OWNER: Marshall Creek Copper Co. Ltd., c/o MacDonald Consultants Ltd., 12, 425 Howe Street, Vancouver 1.
METAL: Molybdenum.
WORK DONE: The geology on 10 claims was mapped, and soil samples were taken for geochemical analysis. Three trenches totalling 2,500 feet were bulldozed. Ten men were employed for four months.
DESCRIPTION: Molybdenite occurs in fractures, shears, and quartz veins in granitic rocks and silicified hornfels.

Skarn

LOCATION: (48° 124° N.W.) On the Nitinat River at elevation of 500 to 1,000 feet.

CLAIMS: Skarn 11, 12.

ACCESS: Thirty miles south from Port Alberni by logging-roads.

OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5.

METAL: Copper.

WORK DONE: Ten thousand line feet of electromagnetic and magnetometer surveying and geochemical soil-sampling over the same area.

DESCRIPTION: Small lenses of pyrite, chalcopyrite, and pyrrhotite in skarn.

BUTTLE LAKE

Lynx Mine

By W. C. Robinson and L. Wardman

LOCATION: (49° 125° N.W.) The mine is on Myra Creek 1 mile west of the south end of Buttle Lake.

ACCESS: By 55 miles of road from Campbell River.

OWNER: Western Mines Limited, 870 One Bentall Centre, Vancouver 1; mine office, Myra Creek; W. G. Jewitt, president; J. B. Magee, general manager.

METALS: Copper, zinc, silver (*see* Table 12 for production). Except for ore obtained during underground development and from an experimental stope, the ore treated was mined from the open pit.

WORK DONE:

Drifting, 3,254 feet; crosscutting, 952 feet; raising 2,255 feet; diamond drilling, 16,896 feet. New construction during 1968 included installation of an underground tailings back-fill plant and storage bin in preparation for a cut-and-fill method of mining.

A 150-kva. portable substation, 4,160–550 volts was installed on the 13th level. Three thousand feet of No. 2/0 Quadraplex cable overhead line was installed between the Lynx portal and the Paramount portal for a mine ventilating-fan and for slushers which may be installed in the future.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1964, pp. 157–166; 1967, pp. 77–78.

Paramount

By W. C. Robinson

LOCATION: (49° 125° N.W.) On the south side of Myra Creek 1 mile west of the south end of Buttle Lake.

CLAIMS: Sixty-nine claims, some Crown granted and some held by record.

ACCESS: By 55 miles of road from Campbell River.

OWNER: Myra Falls Mines Ltd., a wholly owned subsidiary of Western Mines Limited, 870 One Bentall Centre, Vancouver 1; mine office, Myra Creek; J. B. Magee, general manager.

METALS: Copper, zinc, silver.

WORK DONE: Four men were employed for eight months. A new adit, No. 10, was driven at 1,225 feet elevation. It corresponds in elevation to the No. 10 adit of the Lynx mine. Drifting, 1,075 feet; diamond drilling, 5,503 feet; three-quarters of a mile of road built.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 78.

Cream, Bear

LOCATION: (49° 125° S.W. and N.W.) At elevations of 3,000 to 5,000 feet, 5 miles south of Buttle Lake and east of Bedwell Lake.

CLAIMS: Cream 1 to 18, Bear 1 to 42, Elk 1 to 9, 1E to 6E.

ACCESS: Sixty miles by road from Campbell River or 40 miles by helicopter.

OWNER: Cream Silver Mines Ltd., 850 West Hastings Street, Vancouver 1; S. K. Lothrop, managing director.

METALS: Silver, gold, copper, lead, zinc.

WORK DONE: Eight men spent three months on the property. Some detailed geological mapping was done, and soil samples were taken for geochemical analysis. Fifty-three trenches, total length 465 feet, were excavated, and five holes totalling 335 feet were diamond drilled.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 78; Assessment Reports Nos. 1563 and 1564.

VICTORIA MINING DIVISION

JORDAN RIVER

Sunloch and Gabbro By W. C. Robinson

LOCATION: (48° 124° S.E.) The mine is 1 mile north of the mouth of Jordan River.

ACCESS: One mile by road from the turn-off on Highway No. 14 half a mile east of River Jordan Post Office.

OWNER: Cerna Copper Mines Limited (changed from Cowichan Copper Co. Ltd), 620 Howe Street, Vancouver 1; mine office, River Jordan; E. C. Dobell, president. The company has an operating lease from Sunro Mines Ltd. to mine on 51 contiguous claims which cover the Cave, Central, and River ore zones.

METAL: Copper (*see* Table 12 for production).

WORK DONE: Drifting and crosscutting, 1,903 feet; raising, 1,492 feet; diamond drilling, 377 feet. Production ceased November 1, 1968.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1950, pp. 180–193; 1962, pp. 127–129; 1967, p. 78.

ROBERTSON RIVER

Hillcrest

LOCATION: (48° 124° N.E.) Between elevations of 1,500 and 3,000 feet on the east fork of Robertson River 7 miles south of Mesachie Lake.

CLAIMS: Hillcrest group of eight claims (Hillcrest, Hillside, Hilltop, etc.) covering showings formerly known as the Fraser.

ACCESS: By 10 miles of road from Lake Cowichan.

OWNER: W. Fraser.

OPERATOR: Albeta Mines Ltd., 1014 Sluggett Road, Brentwood Bay; G. E. Apps, president.

METALS: Copper, iron.

WORK DONE: One man was employed for one month. Two holes totalling 130 feet were diamond drilled.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1956, p. 122.

DESCRIPTION: Pyrrhotite, chalcopyrite, and magnetite occur in a skarn zone in greenstone.

MOUNT SICKER

Lenora, Tyee, Richard III By W. C. Robinson

LOCATION: (48° 123° N.W.) Between 1,300 and 1,900 feet elevation on Mount Sicker.

CLAIMS: Twenty-six Crown-granted claims, including the Lenora (Lot 35G), the Tyee (Lot 36G), and the Richard III (Lot 39G), and 28 recorded claims.

ACCESS: By road from Duncan.

OWNER: Mount Sicker Mines Ltd., P.O. Box 576, Victoria; E. P. Sheppard, consulting geologist.

METAL: Copper.

WORK DONE: An average crew of five men was employed during 1968. Some geological mapping was done, an electromagnetic survey was made, three trenches totalling 300 feet in length were bulldozed, and some stripping was done.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1902, pp. 238–252; 1943, p. 69; 1967, p. 79; Assessment Reports Nos. 1104 and 1714.

OMINECA MINING DIVISION

TERRACE

NAR (Amax Exploration, Inc.)

(54° 128° N.W. and N.E.) *See under* Skeena Mining Division, page 68.

Croesus

LOCATION: (54° 128° N.E.) On west side of Kleanza Mountain 5 miles east of Terrace.

CLAIMS: Croesus 1 to 120.

ACCESS: By an old logging-road branching off Zymoetz River road 1 mile south of Highway No. 16.

OWNER: Kleanza Mines Ltd., 535 Thurlow Street, Vancouver 5.

METALS: Copper, gold.

WORK DONE: Electromagnetic and geochemical surveys were carried out over the central part of the claim group. Two thousand feet of bulldozer trenching was completed, and eight holes totalling 700 feet were diamond drilled. Surface and underground geological mapping was done by W. M. Sharp. A crew of six men was employed over a seven-month period under the supervision of R. H. Bates.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 80–82, Assessment Report No. 1234.

DESCRIPTION: The geology is described in the 1967 Annual Report, pages 80 to 82.

KLEANZA CREEK

Alvija

LOCATION: (54° 128° N.E.) Between elevations of 1,400 and 2,200 feet at the junction of Kleanza and Kipulta Creeks 22 miles east of Terrace.

CLAIMS: One hundred and eight recorded mineral claims located as the Alpine and Alvija groups and covering ground formerly known as the Idaho and Lucky Jim.

ACCESS: By Highway No. 16 east from Terrace, thence by logging-road and mine road to the property.

OWNERS: Greer, McCulloch, Todd, and Ferber.

OPERATOR: Alvija Mines Ltd., 642 Clark Drive, Vancouver 6; P. Tegart, engineer.
METALS: Copper, silver.
WORK DONE: Surface workings were mapped and geology was mapped in detail in an area 3,000 by 5,000 feet. Fifteen trenches, total length 1,000 feet, were blasted, and four holes having a total length of 1,020 feet were diamond drilled. Eight men worked on the property for eight months. Two miles of mining-road was built.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1929, p. 152; 1967, p. 82; *Geol. Surv., Canada,* Mem. 329, 1964; *Geol. Surv., Canada,* Mem. 212, 1937.

T, DA — ZYMOETZ RIVER

LOCATION: (54° 128° S.E.) On the south side of Zymoetz River at the mouth of Clore River, 24 miles east of Terrace, between elevations of 1,000 and 2,500 feet.
CLAIMS: T 3 to 8, 13 to 20, 25 to 44, and DA 1 to 14.
ACCESS: By Highway No. 16 then south on the Zymoetz River and Columbia Cellulose logging-road to Clore River.
OPERATOR: Ardo Mines Ltd., 102, 1252 Burrard Street, Vancouver 1.
METAL: Copper.
WORK DONE: The surface workings were mapped. An electromagnetic survey was run along 6 line miles, and a reconnaissance geochemical survey was run along 10 line miles. Six trenches totalling 1,000 feet were dug by hand. Two men worked three months under the supervision of Tom McMahon.
REFERENCE: Assessment Report No. 1581.

Golconda — USK

LOCATION: (54° 128° N.E.) Fifteen miles northeast of Terrace, on Bornite Ridge, elevation 2,000 feet, 2 miles east of Usk.
CLAIMS: Fifty-four recorded claims adjoining the Golconda, mineral lease M19.
ACCESS: From Highway No. 16 and Emma Creek trail.
OWNER: J. Bell, of Usk.
OPERATOR: Shasta Mines & Oils Ltd., 1390 Pemberton Avenue, North Vancouver.
METALS: Copper, silver.
WORK DONE: Assessment work only.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 82.

FM, J & J — LEGATE CREEK

LOCATION: (54° 128° N.E.) Between elevations of 4,500 and 5,300 feet at the headwaters of Legate Creek.
CLAIMS: FM 1 to 6, J & J 1 to 4, Hub 1 to 20.
ACCESS: Twenty-five miles by helicopter from Terrace.
OWNERS: FM and J & J claims owned by Hub Mining & Exploration Ltd. Hub owned by Silurian Chieftain Mining Company Limited.
OPERATOR: Hub Mining & Exploration Ltd., 605 Comox Road, Nanaimo; A. P. Fawley, consultant.
METALS: Copper, lead, silver.
WORK DONE: On the J & J 1 and 3 claims, 18 holes totalling 944 feet were diamond drilled. Two men spent two months on the property.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 83.

SEVEN SISTERS PEAKS

Rega

LOCATION: (54° 128° N.E.) Forty-four miles northeast of Terrace at elevations of 5,000 to 6,000 feet on the southwest side of Seven Sisters Peaks between the heads of Flint and Oliver Creeks.

CLAIMS: Rega 1 to 27.

ACCESS: From Highway No. 16 at Coyote Creek by four-wheel-drive vehicle for a distance of 7½ miles.

OWNER: Arthur J. Agar.

OPERATOR: Magnetron Mining & Investment Corporation Ltd., 202, 777 Hornby Street, Vancouver 1.

METALS: Silver, lead, zinc, copper.

WORK DONE: Surface workings were surveyed and electromagnetic and magnetometer surveys of Rega 1 to 4 claims were made. Two adits, total length 60 feet, were driven. Some access road was built.

KITSEGUECLA RIVER

By R. V. Kirkham

Jan

LOCATION: (54° 127° N.W.) The showings are between elevations of 4,000 and 6,000 feet on the north side of an 8,100-foot mountain at the head of Kitsuns Creek about 10 miles west of Louise Lake.

CLAIMS: Jan 1 to 40, Windy 1 to 6.

ACCESS: Thirty-two miles by helicopter west from Smithers.

OWNER: Mastodon-Highland Bell Mines Limited, 300, 999 West Pender Street, Vancouver 1.

METALS: Copper, molybdenum.

WORK DONE: One 600-foot diamond-drill hole was put down in the vicinity of the trenches that were completed in 1967. An induced polarization, a magnetometer, and a geological survey were also completed. A crew of six men under the supervision of E. Wozniak worked on the property for 1½ months.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 84.

DESCRIPTION:

The porphyry-type copper-molybdenum mineralization of the area, with its marked gossan, was originally discovered and staked in 1964 by personnel of Amax Exploration, Inc. However, the property was abandoned in 1965 after preliminary geological and geochemical surveys had produced negative results. E. Wozniak, of Mastodon-Highland Bell Mines Limited, rediscovered the property in 1967 during the course of aerial reconnaissance work. Since then the company has prospected the ground, done some geophysical, geochemical, and geological work, completed two rock trenches for sampling purposes, and has drilled one 600-foot hole.

The deposit occurs in the centre of a small range that is underlain by volcanic and sedimentary rocks of the Hazelton Group and by small porphyry intrusions in the south, and in the north by sedimentary rocks that are probably equivalent to those of the Bowser Group in the Terrace area. In areas that have been mapped, most units strike either easterly or southeasterly and dip moderately to steeply north. Hence the sequence appears to be upright and reasonably uncomplicated away from the intrusions.

The porphyries, which were emplaced as dykes, sills, and stocks, cut all units; however, the largest masses have been emplaced in the volcanic unit between the

Hazelton sediments in the south and the Bowser sediments in the north. From limited reconnaissance mapping, most of these porphyry bodies appear to be either large dykes or small stocks. Some of the latter have been only partially unroofed.

The host rock of the porphyries is mainly fairly uniform, medium- and dark-green basaltic or andesitic tuff-breccia and tuff with fine-grained calcic plagioclase and minor clinopyroxene phenocrysts and crystal fragments. In areas that the writer visited, the contact relations between the volcanic rocks and the porphyries are obscured by pervasive hydrothermal alteration.

The porphyries consist primarily of fine- and medium-grained plagioclase and variable amounts of hornblende, quartz, and biotite phenocrysts, set in a very fine-grained to aphanitic quartzofeldspathic matrix. Most of them are probably quartz diorites. At most localities the plagioclase phenocrysts constitute from 25 to more than 50 per cent of the rock. Under the microscope it can be seen that they form very complex oscillatory zoned crystals (An_{30-45}). The hornblende, which is present in unaltered rocks away from the mineralized area, apparently constituted from 5 to 15 per cent of most porphyries. In the mineralized area, however, most of the hornblende has been completely destroyed by alteration, therefore its original presence can only be inferred. Fine-grained quartz phenocrysts in most areas range from 0 to 10 per cent of the rock. In the drill core there is a discernible increase in the proportion of quartz phenocrysts with depth, possibly signifying that the intrustion is more siliceous beneath the surface. Small percentages of biotite as phenocrysts were found only in specimens of drill core. However, in the mineralized area there could have been much more primary biotite that was subsequently destroyed by hydrothermal activity.

In most specimens the matrix is very difficult to resolve because it is intensely altered and very fine grained. Nevertheless, it was possible to see that in some specimens the matrix is composed primarly of quartz and potash feldspar. However, in none of the specimens examined does potash feldspar appear to constitute more than 20 per cent of the rock. Apatite, even though it probably does not exceed more than 2 per cent, is an important accessory of most porphyries.

The main mineralization occurs in what could be a large dyke-like body of porphyry that is about one-half mile wide and 1 mile long. The body strikes approximately east, dips steeply, and probably is terminated on both ends by faults. The country rock is mainly highly altered mafic tuff and tuff-breccia.

Including part of the porphyry body and the volcanic rocks, there is an area of about 1 by 1½ miles of intensely stained pyritic altered rocks. This alteration is of the propylitic type, being characterized by the presence of epidote and only small percentages of sericite, carbonate, and kaolin. The pyrite at most localities amounts to at least 2 to 3 per cent of the rock. Within this pyritic, propylitic, altered envelope there is an area of about 1,500 by 2,000 feet that contains quartz and carbonate veinlets and chalcopyrite, pyrite, and molybdenite. The molybdenite is probably more highly concentrated in the central part of this area. The alteration in this area is more intense and is marked by an increase in kaolin, sericite, carbonate, and quartz. Chlorite is abundant both in the outer propylitic areas and the inner sericitic, argillic areas. Minor amounts of hydrothermal biotite and potash feldspar are present locally in the inner sericitic, argillic zone. Some stained pieces of drill core from highly altered porphyry show very fine-grained secondary potash feldspar along the walls of hair-line fractures.

Some medium- to very fine-grained aplitic dykelets of pink, perthitic, potash feldspar and quartz also occur in the drill core. These dykelets contain minor disseminated pyrite and appear to cut altered porphyry and some mineralization

but are in turn cut by mineralized quartz veinlets. Hence, although they are not very abundant in areas that were studied, they appear to be temporally related to the mineralization.

For its entire length the 600-foot hole contains pyrite, chalcopyrite, molybdenite, and some magnetite in quartz and carbonate veinlets and along hair-line fractures. However, the over-all grade of copper, molybdenum, and precious metals is low. The copper-molybdenum ratio in this area was found to be approximately three to one. This hole was drilled at minus 45 degrees in a southeasterly direction below the rock face near the trenches. Hence it ended only about 250 feet below the surface near the valley bottom.

HAZELTON

Silver Standard Mine

LOCATION: (55° 127° S.W.) Five and one-half miles north of Hazelton at 1,500 feet elevation on Mount Glen.

CLAIMS: Eight Crown-granted claims under lease.

ACCESS: By road from Hazelton.

OWNER: Silver Standard Mines Limited.

OPERATOR: Northwestern Midland Development Co. Ltd., P.O. Box 1329, Prince George; mine address, P.O. Box 130, Hazelton; J. L. Bryck, president.

METALS: Gold, silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Four men were employed during the year cleaning out old mine stopes, driving 25 feet of drift on the No. 2 vein and 30 feet on the No. 10. A bank of eight flotation cells was added to the mill circuit. Two hundred and one tons of selected high-grade ore was shipped and 560 tons was mined and milled.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 84.

Sunrise

LOCATION: (55° 127° S.E.) At the head of Sunrise Creek in Silver Cup Basin on the north side of Nine Mile Mountain 1 mile east of the Silver Cup. The old portal is at 4,940 feet and the surface outcrop of the vein is at 5,120 feet.

CLAIMS: The Alpha 1 to 30 and Van 1 to 6 and six Crown grants—Noonday, Hidden Treasure, Ethel, Sunset, Sunrise, and Ethel Fraction—cover ground formerly known as the Sunrise and Lead King.

ACCESS: Thirteen miles northeast of Hazelton by four-wheel-drive vehicle.

OWNER: Sunrise Silver Mines Ltd., 425, 718 Granville Street, Vancouver 2.

METALS: Silver, lead, zinc.

WORK DONE: From June until December five men were working on the claims. A new nine-man camp was built near the mountain-top within 200 yards of the main tunnel workings. Other buildings consist of a supply storage house, a storage shed for shipping-grade ore, and a powerhouse. Twenty-one thousand cubic yards of overburden was stripped from the showings by two small bulldozers. Some of the veins uncovered were surface mined, and 300 tons of ore was stockpiled. An 8- by 16-inch jaw crusher driven by a gasoline motor and a hammer mill were set up to crush ore to one-quarter inch for pipelining downhill in plastic pipe to the storage shed. One mile of the mine road was gravelled, some of the narrow rock sections were blasted, and two sections of the old road were relocated.

REFERENCE: *Geol. Surv., Canada,* Mem. 233, pp. 50–52, 78–82.

American Boy

LOCATION: (55° 127° S.W.) On the southwest slope of Mount Glen, northeast of Hazelton.
CLAIMS: American Boy 1 to 6.
ACCESS: By road from Hazelton.
OWNER: George Braun.
OPERATOR: Northwestern Midland Development Co. Ltd., P.O. Box 1329, Prince George; mine address, P.O. Box 130, Hazelton.
METALS: Silver, lead, zinc.
WORK DONE: The American Boy No. 6 vein was stripped and trenched for a total length of 500 feet.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 84.

Bill

LOCATION: (55° 127° S.W.) Ten miles east from Hazelton at elevations of 3,600 to 4,100 feet on Nine Mile Mountain.
CLAIMS: Bill 1 to 16 recorded claims and mineral leases M54 (Silver Dollar, Lot 367, and Hazelton, Lot 3469) and M57. The claims cover showings formerly known as the Barber Bill.
ACCESS: Ten miles by truck from Hazelton.
OWNER: Frontier Exploration Limited, 642 Clark Drive, Vancouver 6.
METALS: Silver, lead, zinc.
WORK DONE: Samples were taken from an area 500 by 1,000 feet in the vicinity of the Tunnel vein for geochemical analysis. Three trenches, length 4,300 feet, were bulldozed, and the old adits were cleaned out. Three men worked for two months on the property.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1910, p. 87; 1966, p. 81.

Orbi

LOCATION: (55° 127° S.E.) Between elevations of 1,300 to 2,000 feet along Bulkley Canyon at the mouth of Porphyry Creek.
CLAIMS: Eighty-eight recorded claims located as the Orbi group.
ACCESS: Twelve miles south by road from New Hazelton.
OWNER: Utah Construction & Mining Co., 718, 510 West Hastings Street, Vancouver 2; M. J. Young, senior geologist.
METALS: Copper, lead, zinc.
WORK DONE: Soil-sampling over an area 5,000 by 1,800 feet was done for geochemical analysis. Six men were employed for two weeks.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 85.

SKEENA MOUNTAINS

BABINE RANGE

King

LOCATION: (55° 127° S.E.) Twenty-five miles north of Moricetown, between elevations of 4,900 and 5,600 feet, 4 miles west of Thoen Mountain.
CLAIMS: King 15 to 54, formerly the Tee group.
ACCESS: Forty-four miles by helicopter from Smithers.
OWNER: Mastodon-Highland Bell Mines Limited, 300, 999 West Pender Street, Vancouver 1; E. R. Wozniak, geologist.

METALS: Copper, molybdenum.
WORK DONE: The geology was mapped, and induced polarization and magnetometer surveys were made. Six men spent 1½ months on the property.
REFERENCES: Assessment Reports Nos. 793 and 1590.
DESCRIPTION: Chalcopyrite, pyrite, and molybdenite are disseminated and occur in quartz veinlets occupying fractures in quartz monzonite.

Suskwa

LOCATION: (55° 126° S.W.) Between elevations of 5,000 and 5,100 feet 1 mile west of French Peak and 10 miles west of Nilkitkwa Lake.
CLAIMS: Suskwa 1 to 16.
ACCESS: Forty miles by helicopter north of Smithers.
OWNER: Mastodon-Highland Bell Mines Limited, 300, 999 West Pender Street, Vancouver 1; E. R. Wozniak, geologist.
METALS: Copper, molybdenum.
WORK DONE: The topography and surface workings were mapped. The geology was mapped, and induced polarization and magnetometer surveys were made. Soil samples were taken for geochemical analysis, and three trenches, length 7,600 feet, were bulldozed. Six men spent one month on the property.

M.G.

LOCATION: (55° 127° S.E.) Thirty-two miles north from Smithers at elevation 2,500 feet on Harold Price Creek, 3 miles upstream from its junction with Suskwa River.
CLAIMS: M.G. 1 to 14.
ACCESS: By helicopter from Smithers.
OWNER: Utah Construction & Mining Co., 718, 510 West Hastings Street, Vancouver 2; M. J. Young and G. A. Noel, geologists.
METALS: Silver, lead, zinc.
WORK DONE: The geology of the claims was mapped, and an electromagnetic survey was made. Soil samples were taken for geochemical analysis. Three X-ray holes totalling 338 feet were diamond drilled. Nine men spent six weeks on the property.
DESCRIPTION: Quartz-siderite veins mineralized with galena, sphalerite, pyrite, and jamesonite occur in Bowser sediments.

Bear (Laura) By A. Sutherland Brown

LOCATION: (55° 127° N.W.) Western flank of Mount Thomlinson between McCutcheon and Sterritt Creeks, 20 miles north of Hazelton.
CLAIMS: One hundred and eighty-seven recorded claims, in five groups, with Bear 1 to 26 covering the porphyry plug and main known mineralization; first located as Mike group by Kennco Explorations, (Western) Limited.
ACCESS: Three-mile access road to camp at about 4,500 feet elevation connects with a dirt road to Kisgegas.
OWNERS: E. and H. Simpson, of Hazelton.
OPERATOR: Laura Mines Ltd., 800, 789 West Pender Street, Vancouver 1; exploration managed by MacDonald Consultants Ltd.
METALS: Molybdenum (copper).
WORK DONE: Detailed soil survey, 10,000 feet BQ diamond drilling in 17 holes, 28,600 feet of trenching; Patrick Henry in charge under over-all supervision of Earl D. Dodson.

Geology

The Laura porphyry plug is a satellite of a group of small plutons in the core of Mount Thomlinson. These epizonal plutons are outriders in a zone of small plutons that mark the northern flank of the Skeena Arch. In this zone the thick sequence of clastic sediments of the Bowser Group is punctured by isolated intrusions that mark the zone of transition from the Bowser Basin proper to the frayed, faulted, and digitated southern margin. The Bowser Group in the vicinity of the Laura pluton originally consisted mainly of lithic sandstones and siltstones. These have been moderately compressed into northwesterly trending folds. The Laura plug occurs in the western flank of a major anticline, but locally the attitudes are discordant and, where bedding can be determined, the beds dip commonly northeasterly. Surrounding the plug the volcanic sandstones have been thermally metamorphosed in an irregular halo up to 1,500 feet wide characterized by the growth of new felted purplish-brown biotite. Near the porphyry plug the hornfels has an intense fracture stockwork.

The Laura pluton is an irregular but fairly simple porphyry plug consisting of two nearly identical phases. In hand specimen P1, the earlier phase, is an obvious porphyry, but P2, the later phase, commonly appears more granitoid because it is crowded with phenocrysts. Both phases are rusty-weathering medium-grey rocks with prominent plagioclase, hornblende, and scattered hexagonal biotite books. P2 has intruded the P1, for it has hornfelsed adjacent parts, indicated by conversion of original hornblende into a felted mass of brown biotite or, more restrictedly, fine acicular actinolite.

Figure 15 is a map based partly on company maps. Considerable interpretation is necessary in projecting dyke-like masses and the contact of the phases because surface exposure is only fair and the phases are very similar. The earlier phase (P1) is the most irregular for it combines elements of lineal and arqurate dyke systems with central intrustion. The later phase (P2) is a central subcircular plug concentric with the first. Contacts between the two phases appear gradational over a short distance, but this may be more apparent than real because of their great similarity.

Microscopy

Both phases of the Laura pluton are composed of rocks that in classification straddle the quartz monzonite-granodiorite boundary in that the potassium feldspar content varies narrowly on either side of one-third of the total feldspar. The average compositions of both are just within the granodiorite field. The following table gives estimated modes in volume per cent based on comparison charts for four and six fresh specimens respectively:—

	P1		P2	
	Average	Range	Average	Range
Phenocrysts—				
Plagioclase	30.25	20–41	39.3	30–51
Composition	An_{48-20}	-----	An_{44-25}	-----
Quartz	.25	0– 1	----	----
Hornblende	8	5–12	8	7–10
Biotite	1.4	.5– 3	0.5	0– 2
Ores	1.4	.5– 2	0.5	0– 2
Total—				
Plagioclase	44.4	37–57	44.3	36–55
Potassium feldspar	20	10–26	21.3	16–25
Quartz	20.4	17–24	20.3	15–25
Hornblende and biotite	13.2	11.5–17	13.1	11–16.5
Ores	1.8	.5– 4	1	0– 2

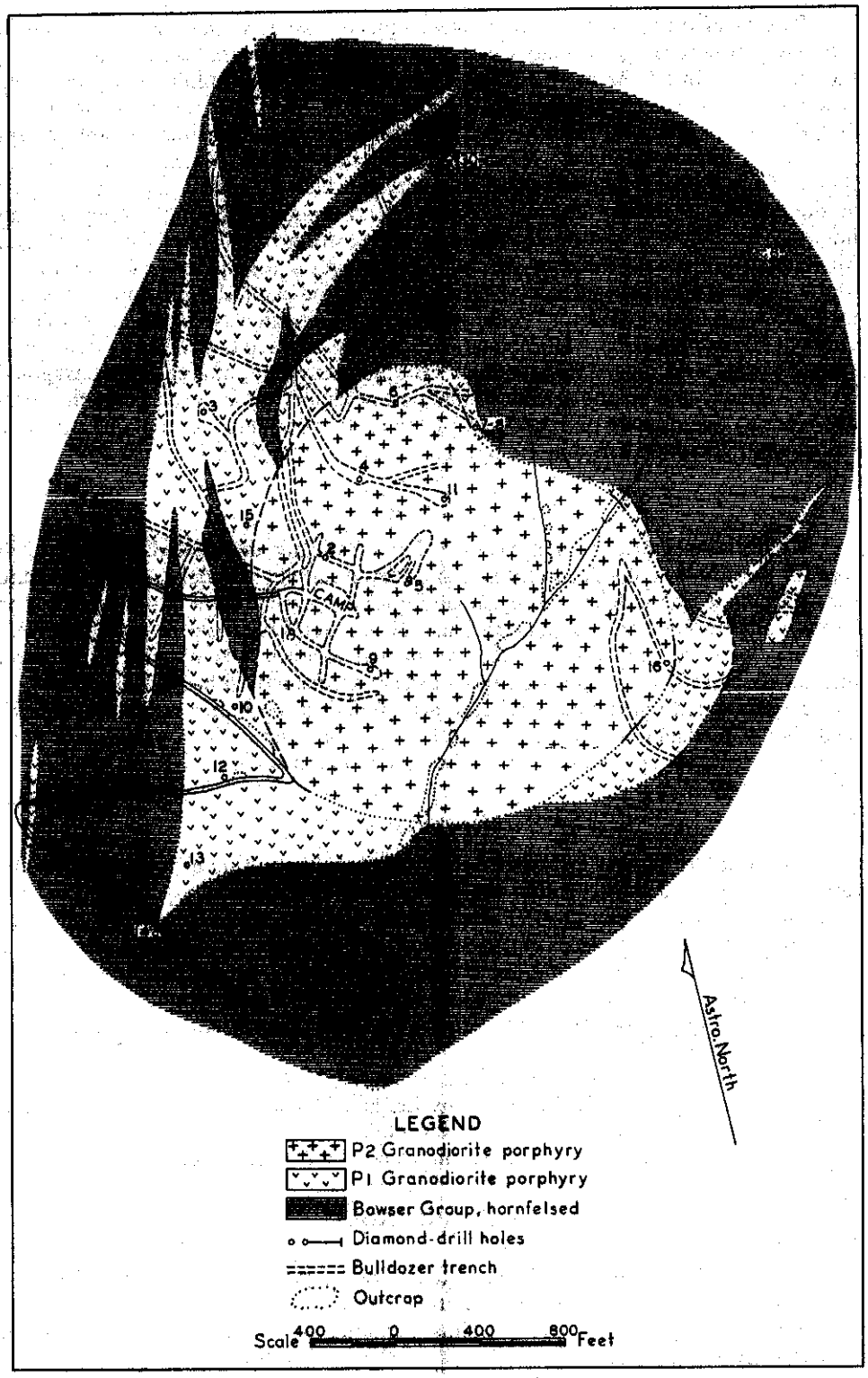


Figure 15. Laura Mines Ltd., Laura porphyry pluton, adapted from company plans.

The chief differences evident microscopically between the two phases are a difference in percentage of plagioclase phenocrysts and a variation in grain size of the matrices. In P1 the matrix is fine (average about 0.03 millimetre), but in P2 is somewhat coarser (average about 0.1 millimetre). Together these characteristics give P2 a more granitoid macroscopic appearance. Quartz phenocrysts are present rarely in P1 but absent in P2. Most quartz and all potassium feldspar is confined to the matrix in both. The plagioclase phenocrysts which form such a prominent part of the rocks are chunky crystals mostly 1 to 4 millimetres long. They are all intensely oscillatory zoned over a range in composition from about An_{45} to An_{20}. Most larger crystals show five or six major cycles over a large part of the total range. Many show synneusis (accidental attachment in the melt during flow) at intermediate stages of the oscillatory zonal growth stage. Plagioclase in the matrix shows only one normal zonation. Hornblende crystals are characteristically long diamond-shaped prisms with ragged terminations. Biotite occurs in scattered large hexagonal books. Sphene and apatite are the commonest accessory minerals and together form one-tenth to one-quarter of 1 per cent of the rock. Disseminated opaque minerals are chiefly pyrrhotite, but may be pyrite.

Alteration

Hydrothermal alteration appears rather erratically distributed. In the drill core for most holes there is an alternation of fresh and altered rock, mostly kaolinite (and carbonate) or sericite with pyrite and quartz. Rarely there is some potassium feldspar alteration or intense silicification. The altered zones appear to be relatively flat lying, but with the widely spaced vertical drill-holes it is difficult to be sure. Intense sericitized zones appeared most closely associated with mineralization.

Disseminated pyrite and pyrrhotite also appear to be rather erratically distributed, but a tendency is evident in which pyrrhotite increases in proportion with depth and pyrite is dominant in hydrothermally altered rocks.

Mineralization

Diamond drilling has established that molybdenum and minor copper mineralization is widely distributed within the pluton, and better grades are commonest toward the periphery. The detailed distribution is fairly erratic. Molybdenite and chalcopyrite occur in quartz veinlets and in dry fractures in a stockwork. Four stages of fracturing and veining are evident:—

(1) Dry pyrite fractures with traces of chalcopyrite and amphibole.
(2) Quartz-pyrite-molybdenite stockwork with chief orientations steep.
(3) Quartz-pyrite.
(4) Quartz-carbonate banded veins with vuggy openings and minor pyrite, sphalerite, specularite, arsenopyrite, and hair-like stibnite or bismuthinite —oriented chiefly near the horizontal.

The company has not announced the discovery of any mineable reserves.

ATNA RANGE

Cob, Ice, Jan, Mad

LOCATION: (55° 127° N.E.) In the Atna Range between elevations of 3,500 and 6,000 feet on the west side of Sicintine Lake.

CLAIMS: One hundred and twenty claims, including the Atna, Sic, Cob, C.M., Ice, Jan, and Mad groups.

ACCESS: From Smithers by helicopter.

OWNER: Sicintine Mines Limited.
OPERATOR: Canadian Superior Exploration Limited, 2201, 1177 West Hastings Street, Vancouver 1; R. A. Dujardin, chief geologist; B. H. Kahlert, project geologist.
METAL: Molybdenum.
WORK DONE: Twelve men worked for two months. A topographic map was made, detailed and regional geology on the Cob and Sic claims was plotted, and soil and rock samples were taken for geochemical analysis. Ten trenches, total length 250 feet, were blasted in rock. Four holes totalling 3,320 feet were diamond drilled.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 85–86.

Ice

LOCATION: (55° 127° N.E.) Between elevations of 3,500 and 5,800 feet at the head of Shelagyote River on the east slope of Atna Range, 8 miles south of Sicintine Lake.
CLAIMS: Ice 1 to 55.
ACCESS: By helicopter from Smithers a distance of 96 miles.
OWNER: Sicintine Mines Ltd., 301, 550 Burrard Street, Vancouver 1; M. H. Sanquinetti, geologist.
METALS: Molybdenum, copper.
WORK DONE: Reconnaissance geology of 23 claims was mapped, and detailed geology of an area 1,500 feet square was done. Seventeen trenches, total length 316 feet, were blasted in bedrock. Three men spent one month on the property.
DESCRIPTION: Molybdenite, chalcopyrite, and pyrite occur as disseminations and in quartz veins in fractured quartz monzonite and quartz diorite.

Peak

LOCATION: (55° 127° N.E.) On the southeast side of Shedin Peak in the Atna Range.
CLAIMS: Peak 1 to 22.
ACCESS: Ninety miles by helicopter from Smithers.
OWNER: Chataway Exploration Co. Ltd., 301, 550 Burrard Street, Vancouver 1; M. H. Sanguinetti, geologist.
METAL: Molybdenum.
WORK DONE: Detailed geology of two zones on the Peak No, 6, and 1, 2, and 22 claims was mapped; 11 trenches, total length 285 feet, were drilled and blasted in bedrock; surface workings were surveyed and mapped.
DESCRIPTION: Molybdenite occurs in shear and quartz veins, and as disseminations in granodiorite.

Cumo, Ike

LOCATION: (55° 127° N.E.) Forty-five miles north from Hazelton at elevations of 3,500 to 4,000 feet in the Atna Range, 4 miles south of Shedin Peak.
CLAIMS: Cumo 1 to 30 and Ike 1 to 6 are grouped as the Macumo group. In addition, Newmont Mining Corporation of Canada Limited located a large number of claims as the MJ group.
ACCESS: By helicopter 45 miles from Hazelton.
OWNERS: D. J. McDonald, M. A. Martin, and I. Shulman hold the Cumo and Ike claims.

OPERATOR: Newmont Mining Corporation of Canada Limited, 604, 744 West Hastings Street, Vancouver 1, held the claims under option agreement until November, 1968; D. M. Cannon, consulting geologist.
METALS: Copper, molybdenum.
WORK DONE: Some claims were surveyed and surface workings were mapped. An area of 2 square miles was geologically mapped, 12 trenches for a length of 1,500 feet were blasted in bedrock, and some stripping was done by hand. Six men worked for four months on the property.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 86.
DESCRIPTION: Pyrite, chalcopyrite, and molybdenite with quartz occur in breccia and as fracture fillings near the contact of a quartz diorite pluton.

CARIBOO HEART RANGE

Northstar

LOCATION: (56° 126° S.E.) In the Cariboo Heart Range north of Kaza Lake, 95 miles north-northeast of Smithers.
CLAIMS: About 130 claims, including the Fred 1 to 12, Bobo 1 to 12, Marg 1 to 6, and others.
ACCESS: By air from Smithers or by 30 miles of tractor-trail from Bulkley House at the head of Takla Lake.
OWNER: Northstar Copper Mines Ltd., 1214 Eastview Road, North Vancouver; R. M. Tait, president and field manager.
METAL: Copper.
WORK DONE: Seven men spent five months working on the property. A tractor-trail from Bulkley House was built, about 30,000 feet of trenching was done by bulldozer, 2,600 feet of diamond drilling was done in 11 holes, and about 50 short holes totalling 200 feet drilled by Cobra drill.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 86–88.

Fire

LOCATION: (55° 126° N.E.) Four miles south-southwest of Kaza Lake, 90 miles north-northeast of Smithers.
CLAIMS: Fire 1 to 43, Burn 1 to 12, and others.
ACCESS: Ninety miles by air from Smithers or by 20 miles of tractor-trail from Bulkley House.
OWNER: Kaza Copper Limited, 1214 Eastview Road, North Vancouver; R. M. Tait, president.
METALS: Copper, silver.
WORK DONE: Detailed geology of an area 1,500 by 2,000 feet on the Fire 1 to 4 claims was mapped; 10,000 lineal feet of trench was bulldozed. Twenty miles of access road from Bulkley House was built, six holes totalling 1,500 feet were diamond drilled. Eight men spent five months on the property.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 88–89; Assessment Report No. 1191.

MCCONNELL RANGE

Marmot, Thorne

LOCATION: (56° 126° N.E.) Between elevations of 5,000 and 6,300 feet on Menard Creek near the headwaters of the Ingenika River.
CLAIMS: One hundred and sixty-nine claims—Marmot 1 to 141, Thorne 1 to 28.
ACCESS: Two hundred miles by float plane from Fort St. James to Thorne Lake,

then by tractor-trail to the camp, 10 miles southeast of the lake or by wheel-mounted aircraft from Prince George to the landing-strip on the property, roughly 300 miles.

OWNER: New Wellington Mines Limited, c/o John Sheather, 2750 Matson Road, Victoria.

METALS: Copper, gold, silver.

WORK DONE: Three men spent three months stripping approximately 8 acres of bedrock and making a geological survey under the supervision of W. D. Savage, field manager.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, p. 82; 1967, p. 89.

SICINTINE RANGE

Dave

LOCATION: (56° 126° S.W.) At elevation 5,000 feet, 4 miles west of Bear Lake.

CLAIMS: Davie 1 to 8 (formerly in part Bearnx and Bobnx).

ACCESS: One hundred miles north by air from Smithers.

OWNER: Cominco Ltd., 1199 West Pender Street, Vancouver 1; J. M. Hamilton, exploration geophysicist.

METAL: Copper.

WORK DONE: An electromagnetic survey along 7.8 line miles was made on the Dave 1 to 6 claims. Two men spent one week on the property.

REFERENCE: Assessment Report No. 1614.

JKB

LOCATION: (56° 127° S.E.) Six miles southeast of junction of Squingula River with Skeena River.

CLAIMS: JKB 1 to 20, formerly called Motase A.

ACCESS: By float plane, 100 miles north from Smithers.

OWNER: Canadian Superior Exploration Limited, 2201, 1177 West Hastings Street, Vancouver 1.

METAL: Copper.

WORK DONE: Six men spent one month making geological and geochemical surveys on the 20 claims under the supervision of B. Kahlert, geologist.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 81.

DESCRIPTION: Chalcopyrite and pyrite are disseminated in an intensely kaolinized feldspar porphyry.

SMITHERS

Cu, Bob, Mert

LOCATION: (54° 126° N.W.) On the northeast side of Astlais (Big Onion) Mountain, 12 miles east of Smithers between elevations of 4,000 and 5,000 feet.

CLAIMS: Cu 1 to 19, 21 and 23, Bob 1 to 4, 6, 8, and 10, Mert 3, 5 to 20, and 23 to 37.

ACCESS: By 6 miles of access road from the Babine Lake road.

OWNER: Tro-Buttle Exploration Limited, 118, 815 West Hastings Street, Vancouver 1; G. A. Dirom, consultant.

METALS: Copper, molybdenum.

WORK DONE: Some bulldozer trenching and stripping and soil-sampling was done on the Cu group, and a geochemical survey of the Mert group was made. No work was done on the Bob claims.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 90; Assessment Reports Nos. 1017 and 1143.

Glacier Gulch By R. V. Kirkham

LOCATION: (54° 127° N.E.) The main showings are 5 miles northwest of Smithers in Glacier Gulch on the east side of Hudson Bay Mountain.

CLAIMS: Four hundred and twenty-five recorded and Crown-granted claims.

ACCESS: The 3,500-foot level portal is 8 miles by road from Smithers.

OWNER: Fourteen Crown-granted and 30 recorded claims are held under option from W. Yorke-Hardy and associates.

OPERATOR: Climax Molybdenum Corporation of British Columbia Limited, P.O. Box 696, Smithers.

METALS: Molybdenum, tungsten.

WORK DONE: Six diamond-drill holes totalling 6,647 feet were completed from underground, and geochemical soil-sampling was done on part of the property. However, because of the increased supply of molybdenum in the western world and the company's large economic commitment in Colorado on the Henderson project, exploration of this large deposit has been curtailed.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 86–90.

DESCRIPTION: Deep diamond-drill holes from underground have shown that a large body of quartz monzonite porphyry, which apparently post-dates most of the molybdenum mineralization, is present on the western side of the orebody. The " porphyritic granodiorite " shown at the base of hole No. 28 (Ann. Rept., 1966, Fig. 11) is part of this body.

Sil-Van Mine By R. V. Kirkham

LOCATION: (54° 127° N.E.) The mine is on the southwest side of Hudson Bay Mountain, 14 miles by road from Smithers.

OWNER: Sil-Van Mines Limited.

OPERATOR: Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2.

METALS: Silver, lead, zinc, copper, gold.

WORK DONE: In order to test some electromagnetic anomalies found in 1963 in the vicinity of the old mill, three holes totalling 2,221 feet were diamond drilled from surface.

REFERENCES: *Geol. Surv., Canada*, Mem. 223, 1954; *Minister of Mines, B.C.*, Ann. Repts., 1948, pp. 82–85; 1963, p. 25.

DESCRIPTION: Relatively unaltered, flow-layered, spherulitic, and massive rhyolite and some fragmental volcanic rocks and green andesitic dykes were the main rock types intersected in the drill-holes. Only trace amounts of galena and sphalerite and minor sections of hydrothermally altered rocks were intersected.

Midnight, Canadian Citizen, American Citizen By R. V. Kirkham

LOCATION: (54° 127° N.E.) The claims lie between elevations of 2,000 and 5,000 feet and cover most of the lower slopes of Hudson Bay Mountain immediately west of Smithers.

CLAIMS: Two hundred and eight claims located as the Midnight, NF, BV, SL, and Seymour groups and Canadian Citizen (Lot 7171) and American Citizen (Lot 7238).

ACCESS: The Midnight group is about 4 miles by jeep-road west of Smithers, and the Canadian Citizen and American Citizen claims are about 2 miles from Smithers along the McDonell Lake road.

OWNER: Buval Mines Ltd., 812, 1177 West Hastings Street, Vancouver 1.

METALS: Silver, lead, zinc, copper, gold.

WORK DONE: Nineteen short diamond-drill holes totalling 3,600 feet were completed. Fifteen, totalling 2,130 feet, were drilled on the old Snowshoe property, now located as the Midnight 1, 2, 3, and 4 claims, and four, totalling 1,370 feet, were drilled on the Canadian Citizen and American Citizen claims. A crew of six men under the supervision of M. J. Beley worked on the property for four months. Beley did some detailed geological mapping in the vicinity of the Snowshoe vein.

REFERENCES: *Geol. Surv., Canada,* Mem. 223, 1954, p. 125 (Snowshoe); *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 90–91.

DESCRIPTION:

Present exploration was confined to the old Snowshoe and Canadian Citizen properties, where two entirely different types of mineralization occur. On the Snowshoe property there is a complex, massive sulphide-sulphosalt vein with variable amounts of quartz and carbonate gangue. On surface this vein strikes south to southeast and dips 60 to 80 degrees southwest. The diamond-drill results indicate, however, that the dip is considerably less at depth. The main ore minerals found in this vein are galena, sphalerite, arsenopyrite, pyrite, chalcopyrite, and tetrahedrite. The main metals of value are silver, lead, zinc, copper, and gold. Only narrow widths of mineralization were, however, intersected in the drill-holes.

This type of ore is characteristic of the outer zone of mineralization on Hudson Bay Mountain and is apparently related to the emplacement of Early Tertiary porphyry intrusions in the Glacier Gulch area.

On the Canadian Citizen claims, bornite and chalcopyrite occur in small veinlets along a fault zone that cuts massive purple and grey volcanic rocks of the Hazelton Group. Copper and silver are the main metals of value. Some of the recent diamond-drill holes are reported to have intersected mineralization beneath and to the east of the surface showings but not to the west.

This type of copper-silver mineralization is very widespread in the older volcanic sequence of the Hazelton Group. From known occurrences it shows no spatial relationship to the much younger porphyry intrusions and hence probably is not related to them.

Ascot

LOCATION: (54° 126° N.W.) Dome-McKendrick Basin.

CLAIMS: Ascot 1 to 160.

ACCESS: By helicopter 15 miles east from Smithers.

OWNER: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5.

METALS: Lead, zinc.

WORK DONE: Eight men spent 2½ months making topographic, geological, geophysical, and geochemical surveys.

REFERENCES: Assessment Reports Nos. 1702A, 1702B, and 1702C.

NH

By R. V. Kirkham

LOCATION: (54° 127° N.W.) The showings are between elevations of 3,500 and 5,500 feet on a ridge about 5 miles due south of the junction of Sandstone Creek and the Zymoetz River.

CLAIMS: NH 1 to 82.

ACCESS: Twenty-three miles by helicopter west of Smithers or about 3 miles from the end of the McDonell Lake road.

OPERATOR: Dome Babine Mines Ltd., 200, 535 Thurlow Street, Vancouver 5.
METALS: Copper, silver.
WORK DONE: Four trenches with a total length of 115 feet and two pits were drilled and blasted, and four holes totalling 1,056 feet were diamond drilled. Induced polarization, geochemical, and geological surveys were also made. A crew averaging eight men, under the supervision of M. J. Beley, worked on the property for two months.
REFERENCE: Assessment Report No. 1640.

DESCRIPTION:

The area covered by the claims is underlain by unmetamorphosed flows and tuffs of the Hazelton Group. In the vicinity of the showings the rocks strike about north 30 degrees east and dip about 30 degrees southeast. The flows are mainly green, grey, and purple; porphyritic; amygdaloidal andesites. Medium-grained andesine and minor clinopyroxene occur as phenocrysts, and calcite, chlorite, potash feldspar, epidote, and zeolites fill the amygdules. Most flows are from 20 to 100 feet thick.

The tuffs are mostly various shades of red, purple, and grey and occur in both massive and well-bedded units. There are some welded tuffs scattered throughout the section. Most tuff beds are less than 100 feet thick. A 70- to 80-foot welded lapilli tuff layer has been preferentially mineralized in the vicinity of the main showings.

Figure 16 is a sketch of the showings. These showings have been designated the *A*, *B*, *C*, and *D* zones. At these occurrences, apparently both structural and stratigraphic controls have been important in localizing the mineralization.

The *A* zone consists of bornite, chalcocite, and digenite(?) in fractures and calcite veinlets in the welded tuff unit adjacent to a fault. The welded tuff unit has been mineralized for more than 100 feet northeast of the fault, but the mineralization is most abundant in the fault zone and immediately adjacent to it. Trace amounts of chalcopyrite and galena are present in a quartz carbonate veinlet near the fringe of the bornite and chalcocite mineralization. A chip sample taken across 8 feet of the most highly mineralized portion of the fault zone assayed: Gold, trace; silver, 6.0 ounces per ton; copper, 3.51 per cent. The results of assays taken across the entire *A* zone from the fault to the northeast are as follows:—

Location	Gold	Silver	Copper
	Oz. per Ton	Oz. per Ton	Per Cent
1. First 25 feet[1]	Trace	2.6	2.47
2. Middle 40 feet	Trace	0.7	0.81
3. Outer 32 feet	Trace	1.2	0.78

[1] Includes high-grade zone at the fault.

The *B* zone consists of a brecciated portion of the favourable tuff horizon on the uplifted side of a small fault. The exposed area of the breccia is approximately 50 by 50 feet. Coarse-grained calcite and very small amounts of disseminated chalcocite form the matrix of the breccia. A grab sample from the breccia assayed: Gold, trace; silver, 0.3 ounce per ton; copper, 0.53 per cent. Small amounts of fine-grained chalcopyrite, bornite, and chalcocite are present in the tuff for about 100 feet southwest of the breccia zone.

In order to test the copper content of the host tuff horizon away from obviously mineralized areas, a chip sample of unaltered maroon tuff was collected about 170 feet southwest of the *B* zone breccia. The sample assayed: Gold, *nil;* silver, trace; copper, 0.07 per cent.

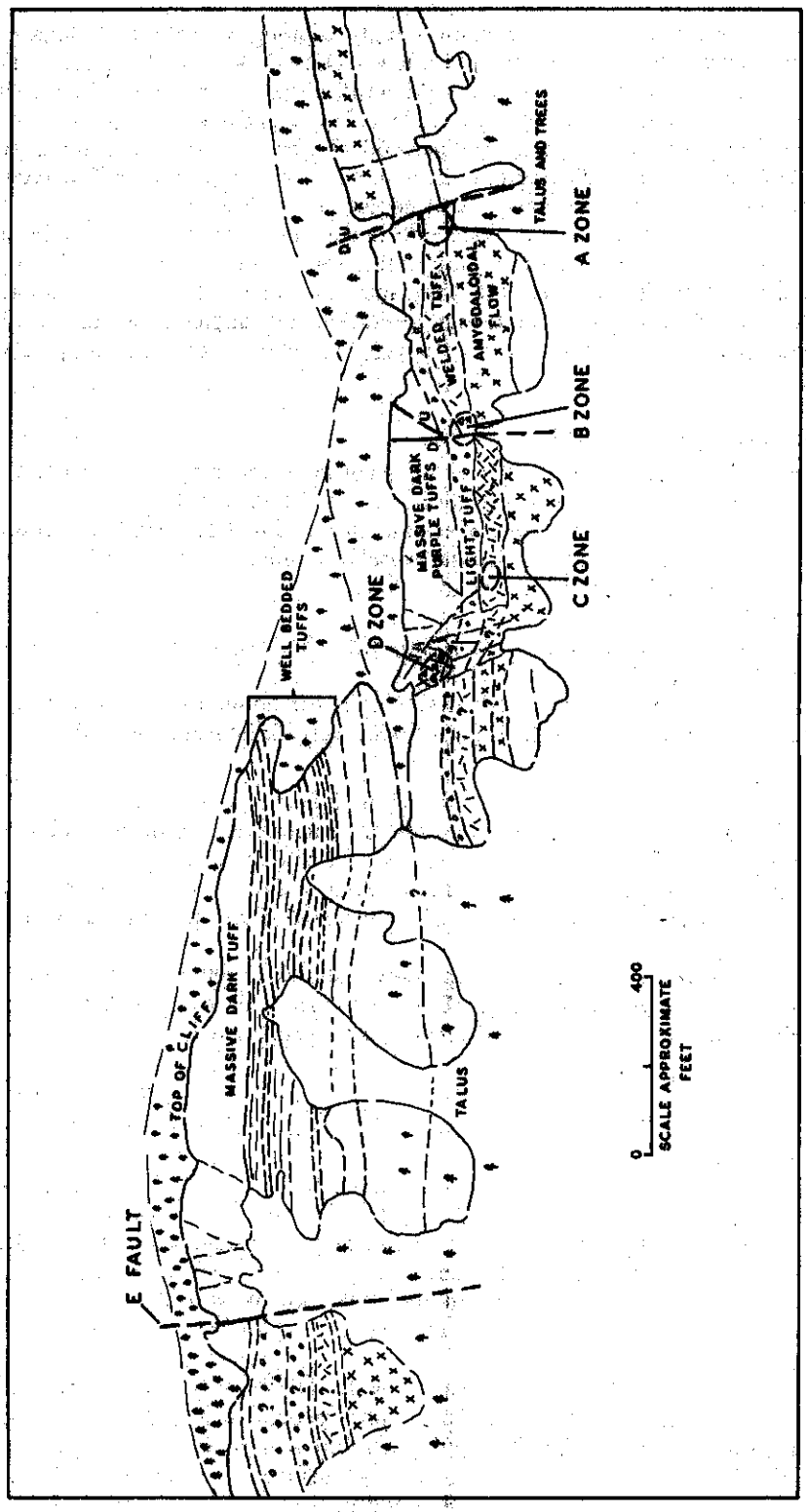


Figure 16. Dome Babine Mines Ltd., sketch of a cliff face (looking southeast) showing mineralized zones on the NH group.

The *C* zone consists of one main steeply dipping 1- to 8-inch high-grade chalcocite, bornite, digenite(?) vein and a few scattered associated veinlets. These veinlets are exposed near the top of the welded tuff horizon and seem to be restricted to it. Some specimens from the high-grade vein assayed: Gold, 0.05 ounce per ton; silver, 81.2 ounces per ton; copper, 60.71 per cent. A semi-quantitative spectrochemical analysis indicated that the sample also contained a small percentage of arsenic and zinc and minor amounts of cobalt and cadmium.

At the *D* zone, bornite and chalcocite occur as disseminations and in small fractures and calcite veins in altered lapilli tuff. Some small grains of native copper are also present at this locality, but they may have been formed by supergene processes. Quartz and potash feldspar alteration are apparent at this locality. A grab sample assayed: Gold, trace; silver, 0.3 ounce per ton; copper, 0.88 per cent.

Caribou, Ptarmigan, Car, C.P. By R. V. Kirkham

LOCATION: (54° 127° N.W.) Three miles south of the junction of Coal Creek and Zymoetz River between elevations of 3,500 and 6,500 feet.

CLAIMS: Fifty-five recorded claims, Caribou, Ptarmigan, Car, and C.P. groups.

ACCESS: Twenty-four miles by helicopter west from Smithers or about 3 miles from the end of the McDonell Lake road.

OWNER: J. L'Orsa.

OPERATOR: Dome Babine Mines Ltd., 200, 535 Thurlow Street, Vancouver 5.

METALS: Copper, silver, gold.

WORK DONE: Two men prospected these claims for about two weeks during the summer. Three trenches totalling 45 feet were drilled and blasted.

DESCRIPTION:

The area is underlain by unmetamorphosed Hazelton volcanic rocks. At a showing visited by the writer, azurite and minor chalcopyrite are present along fractures in grey and pink felsic volcanic rocks near a contact with a mafic flow. The mineralization has probably been emplaced along a fault. A chip sample taken across a 15-foot trench assayed: Gold, *nil;* silver, 0.5 ounce per ton; copper, 0.14 per cent.

There are several other minor copper-silver showings reported on this property but very little is known about them. East of the showing examined, chalcopyrite and bornite have been reported to occur in quartz veins and breccias.

Tetra By A. Sutherland Brown

LOCATION: (55° 127° S.E.) On canyon of Causqua Creek at 1,900 feet elevation, 13 miles due north of Smithers.

CLAIMS: Eighty-two recorded claims—Tetra 1 to 10, 13 to 40; Titan 1 to 14; Bulkley 1 to 12; Hope 1 to 16; Harry 1 and 2; most work on Tetra 1 and 2.

ACCESS: Four miles by road northeast of Moricetown bridge over Bulkley River.

OWNERS: Ralph Dieter and Jim Hutter.

OPERATOR: Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2; H. B. Gilleland and J. H. Hachey, exploration managers.

METALS: Silver (lead, zinc).

WORK DONE: A new showing discovered by R. Dieter in 1966 tracing float up Causqua Creek; geological mapping, minor geochemical surveying, bulldozer trenching (650 feet), hand stripping (4,800 square feet), two adits (total length 672 feet), one raise (50 feet), 14 surface diamond-drill holes (total 2,441 feet), seven underground diamond-drill holes (total 150 feet).

DESCRIPTION:

The Moricetown silver prospect occurs in a sequence of sedimentary rocks of volcanic derivation originally mapped as the Hazelton Group but now generally considered part of the Bowser Group of Upper Jurassic and Cretaceous age. The sequence in the vicinity of the prospect is dominated by dense dark greenish-grey volcanic sandstones intercalated with lesser black shale and with one pebble conglomerate member. The conglomerates are poorly sorted, mottled grey rocks composed of subangular to subrounded pebbles of a wide variety of volcanic rocks in a gritty matrix similar to the sandstones. The volcanic particles are dominantly andesitic porphyries. About 15 per cent of the pebbles are dark siltstone, and the matrix includes some quartz and feldspar grains. In the sandstones most grains are also volcanic, but about 15 per cent are feldspar and 5 per cent quartz. The shales are black clay shales with irregular laminations of limonite, organic matter, and sericite.

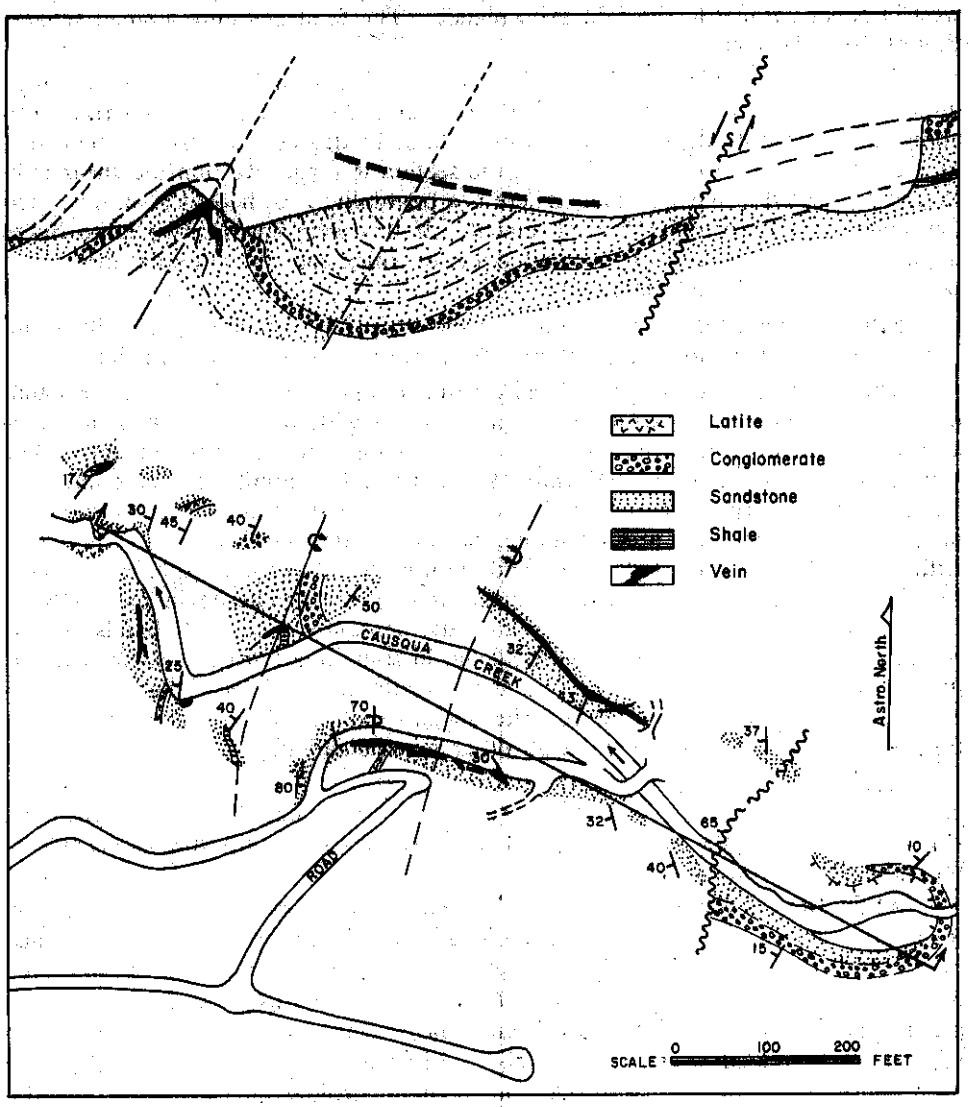


Figure 17. Silver Standard Mines Limited, plan and section of the Tetra (Moricetown) silver prospect.

The sedimentary rocks are cut by two latite dykes which follow the bedding in parts of folds where orientations are similar. The virtual identity of the two dykes would scarcely be suspected in the field, but differing intensity of kaolin-carbonate alteration appears to be the only difference microscopically. Least altered specimens are composed of about 50 per cent long laths of zoned plagioclase (An_{70-45}) with interstitial chlorite, carbonate, and minor ores and quartz. Most altered specimens are composed of completely kaolinized plagioclase laths with porphyroblasts of ferrodolomite. Abundant inclusions and trachytic textures are characteristic of all specimens.

Geology in the vicinity of the prospect is shown on a map and section (Fig. 17). The sedimentary rocks are compressed into an anticline-syncline pair striking north 20 degrees east and overturned to the east. The eastern limb of the syncline is cut by a fault that strikes also north 20 degrees east and dips 65 degrees west in effect parallel to the fold axial planes. The fault has only a small separation of 40 to 50 feet.

The main mineralization is contained in a braided shear-like vein that, although quite irregular locally, maintains a fairly regular attitude over all. It strikes also about north 20 to 40 degrees east and dips about 15 degrees eastward. The orientation and position of the vein shear in the section is suggestive that the shear is in some way related to the syncline. There is a possibility it is, however, an unrelated low angle fault of considerable movement. If this were so, the two latite dykes might be faulted segments of the same dyke, in which case the apparent movement would be 250 feet, upper plate east.

Minor mineralization is contained in the steep fault previously described and in a small steep shear striking northerly on the western limb of the anticline.

The main vein shear varies locally from a small series of thin veinlets that horsetail into the bedding to a discrete mass 4 feet wide or more with minor mineralization extending into the walls as veinlets or disseminated replacements. The vein consists of partially replaced wallrock with variable amounts of quartz, ankerite, and sulphide minerals in bands, blobs, and disseminated grains. The ore minerals in decreasing abundance are sphalerite, galena, pyrite, tetrahedrite, arsenopyrite, with traces of bournonite, polybasite, and pyrargyrite. In general, sphalerite occurs together in discrete bands but with galena veining the sphalerite in part. Pyrite and arsenopyrite occur as discrete crystals but commonly in separate bands of concentration. Tetrahedrite occurs with galena, in some quartz-rich areas as a minor matrix to separate quartz crystals, and as transecting late veinlets. The silver minerals are associated with the tetrahedrite, in part with exsolution textures. Minor thin parallel carbonate veinlets cut all other mineralization.

Rock alteration in the vicinity of the showings is noticeable and consists of porphyroblastic ferrodolomite and a variable amount of kaolinization of feldspars. It is most intense in the immediate vicinity of the vein shear and most noticeable in the latite dyke in the vein.

At the time of the writer's visit in August, the vein was exposed in the canyon for a strike length of 130 feet and a dip length of 150 feet or so. A start had just been made on the two adits. Up to the end of 1968, the north adit had been driven 340 feet and the south one 180 feet, including a short raise. Unfortunately the pre-glacial channel of Causqua Creek must have been north of the present canyon for the north adit advanced into gravels at 340 feet. Exploration since then has been concentrated on the south adit, on diamond drilling the eastward down-dip continuity and outlining the pre-glacial canyon and possible continuation beyond.

TELKWA RANGE

Al

LOCATION: (54° 127° N.E.) On the east side of Howson Creek just north of the junction of Glacier Creek.
CLAIMS: Al 1 to 10.
ACCESS: Fifteen miles by helicopter south of Smithers.
OWNER: Pyramid Mining Co. Ltd., 640, 890 West Pender Street, Vancouver 1.
WORK DONE: One hole was diamond drilled on the Al No. 4 claim.
REFERENCE: Assessment Report No. 1570.
DESCRIPTION: The six holes drilled on the Phil, Mike, and Al claims totalled 1,447 feet.

Phil, Dave, John

LOCATION: (54° 127° S.E.) On the west side of Thautil River south of Starr Creek.
CLAIMS: Phil 1 to 10, Dave 1 to 10, John 1 to 20.
ACCESS: Thirty miles by helicopter south from Smithers.
OWNER: Pyramid Mining Co. Ltd., 640, 890 West Pender Street, Vancouver 1; G. E. Van Rosen, geologist.
WORK DONE: One hole was diamond drilled on the Phil No. 6 claim.
REFERENCE: Assessment Report No. 1570.

BL

LOCATION: (54° 127° S.W.) Between elevations of 3,900 and 5,200 feet on the east side of Burnie Lake, 32 miles southwest of Smithers.
CLAIMS: BL 1 to 20.
ACCESS: By helicopter or float plane from Smithers.
OWNER: Phelps Dodge Corporation of Canada, Limited, 404, 1112 West Pender Street, Vancouver 1; P. G. Curtis, geologist.
METAL: Copper.
WORK DONE: Some detailed geological mapping was done, soil samples were taken for geochemical analysis, and 27 feet of trenching was done by hand. Six men spent 1½ months on the property.
REFERENCE: Assessment Report No. 1646.

Joker, PR, SQ

LOCATION: (54° 127° S.E.) Between elevations of 3,250 and 6,500 feet at the head of Howson Creek, 22 miles south-southwest of Smithers.
CLAIMS: Two hundred and fifty-one claims, including the PR, SQ, Zero, Joker, Firm, Cary, and EX claims. Former names include Santa Maria, Duchess, Evening, War Eagle, and Princess.
ACCESS: By road from Telkwa, a distance of 26 miles.
OWNER: Norcan Mines Ltd.
OPERATOR: Bethex Explorations Ltd., 1818, 355 Burrard Street, Vancouver 1; I. M. Watson, geologist.
METALS: Copper, silver.
WORK DONE: Topographic and geologic maps were made, induced polarization and magnetometer surveys were run, and silt and soil samples were taken for geochemical analysis. Twenty-two trenches, total length 11,200 feet, were bulldozed, seven bedrock open cuts were blasted, and two holes totalling 922

feet were diamond drilled. Sixteen miles of road was rehabilitated and 7 miles of new access road was built. Eighteen men spent five months on the property.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 91–97; Assessment Reports Nos. 917 and 919.

Fog

LOCATION: (54° 127° S.E.) At the head of Sunsets Creek in the Telkwa Range, 19 miles south of Smithers, between elevations of 5,000 and 6,000 feet.

CLAIMS: Fog 1 to 46.

ACCESS: Twenty-two miles by helicopter from Smithers.

OWNER: Noranda Mines, Limited.

OPERATOR: Whitesail Mines Ltd., 5424 Halifax Street, Burnaby 2; R. C. O'Brian, exploration supervisor.

METALS: Copper, molybdenum.

WORK DONE: Geophysical and geochemical surveys were made over an area of 1 square mile, and 500 feet of diamond drilling was done in two holes.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 97–100; Assessment Report No. 1605.

Mike

LOCATION: (54° 127° S.E.) At the head of Thautil River between Denys and Sunsets Creeks.

CLAIMS: Mile 1 to 16.

ACCESS: Twenty-five miles by helicopter south of Smithers.

OWNER: Pyramid Mining Co. Ltd., 640, 890 West Pender Street, Vancouver 1.

WORK DONE: Holes were drilled on the Mike 3, 11, and 12 claims and on the Mike 44 claim north of Sunsets Creek.

REFERENCE: Assessment Report No. 1570.

DOM

By R. V. Kirkham

LOCATION: (54° 127° S.E.) The showings are at the head of Denys Creek in the Telkwa Range between elevations of 5,500 and 6,500 feet.

CLAIMS: DOM 1 to 26, two Dominion claims.

ACCESS: Twenty-four miles by helicopter south from Smithers.

OWNER: Two Dominion claims are under option from T. S. George; the DOM group is owned by Falconbridge Nickel Mines Limited, 500, 1112 West Pender Street, Vancouver 1.

METALS: Copper, silver.

WORK DONE: Two trenches totalling 60 feet were drilled and blasted, and eight short diamond-drill holes totalling 611 feet were completed. A geological map and a self potential survey were made. The work was supervised by D. H. Brown.

DESCRIPTION: The area is mainly underlain by volcanic rocks of the Hazelton Group. A few small granitic and dioritic intrusions are also known in the area. Pods and specks of hematite, chalcocite, bornite, and chalcopyrite occur in a highly altered pyroclastic andesite bed. Epidote, calcite, chlorite, sericite, and quartz are the main gangue minerals.

Stock, Lorne, Etc.

By R. V. Kirkham

LOCATION: (54° 127° N.E.) The claims lie between elevations of 4,000 and 6,000 feet at the head of Winfield Creek on a ridge about 6 miles north of the Telkwa River.

CLAIMS: Seventy-four claims located as the Stock, Lorne, Larry, Martin, Saddle, Table, Premier, Don, and Ken groups include the mineral showings formerly known as the Copper Queen.

ACCESS: About 5 miles by jeep-road northwest of the British Columbia Telephone microwave station at the head of Cumming Creek.

OWNER: Copper Queen Explorations Ltd., 1690 West Broadway, Vancouver 9.

METALS: Copper, silver.

WORK DONE: Some bulldozer trenching was done on the Table No. 3 claim.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1961, p. 18; Assessment Report No. 1239.

DESCRIPTION:

The area is underlain by red, purple, and grey tuffs and flows of the Hazelton Group. They are probably mainly dacites and andesites. In the vicinity of the old workings they strike north 25 degrees east and dip 25 degrees southeast.

On the Stock No. 1 claim at 5,250 feet elevation on a ridge overlooking the west branch of Winfield Creek, there is an old caved shaft with a caved adit and a large open cut about 200 feet below the shaft. At these localities chalcocite, bornite, digenite(?), and chalcopyrite occur along fractures and in calcite veinlets related to a fault zone that strikes approximately south 60 degrees east and dips about 75 degrees southwest. Chip samples of weathered outcrops taken in the vicinity of the old workings gave the following results:—

Location	Width	Gold	Silver	Copper
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent
1. Above the adit	8	*Nil*	Trace	0.33
2. 15 to 30 feet north of the adit	15	*Nil*	Trace	0.45
3. 30 to 45 feet north of the adit	15	Trace	Trace	0.31
4. Above the shaft	12[1]	Trace	0.5	3.40

[1] Includes a 10-inch band of high-grade chalcocite, digenite(?), calcite stringers.

About three-quarters of a mile south of the old workings on Table No. 3 claim, bornite, chalcocite, and digenite(?) in veinlets and disseminated in amygdules have been exposed in trenches along a fault zone between light-grey, spherulitic, flow-layered felsite and purple amygdaloidal lava. The fault strikes south 50 degrees east and dips 75 degrees southwest. A chip sample taken across 5 feet of weathered material from the fault zone assayed: Gold, *nil*; silver, trace; copper, 0.33 per cent.

About one-quarter of a mile farther south on Table No. 5 claim, minor amounts of chalcocite(?) and malachite occur along fractures in bleached and altered, maroon, siliceous volcanic rocks. This fault or fracture zone also strikes about south 50 degrees east.

During the course of regional mapping in the area, the writer found a few specks of chalcopyrite and pyrite in a 2- to 4-foot cherty tuff horizon exposed near a small lake about one-half mile northeast of the old workings. Although the concentration of copper in this horizon must be extremely low, it is noteworthy that no fracture-controlled mineralization was observed.

Lava

LOCATION: (54° 127° N.E.) At elevations of 4,500 to 6,000 feet between the heads of Goathorn and Webster Creeks, 3 miles east of Hunter Basin in the Tetkwa Range.

CLAIMS: Lava 1 to 135, Old Tom 1 and 2.

ACCESS: Twenty miles by helicopter south from Smithers or about 4 miles from the Cabinet Creek road.

OWNERS: Old Tom 1 and 2 owned by T. S. George; Lava 1 to 135 owned by Falconbridge Nickel Mines Limited.

OPERATOR: Falconbridge Nickel Mines Limited, 500, 1112 West Pender Street, Vancouver 1; D. H. Brown, geologist.

METALS: Copper, molybdenum, silver.

WORK DONE: Sixteen men worked for four months. A topographic map and magnetometer and self-potential surveys were made. Soil and silt samples were taken for geochemical analysis. Four holes totalling 691 feet were diamond drilled.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1907, pp. 78–79.

DESCRIPTION: Copper-silver mineralization occurs in siliceous volcanic units of the Hazelton Group and copper-molybdenum mineralization is present in a small body of granodiorite.

BABINE LAKE

Snoopy

LOCATION: (55° 126° S.E.) Between elevations of 3,000 and 4,500 feet 1 mile northwest of Nizik Lake and 3 miles northeast of the head of Hagan Arm.

CLAIMS: Snoopy.

ACCESS: Forty miles by air from Smithers.

OWNER: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5; G. R. Peatfield, geologist.

METAL: Copper.

WORK DONE: The geology of the claims was mapped and soil samples were taken for geochemical analysis. Six men spent one month on the property.

Mary Ann, Dave

LOCATION: (54° 125° N.W.) At Wright Bay on the east side of Babine Lake.

CLAIMS: Mary Ann 1 to 16, Dave 1 to 46.

ACCESS: Five miles by boat east from Topley Landing.

OWNER: Canex Aerial Exploration Ltd., 800, 1030 West Georgia Street, Vancouver 5.

METAL: Copper.

WORK DONE: Four men spent one month doing reconnaissance magnetometer work, soil-sampling, and blasting of trenches in the vicinity of an old showing. The work was supervised by C. C. Rennie.

DESCRIPTION: Chalcopyrite with malachite occurs in limestone interbedded with intermediate volcanic rocks.

Fort

LOCATION: (55° 126° S.E.) On Old Fort Mountain, at the north end of Babine Lake.

CLAIMS: Fort 1 to 32.

ACCESS: By road and boat, 55 miles northeast from Smithers.

OWNER: Canex Aerial Exploration Ltd., 800, 1030 West Georgia Street, Vancouver 5.

METAL: Copper.

WORK DONE: Eight men spent one month making geophysical and geochemical surveys under the supervision of D. A. Howard, geologist.

DA

LOCATION: (55° 126° S.E.) Two miles east of Nakinilerak Lake.
CLAIMS: DA 1 to 32 and Wendy groups.
ACCESS: By float-equipped aircraft from Smithers, 50 miles southwest.
OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; G. E. Dirom, area supervisor.
METAL: Copper.
WORK DONE: Three men spent two months carrying out 48 line miles of magnetic and electromagnetic surveys. Six holes totalling 203 feet were diamond drilled.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1964, p. 53; 1966, pp. 95–96; 1967, p. 103; Assessment Report No. 1198.

Dot, Lory, Miami, Bay, Maria, Luz

LOCATION: (55° 126° S.E.) Dot and Lory claims lie east of the north end of Hatchery Arm, Babine Lake. The Miami, Bay, Maria, and Luz groups are west of the Dot and Lory groups, on the west side of Hatchery Arm. Elevations range from 2,332 feet at lake-level to 3,500 feet.
CLAIMS: The Dot group consists of 34 claims, the Lory group 42 claims, the Miami group 34 claims, the Bay group 7 claims, the Maria group 20 claims, and the Luz group 24 claims.
ACCESS: Fifteen miles by boat east from Smithers Landing.
OWNER: Golden West Mines Ltd.
OPERATOR: Canex Aerial Exploration Ltd., 800, 1030 West Georgia Street, Vancouver 5.
METAL: Copper.
WORK DONE: Geochemical work was carried out in the spring of 1968 on the Dot and Lory groups. Some geological work was done on the claim groups west of Hatchery Arm.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, pp. 92–93; 1967, pp. 103–104; Assessment Reports Nos. 969, 992, 1201, 1568, and 1571.

Jake

LOCATION: (55° 126° S.E.) Three miles northeast of Hatchery Arm, Babine Lake, between elevations of 3,300 and 4,600 feet.
CLAIMS: Jake 1 to 44.
ACCESS: Fifteen miles by boat or helicopter east from Smithers Landing.
OWNER: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5.
METAL: Copper.
WORK DONE: Work was done on the Jake 1 to 24 claims. Topographic and geological maps were made and soil samples taken for geochemical analysis. A crew of six men spent one month on the property under the supervision of C. C. McLeod, geologist.
DESCRIPTION: Minor pyrite, chalcopyrite, and malachite occur in fractures in stratified volcanic rocks.

Don By N. C. Carter

LOCATION: (55° 126° S.E.) East of Hatchery Arm, the northeast arm of Babine Lake, between elevations of 3,000 and 4,000 feet.
CLAIMS: Don 1 to 30.
ACCESS: Forty-five miles by helicopter east from Smithers.

OWNER: Canex Aerial Exploration Ltd., 800, 1030 West Georgia Street, Vancouver 5.

METAL: Copper.

WORK DONE: Geochemical, geological, and magnetometer surveys were made over the west part of the claim group. Nine men were employed for two months under the supervision of D. A. Howard, geologist.

DESCRIPTION: The claims are underlain by fragmental andesites intruded by sills and irregular masses of diorite and gabbro. Very sparse chalcopyrite was seen.

Wasp

LOCATION: (55° 126° S.W.) Five miles west of Smithers Landing on Babine Lake at 3,000 feet elevation.

CLAIMS: Wasp 1 to 36.

ACCESS: Thirty miles by road from Smithers.

OWNER: Mastodon-Highland Bell Mines Limited, 300, 999 West Pender Street, Vancouver 1; E. R. Woznlak, geologist.

METAL: Copper.

WORK DONE: Six men spent two months on the property. Two holes totalling 750 feet were diamond drilled, and magnetometer and induced polarization surveys of four claims were made. One-half mile of access road was built.

DESCRIPTION: The area is covered by 100 feet of overburden. Porphyry and hornfelsic fragmental volcanic rock containing pyrite and trace amounts of chalcopyrite were intersected in the diamond-drill holes.

Kare By N. C. Carter

LOCATION: (54° 126° N.E.) On the east side of Babine Lake south of Hawthorn Bay; elevations range from lake-level at 2,332 feet to 3,500 feet.

CLAIMS: Kare 1 to 72.

ACCESS: Eight miles by boat north from Topley Landing.

OWNER: Tro-Buttle Exploration Limited.

OPERATOR: McIntyre Porcupine Mines Limited, 1023, 409 Granville Street, Vancouver 2.

METAL: Copper.

WORK DONE: Six BQ-size holes totalling 1,500 feet were diamond drilled by McIntyre Porcupine; the owner of the claims completed 40 line miles of magnetometer work.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1965, pp. 90–93; 1967, p. 104; Assessment Reports Nos. 951 and 1256.

Granisle Mine By W. G. Clarke

LOCATION: (54° 126° N.E.) On McDonald (Copper) Island, 10 miles north of Topley Landing.

CLAIMS: Thirty-one Crown-granted and 15 recorded claims on McDonald Island and 44 recorded claims on Sterrett Island and one adjoining island to the south.

ACCESS: By ferry from the townsite of Granisle, on the west side of Babine Lake, 7 miles by gravel road from Topley Landing.

OWNER: Granisle Copper Limited, 1111 West Georgia Street, Vancouver 5; mine office, Granisle; L. T. Postle, president; A. J. McDougall, mine manager to December 15th; Boyd Hardwicke, mine manager since December 15th.

METAL: Copper (*see* Table 12 for production).

WORK DONE:

Ore shipped or treated, 2,230,210 tons; waste removed, 877,316 tons. Additional mining equipment used included a 4½-yard shovel, a D-7 Caterpillar, four 35-ton trucks, and a drill. There was some new construction in both the plant and the townsite.

A reclaim-water pumping system and tailings-treatment plant were installed. Eight flotation cells and a 100-horsepower blower were added to the mill equipment. Electric heating was installed in the crusher.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, pp. 97–99; 1967, pp. 104–105.

Totem, Topley, Babine

LOCATION: (54° 126° N.E.) Three miles south of Topley Landing.

CLAIMS: Totem 17 to 64, 67 to 88 and No. 1 Fraction; Topley 19 to 51; Babine 1 to 12, 63, 64, 67 to 100.

ACCESS: By road from Topley on Highway No. 16.

OWNER: Tro-Buttle Exploration Limited, 118, 815 West Hastings Street, Vancouver 1; Gavin A. Dirom, consultant.

METAL: Copper.

WORK DONE: Soil samples were taken for geochemical analysis and a magnetometer survey was started.

Tachi

LOCATION: (54° 126° N.E.) Four miles south of Topley Landing.

CLAIMS: One hundred and seventy claims, including Tachi 1 to 100, 117 to 138, 140 to 146, 148 to 150; Tachek 101 to 110; Tachi 1 to 6 Fractions; Met 1 to 32.

ACCESS: By road from Topley, 23 miles south.

OWNERS: R. Keefe and H. Thornton.

OPERATOR: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; G. E. Dirom, area supervisor.

METALS: Copper, molybdenum.

WORK DONE: Surveys included preliminary geological mapping, induced polarization and magnetometer work, and soil and silt sampling. Twelve shallow pits were drilled and blasted. Four company and three contractor personnel were employed for two months.

DESCRIPTION: Chalcopyrite and molybdenite occur in granite, quartz diorite, and hornblende-biotite-feldspar porphyry as disseminations in the matrix and on joint planes.

Del, Lou

LOCATION: (54° 126° N.E.) Between elevations of 2,300 and 2,600 feet on the west side of Babine Lake.

CLAIMS: Fifty-two claims.

ACCESS: Ten miles by boat and trail from Topley Landing.

OWNER: Rip Van Mining Ltd., 020, 640 Seventh Avenue Southwest, Calgary, Alta.

METAL: Copper.

WORK DONE: Five men spent one month making geophysical and geochemical surveys under the direction of S. J. Hunter, consulting engineer.

REFERENCES: Assessment Reports Nos. 1250, 1724, and 1725.

Mag

By N. C. Carter

LOCATION: (54° 126° N.E.) Claims lie north of Hawthorn Bay on Babine Lake and adjoin Granisle Copper Limited claims.

CLAIMS: Mag 1 to 18, 21 to 60 and STHUF 1 and 2.

ACCESS: Eleven miles, by boat north from Topley Landing or from Granisle mine.

OWNER: The Granby Mining Company Limited, 509, 1111 West Georgia Street, Vancouver 5.

METAL: Copper.

WORK DONE: The geology was mapped, a geochemical survey of all claims was made, and four AXQ-size holes totalling 1,206 feet were drilled. Three men were employed for three months under the supervision of K. C. Fahrni.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 103; 1967, p. 105.

Newman

By N. C. Carter

LOCATION: (54° 126° N.E.) At the north end of Newman Peninsula on Babine Lake.

CLAIMS: One hundred and seventy-nine claims, including the Newman and Lad groups.

ACCESS: From Smithers by road to Smithers Landing on Babine Lake a distance of 45 miles, then 15 miles by boat to the property.

OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; G. E. Dirom, area supervisor.

METAL: Copper.

WORK DONE: A geological map of the property was completed by D. J. T. Carson. Magnetometer and induced polarization surveys were carried out in the northwest part of the property, and some silt-sampling was done in the central part. Twenty-seven holes totalling 12,944 feet were drilled. Three company and six contractor personnel were employed for six months.

REFERENCES: *Minister of Mines, B.C.*, Ann Repts., 1965, pp. 98–102; 1966, p. 99; 1967, p. 105.

Kofit

By N. C. Carter

LOCATION: (55° 126° S.E.) On west slope of Hearne Hill, between elevations of 3,000 and 4,500 feet, 1 mile east of the south end of Morrison Lake.

CLAIMS: Kofit 1 to 188.

ACCESS: By 45 miles of road from Smithers to Smithers Landing on Babine Lake and thence by boat 15 miles to the head of Hatchery Arm, or by float plane from Smithers to Morrison Lake.

OWNER: Tro-Buttle Exploration Limited.

OPERATOR: Canadian Superior Exploration Limited, 2201, 1177 West Hastings Street, Vancouver 1.

METAL: Copper.

WORK DONE: Nine men under the supervision of R. A. Dujardin were employed for one month making geological and geochemical surveys in the east half of the group. A magnetometer and induced polarization survey over the same area was made by Seigel and Associates.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, pp. 99–101; 1967, pp. 105–106; Assessment Report No. 1102.

DESCRIPTION: Property was worked by Texas Gulf Sulphur Company in 1967. A short description of the geology is contained in the 1967 Annual Report.

Marc, Cram

By N. C. Carter

LOCATION: (55° 126° S.E.) On Hearne Hill east of the south end of Morrison Lake, between elevations of 3,000 and 4,500 feet.

CLAIMS: Marc 1 to 33, Cram 1 to 14.

ACCESS: By 45 miles of road from Smithers to Smithers Landing on Babine Lake, thence by boat 15 miles to the north end of Hatchery Arm.

OWNER: A. P. Fletcher, Prince George.

OPERATOR: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5; A. J. Schmidt, geologist.

METAL: Copper.

WORK DONE: A crew of six was engaged for a month in geological mapping, soil-sampling, and making a magnetometer survey over most of the claim group.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, pp. 99–101; 1967, pp. 105–106; Assessment Reports Nos. 1255 and 1611.

DESCRIPTION: The Marc and Cram groups were part of a large block of claims under option to Texas Gulf Sulphur Company in 1967. A brief description of the geology is contained in the Annual Report for 1967.

Morrison

By N. C. Carter

LOCATION: (55° 126° S.E.) At the southeast end of Morrison Lake.

CLAIMS: Thirty-three recorded claims, including Alva 1 and 2, Frances 25 and 27, Dyke 1 to 4, Dull Axe 1 and 2, She 13 and 14, Ellen 1 to 16, Ellen 3 Fraction, Dyke 5 to 7 Fractions.

ACCESS: By float-equipped aircraft from Smithers, 45 miles southeast.

OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; G. E. Dirom, area supervisor.

METAL: Copper.

WORK DONE: Sixteen new diamond-drill holes and two extensions of older holes were completed, totalling 10,238 feet. Four company and six contractor employees worked for five months.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 104; 1966, pp. 101–102; 1967, pp. 106–107.

Lorna

By N. C. Carter

LOCATION: (55° 126° S.E.) West side of Morrison Lake, 3 miles from its north end.

CLAIMS: Lorna 13 to 24, 26 to 60.

ACCESS: By aircraft from Smithers, 45 miles southwest.

OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; G. M. Ford, geologist.

WORK DONE: Three men were employed for two months in geological mapping, making an electromagnetic survey, and doing geochemical work. The claims were allowed to lapse.

CAVZ

LOCATION: (55° 126° S.E.) Between elevations of 3,500 and 5,300 feet on Trail Peak, 10 miles north of Morrison Lake.

CLAIMS: CAVZ 1 to 70 and four fractions.

ACCESS: Fifty miles by helicopter from Smithers.

OWNER: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5; Cary C. McLeod, geologist.

METAL: Copper.
WORK DONE: The geology was mapped, electromagnetic and magnetometer surveys were made, and soil samples were taken for geochemical analysis. Six men spent 2½ months on the property.
REFERENCES: Assessment Reports Nos. 1672A, 1672B, 1672C, and 1672D.

Wolf By N. C. Carter

LOCATION: (55° 126° S.E.) West side of Morrison Lake, 4 miles north of its south end, elevations range from lake-level at 2,400 feet to 3,300 feet.
CLAIMS: Wolf 1 to 38 plus one fraction. The claims include the former Bee group, held by Kerr Addison Mines Limited in 1965 and 1966.
ACCESS: Forty-five miles by float plane northeast from Smithers.
OWNER: Tro-Buttle Exploration Limited.
OPERATOR: Canadian Superior Exploration Limited, 2201, 1177 West Hastings Street, Vancouver 1.
METAL: Copper.
WORK DONE: Owners completed a magnetometer survey early in 1968. During the field season the operating company carried out geological mapping, a geochemical survey, and an induced polarization survey over the entire claim group. Nine men were employed for one month under the supervision of R. A. Dujardin.
REFERENCES: *Minister of Mines, B.C.*, Ann Repts., 1966, pp. 99–102; 1967, p. 107; Assessment Reports Nos. 761 and 1240.
DESCRIPTION: A description of the regional and local geology is contained in the Annual Report for 1966, pages 99 to 102.

SUTHERLAND RIVER

Kid

LOCATION: (54° 124° S.W.) Between elevations of 3,000 and 3,500 feet 12 miles east-southeast of Babine Lake and 18 miles south of Tachie on Stuart Lake.
CLAIMS: Kid 1 to 46.
ACCESS: By helicopter from Babine Lake or Stuart Lake.
OWNER: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; W. Lodder, geologist.
METAL: Molybdenum.
WORK DONE: Two men spent six weeks making geological and geochemical surveys.
DESCRIPTION: Molybdenite and pyrite occur in a quartz vein stockwork in quartz monzonite.

PEROW

Mollyday, Centenial

LOCATION: (54° 126° N.W.) Five miles northwest of Perow.
CLAIMS: Mollyday 1 to 22, Centenial 1 to 40.
ACCESS: By 5 miles of logging-road from Highway No. 16.
OWNER: Jomar Mining Co. Ltd., P.O. Box 458, Prince George.
METAL: Copper.
WORK DONE: Some stripping was done and soil samples taken for geochemical analysis.

Lucky, Lady, Pehu

LOCATION: (54° 126° N.W. and N.E.) Fourteen miles north-northeast of Houston between elevations of 2,600 and 4,600 feet.

CLAIMS: Two hundred and forty-seven claims, including Pehu, Lucky, Lady, C.V., Black Mountain, Puff, and Boot claims.
ACCESS: By 6 miles of road north from Perow on Highway No. 16.
OWNER: Normont Copper Ltd.
OPERATOR: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; G. E. Dirom, area supervisor.
METALS: Copper, silver.
WORK DONE: Airborne magnetometer and electromagnetic survey, and ground magnetic, electromagnetic, and induced polarization surveys were made, soil and silt samples were taken for geochemical analysis, and seven holes totalling 297 feet were diamond drilled. Four men were employed for three months.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 107; Assessment Reports Nos. 1559 and 1667.
DESCRIPTION: Chalcopyrite and bornite occur with calcite in fractures in Hazelton-type volcanic and sedimentary rocks.

BABINE RANGE

Brenda, Tony

LOCATION: (54° 126° N.W.) Between elevations of 3,500 and 5,000 feet, 5 miles south-southeast of Dome Mountain.
CLAIMS: Brenda 1 to 40, Tony 1 to 24.
ACCESS: From Quick by road and trail, a total distance of 15 miles.
OWNER: J. C. Bot.
OPERATOR: Dome Babine Mines Ltd., 200, 535 Thurlow Street, Vancouver 5; M. J. Beley, geologist.
METALS: Copper, silver.
WORK DONE: Airborne electromagnetic and magnetometer surveys were made of an area of 20 square miles.
REFERENCE: Assessment Report No. 1665.

BUCK CREEK

S.G.

LOCATION: (54° 126° S.E.) Between elevations of 3,500 and 4,000 feet at the head of Buck Creek, 1 mile east of Goosly Lake.
CLAIMS: S.G. group of about 58 claims.
ACCESS: Twenty-one miles by road from Houston.
OWNER: Kennco Explorations, (Western) Limited, 730, 505 Burrard Street, Vancouver 1; P. T. Black, project manager.
METAL: Copper.
WORK DONE: The geology of the claims was mapped, magnetometer and induced polarization surveys were made, soil samples were taken for geochemical analysis, six trenches totalling 2,800 feet were bulldozed, 5,000 square feet of bedrock was stripped, and four holes totalling 1,200 feet were diamond drilled. One and a half miles of access road was built. Twelve men spent seven months on the property.
REFERENCE: Assessment Report No. 1683.

HOUSTON

Barr, Lybdenum

LOCATION: (54° 126° S.W.) Between elevations of 2,400 and 3,700 feet 4 miles west of Barrett.

CLAIMS: Lybdenum 1 to 3 and the 40-claim Barr group.
ACCESS: By 14 miles of logging-road from Quick.
OWNER: The Lybdenum claims are held under option from W. H. Smith and the Barr claims were located by Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; W. Lodder, geologist.
METAL: Molybdenum.
WORK DONE: Four holes totalling 3,079 feet were diamond drilled. Seven men spent one month on the property.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 103; Assessment Report No. 1139.

NC, Klondike, Star

LOCATION: (54° 126° S.W.) At an elevation of 3,000 feet on Dungate Creek, 5 miles southeast of Houston.
CLAIMS: NC 1 to 40, Klondike 1 to 10, Star 1, 2, 4, 6, 8, 10, 16 to 24, 38, 40 to 43.
ACCESS: By 6 miles of road from Houston.
OWNER: Normont Copper Ltd.
OPERATOR: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; G. E. Dirom, area supervisor.
METAL: Copper.
WORK DONE: Geological mapping and magnetic and electromagnetic surveys were carried out. Seven holes totalling 2,000 feet were drilled. Two company and two contractor employees were employed for three months.
REFERENCES: Assessment Reports Nos. 1157 and 1181.
DESCRIPTION: Chalcopyrite and pyrite occur with quartz in fractures and as disseminations in a biotite-feldspar-porphyry intrusion and adjacent Hazelton-type sedimentary rocks.

Dot, Rod, Ton, Luky

LOCATION: (54° 126° S.W.) Between elevations of 2,600 and 2,900 feet at the junction of Bob Creek and Buck River.
CLAIMS: Dot 3 to 5, Ton 1 to 8, Rod 4, 6, Luky 1 to 40.
ACCESS: Seven miles by road, south from Houston.
OWNER: Lorne Hansen.
OPERATOR: American Smelting and Refining Company, 504, 535 Thurlow Street, Vancouver 5; R. McLeod, geologist.
METALS: Gold, silver, zinc.
WORK DONE: Seven holes totalling 2,090 feet were diamond drilled, and 1½ miles of access road was built. Eight men were employed for one month.

LV

LOCATION: (54° 127° S.W.) Between elevations of 3,300 and 4,400 feet 2 miles northwest of Knockholt.
CLAIMS: LV 1 to 36 and others, formerly Lakeview.
ACCESS: By truck-road from Knockholt.
OWNERS: G. Y. Graham and P. Huber.
OPERATOR: Buval Mines Ltd., 812, 1177 West Hastings Street, Vancouver 1; M. J. Beley, geologist.
METALS: Copper, silver.
WORK DONE: Soil and silt samples for geochemical analysis were taken from about 28 claims.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 102.

OWEN LAKE

Far

LOCATION: (54° 126° S.W.) Between elevations of 2,300 and 6,000 feet on Tsalit Mountain, 2 miles north of Puport Creek and 4 miles north of Nadina Mountain.
CLAIMS: Far 1 to 4.
ACCESS: Twenty-five miles by road from Houston.
OWNER: Normont Copper Ltd., 200, 535 Thurlow Street, Vancouver 5; M. J. Beley, geologist.
METALS: Copper, silver.
WORK DONE: Three holes totalling 308 feet were diamond drilled.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 103.

Silver Queen

LOCATION: (54° 126° S.W.) Between elevations of 2,500 and 3,500 feet on the east side of Owen Lake.
CLAIMS: Seventeen Crown-granted mineral claims under agreement from Canadian Exploration Limited, and 33 recorded claims in the Big Moose, Owl, Nadina, and Angus groups.
ACCESS: By road 27 miles south of Highway No. 16, 2 miles west of Houston.
OWNER: Canadian Exploration Limited and Nadina Explorations Limited, 1003, 789 West Pender Street, Vancouver 1; mine address, P.O. Box 487, Houston; George Stewart, manager.
WORK DONE: Additional geological mapping was done, closely spaced soil samples were taken for geochemical analysis from an area approximately 10 square miles, 30 trenches totalling 5,000 feet were bulldozed, 1,600 square feet of bedrock was stripped by bulldozer, about 20 bedrock cuts were drilled and blasted, 400 feet of underground drifting was done, and 22 holes totalling 660 feet were diamond drilled from underground. Approximately 6 miles of access roads was bulldozed to showings.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 108–109; Assessment Reports Nos. 1133 and 1184.

Code

LOCATION: (54° 126° S.W.) On Fenton Creek 2 miles south of Morice River.
CLAIMS: Code 1 to 15, Code 21 to 30.
ACCESS: By the Morice River road a distance of 26 miles from Houston.
OWNER: Anaconda American Brass Limited, Britannia Beach; T. Conto, geophysicist.
WORK DONE: Electromagnetic, inducted polarization, and magnetometer surveys were made. Four men spent 1½ months on the property.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 109; Assessment Report No. 1229.

MORICE LAKE

Lucky Ship, Sam

LOCATION: (54° 127° S.E.) Between elevations of 3,500 and 4,500 feet, south of the east end of Morice Lake.
CLAIMS: One hundred and five claims comprising the Lucky Ship and Sam groups.
ACCESS: By road from Houston, a distance of 57 miles.
OWNER: Plateau Metals Limited.

OPERATOR: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; T. J. R. Godfrey, geologist.
METAL: Molybdenum.
WORK DONE: Two holes totalling 2,718 feet were diamond drilled. Some detailed geological mapping was done, and 3 acres of bedrock was stripped by bulldozer and hydraulicking. Eleven men were employed for five months.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1965, pp. 84–87; 1966, pp. 104–109; 1967, p. 109.

King, Queen, Jack

LOCATION: (54° 127° S.E.) Between elevations of 3,500 and 4,000 feet on the east slope of Tableland Mountain, 3 miles southwest of Lamprey Lake, 40 miles southwest of Houston.
CLAIMS: Thirty claims comprising the King, Queen, Jack, Pine, P.I., and Squeek groups.
ACCESS: From Highway No. 16 at Houston via the Morice River road and logging-roads.
OWNER: E. Westgarde and associates.
OPERATOR: Falconbridge Nickel Mines Limited, 500, 1112 West Pender Street, Vancouver 1; D. H. Helgesen, geologist.
METALS: Molybdenum, copper.
WORK DONE: Four men worked for one month. Soil and silt samples were taken for geochemical analysis. Twelve trenches were excavated.

PC

LOCATION: (53° 127° N.W.) At elevations of 4,000 and 7,000 feet, 4 miles southwest of Atna Bay, between the Atna River and Morice Lake.
CLAIMS: PC 1 to 36.
ACCESS: By helicopter from Smithers, a distance of 60 miles.
OWNER: Phelps Dodge Corporation of Canada, Limited, 404, 1112 West Pender Street, Vancouver 1; P. G. Curtis, geologist.
METALS: Lead, zinc, silver, copper.
WORK DONE: The geology of the claims was mapped and chip samples were taken for geochemical analysis. Nine trenches, total length 692 feet, were blasted in bedrock. Six men were employed for six weeks.

D.W., Corb, Cup, Fen

LOCATION: (53° 127° N.W.) Between elevations of 3,100 and 4,000 feet on the west side of Nanika Lake.
CLAIMS: D.W. 1 to 14, Corb 1 to 80, Cup 1 to 10, 17 to 38, Fen 1 to 10.
ACCESS: Seventy-five miles, by helicopter or float plane, south-southwest from Smithers.
OWNER: The D.W. group, owned by Silver Cup Mines Ltd., is under option.
OPERATOR: Quintana Minerals Corporation, 2160 One Bentall Centre, Vancouver 1; H. H. Shear, consulting geologist.
METALS: Copper, molybdenum.
WORK DONE: Sixteen men spent five months making topographical, geological, and geochemical surveys, and diamond drilling 8,625 feet in 14 holes.
DESCRIPTION: Pyrite, chalcopyrite, pyrrhotite, and molybdenite occur in a fault zone contact between Coast Range intrusive rocks and dacite porphyry of the Hazelton series, with the porphyry being the host for the sulphides.

TAHTSA LAKE

Emerald Glacier Mine

LOCATION: (53° 127° N.E.) Between elevations of 6,000 and 6,500 feet on Mount Sweeney in the Sibola Range near Tahtsa Lake.
CLAIMS: Mineral lease No. 15 (nine Emerald and Glacier Crown-granted claims) and 27 recorded claims.
ACCESS: By road from Houston, a distance of 60 miles.
OWNER: Emerald Glacier Mines Ltd.
OPERATOR: Pine Glacier Mines Ltd., 1111, 736 Granville Street, Vancouver 2.
METALS: Lead, zinc, silver (*see* Table 12 for production).
WORK DONE: Underground development: Drifting, 65 feet; raising, 90 feet. An access road was built to the 1275 portal.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 110–113.

Ox

LOCATION: (53° 127° N.E.) Between elevations of 2,800 and 3,200 feet on the south shore of Tahtsa Reach, 4 miles east of Huckleberry Mountain.
CLAIMS: Ox 1 to 64.
ACCESS: By float plane from Smithers, a distance of 70 miles, or by access road from the Tahtsa Lake road.
OWNER: Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2; N. W. Burmeister, geologist.
METALS: Copper, molybdenum.
WORK DONE: Twelve men spent four months making topographical, geological, geophysical, and geochemical surveys, bulldozing 10,000 feet of trench, and diamond drilling 11 holes totalling 4,800 feet. Two and one-half miles of access road was built.

TROITSA LAKE

OVP, MK, FAG

LOCATION: (53° 127° N.E.) On the south shore of Troitsa Lake 75 miles from Burns Lake and Terrace between 3,000 and 6,000 feet elevation.
CLAIMS: One hundred and sixty claims.
ACCESS: By float plane or helicopter from Burns Lake or Smithers, a distance of 75 miles.
OWNER: George Bleiler.
OPERATOR: Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2.
METAL: Copper.
WORK DONE: Six men spent two months diamond drilling 1,500 feet in three holes under the supervision of N. W. Burmeister, geological engineer.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, p. 112; 1967, p. 113.

Fab

LOCATION: (53° 127° N.W.) Between elevations of 3,500 to 5,300 feet, on the south side of Troitsa Lake and west of Coles Creek.
CLAIMS: Fab 1 to 11, 33 to 40.
ACCESS: Sixty-six miles by helicopter from Houston.
OWNER: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; A. Gambardella, geologist.
METALS: Copper, lead, zinc.

WORK DONE: The geology of the claims was mapped and soil samples were taken for geochemical analysis. Five men were employed for 10 days.
REFERENCE: Assessment Report No. 1679.

EUTSUK LAKE

Red Bird (CAFB)

LOCATION: (53° 127° S.E.) On Red Bird Mountain between Haven Lake and the west end of Eutsuk Lake.
CLAIMS: CAFB group of 239 claims and fractions.
ACCESS: By float plane from Smithers, a distance of 100 miles.
OWNER: Ashfork Mines Limited, a subsidiary of Phelps Dodge Corporation of Canada, Limited, 404, 1112 West Pender Street, Vancouver 1; H. R. Buckles, project engineer.
METALS: Molybdenum, minor copper.
WORK DONE: On the CAFB 3, 5, and 15, two holes, total length 940 feet, were diamond drilled, and a 3,300-foot trench was bulldozed and blasted in rock. Seven men were employed for two months.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, pp. 112–116; 1967, p. 114.

ENDAKO

Endako Mine

By W. G. Clarke and L. Wardman

LOCATION: (54° 125° S.E.) North of the east end of Francois Lake, 115 miles west of Prince George.
CLAIMS: Two hundred and fifty-four mineral claims, of which 18 are held by mineral leases. An additional 57 mineral claims are held under an option agreement from Torwest Resources (1962) Ltd., Vimy Explorations Ltd., and Tormont Mines Limited.
ACCESS: By paved road from Highway No. 16, 1 mile east of the village of Endako.
OWNER: Endako Mines Ltd., Endako (controlled and managed by Canadian Exploration Limited); H. J. Matheson, mine manager; company office, 1218, 1030 West Georgia Street, Vancouver 5.
METAL: Molybdenum (*see* Table 12 for production).
WORK DONE:

Pit production, 9,548,700 tons; ore milled, 6,597,000 tons; overburden stripped, 247,100 cubic yards; diamond drilling, 12,246 feet.

The 150-horsepower motors on the four reclaim-water pumps were replaced with 200-horsepower motors. Approximately 1,500 feet of 5,000-volt 260 M.C.M. overhead line was added to the pit electrical distribution system. A 25-horsepower air compressor was installed in the mill, and the number of lighting circuits was increased by five. Three 5-kva. 550–208/120-volt lighting transformers in the mill were replaced by three 15-kva. transformers. Eight shaker motors and four screw conveyor motors were installed for the secondary crusher dust-collector.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1965, pp. 136–138; 1966, p. 117; 1967, pp. 114–115.

Lorne

LOCATION: (54° 125° S.E.) Between elevations of 2,500 and 2,800 feet, on Sam Ross Creek, 8 miles west of Endako and 750 feet south of Highway No. 16.
CLAIMS: Lorne group of 35 claims.
ACCESS: By Highway No. 16 to Sam Ross Creek, then by access road to the property.

OWNER: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; W. Lodder, staff geologist.
METAL: Molybdenum.
WORK DONE: One hole 638 feet deep was diamond drilled.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 115; Assessment Report No. 1235.

Lot, Lad, Lee

LOCATION: (54° 125° S.E.) Between elevations of 2,500 and 2,800 feet adjacent to Highway No. 16, 7 miles west of the village of Endako.
CLAIMS: One hundred and eight claims, including Lot 1 to 27, Lad 1 to 40, Lee 1 to 18, Lou 1 to 22, and Kim.
ACCESS: By Highway No. 16.
OWNER: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; W. Lodder, staff geologist.
METAL: Molybdenum.
WORK DONE: Geological and induced polarization surveys were made of all claims, and soil samples were taken on the Lot and Lad groups for geochemical analysis. Three men were employed for two months.

Nu, Elk, Etc.

LOCATION: (54° 125° S.E.) Three miles west of the Endako mine.
CLAIMS: Fifty-four claims—Elk 1 to 12, Nu 1 to 10, Deer 3, 4, 9 to 12, Dis 26, 28 to 36, and Dat 401 to 416.
ACCESS: By 6 miles of road from Highway No. 16.
OWNER: Denak Mines Ltd.
OPERATOR: Endako Mines Ltd., Endako; E. T. Kimura, geologist.
METAL: Molybdenum.
WORK DONE: One hole 150 feet deep was diamond drilled. Nine men spent one week on the property.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 115.

Lim, Gem

LOCATION: (54° 125° S.E.) Between elevations of 2,500 and 2,800 feet 6 miles west of Endako, 1 mile south of Oval Lake.
CLAIMS: Lim 1 to 28, Gem 1 to 14.
ACCESS: The property is 100 feet from Highway No. 16.
OWNER: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; W. Lodder, geologist.
METAL: Molybdenum.
WORK DONE: The geology of the claims was mapped and soil samples were taken for geochemical analysis. Three men were employed for two months.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 116.

CM

LOCATION: (54° 125° S.E.) At elevation 3,000 feet on the ridge 3 miles due south of Endako village.
CLAIMS: CM 1 to 32.
ACCESS: Five miles by road from the village of Endako.
OWNER: Torwest Resources (1962) Ltd. and Vimy Explorations Ltd.
OPERATOR: Endako Mines Ltd., Endako; E. T. Kimura, senior geologist.

METAL: Molybdenum.
WORK DONE: Thirteen holes totalling 3,897 feet were diamond drilled. Eighteen men spent one month on the property.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 116.

Bell

LOCATION: (54° 125° S.E.) Four miles south-southwest of Endako.
CLAIMS: Bell 1 to 19, Bell 20 Fraction.
ACCESS: Six miles by road from Endako.
OWNER: Mart Mining Co. Ltd., 1223, 409 Granville Street, Vancouver 2; Dolmage, Campbell and Associates Ltd., consultants.
METAL: Molybdenum.
WORK DONE: The geology of the claims was mapped, and six holes totalling 1,729 feet were diamond drilled.
DESCRIPTION: Molybdenite is disseminated in the Topley granite.

Co

LOCATION: (54° 125° S.E.) Just east of Endako mine, 3 miles southwest of Endako.
CLAIMS: Co group of 25 claims.
ACCESS: By road from Endako, a distance of 6 miles.
OWNER: Tormont Mines Limited.
OPERATOR: Endako Mines Ltd., Endako; E. T. Kimura, senior geologist.
METAL: Molybdenum.
WORK DONE: Fourteen holes totalling 3,058 feet were diamond drilled. Seventeen men were employed for one month.

Ken

LOCATION: (54° 125° S.E.) Between elevations of 2,500 and 2,800 feet at the northwest corner of Tatin Lake, 4 miles north of Endako.
CLAIMS: Ken 1 to 18.
ACCESS: By float plane from Fraser Lake, a distance of 8 miles.
OWNER: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; W. Lodder, geologist.
METAL: Molybdenum.
WORK DONE: The claim geology was mapped and soil samples were taken for geochemical analysis. Two men were employed for six weeks.

NITHI MOUNTAIN

Owl, Nit, Bee

LOCATION: (53° 124° N.W.) Three miles south of Nithi Mountain between elevations of 3,000 and 4,000 feet.
CLAIMS: Forty claims, including the Owl 1 to 20, Nit 1 to 18, and Bee 1 and 101 Fractions.
ACCESS: By 16 miles of road from the village of Fraser Lake.
OWNER: Anaconda American Brass Limited, Britannia Beach; G. Bysouth, geologist.
METAL: Molybdenum.
WORK DONE: Six men worked for two months. Geological, induced polarization, and geochemical surveys were made.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 116; Assessment Reports Nos. 1216 and 1689.

VANDERHOOF

Sue

LOCATION: (53° 124° N.W.) On the west flank of Mount Greer, between elevations of 3,000 and 3,500 feet.

CLAIMS: Sue 1 to 36.

ACCESS: By road from Vanderhoof, a distance of 30 miles.

OWNER: Anaconda American Brass Limited, Britannia Beach; G. Bysouth, geologist.

WORK DONE: Geological and induced polarization surveys were made, and samples were taken for geochemical analysis. Six men were employed for one month.

FORT ST. JAMES

By W. G. Clarke and L. Wardman

Pinchi Lake Mine

LOCATION: (54° 124° N.W.) On the north shore of Pinchi Lake.

CLAIMS: One hundred and sixty-nine mineral claims.

ACCESS: By 29 miles of good gravel road from Fort St. James.

OWNER: Cominco Ltd., P.O. Box 220, Fort St. James; mine office, Pinchi Lake; superintendent, K. V. S. Meyer.

METAL: Mercury.

WORK DONE:

The 800-ton plant, consisting of crushing, grinding, flotation, roasting, and condensing sections, was built by Kootenay Engineering Company Ltd. and completed on August 1, 1968. Service buildings, consisting of an office-warehouse-machine shop complex, a change-house with first-aid facilities, compressor-house, stand-by generating-station, carpenter-shop, and pumphouse, were also completed in August. An approved sewage lagoon with adjoining overflow lagoon were completed, as was a tailings dam designed to hold initially the tailings from six to seven years' production.

A 60-kv. power-line from Fort St. James was commissioned in July, having been built for British Columbia Hydro by West Kootenay Power and Light Company. In the event of a power failure there are four 100-kva. diesel-driven generators on stand-by for essential power.

The ore is crushed by a jaw crusher, conveyed to a rod deck screen, where the fines are separated and conveyed to the fine-ore bin. The coarser material passes through a hydrocone crusher, which is in closed circuit with the rod deck screen. The two crushers are driven by 150-horsepower 600-volt motors.

In the concentrator the fine ore is fed to a rod mill. Pulp from this mill is passed through cyclones to separate out the fines, which go directly to the flotation circuit. The coarser material from the cyclones is fed to a ball mill, which is in closed circuit with them. The rod and ball mills are driven by 250- and 600-horsepower 2,300-volt synchronous motors respectively.

The flotation section consists of rougher, cleaner, recleaner, and scavenger flotation cells. From the flotation cells the concentrates enter a roaster, and the mercury vapour from it is then taken to a collector. Other equipment consists of pumps, fans, and conveyors.

The compressor-house will contain three compressors driven by three 400-horsepower synchronous motors.

In the mine the following equipment was installed: One 100-horsepower fan on the surface at the 300-foot level, one 100-horsepower fan on the 500-foot level,

one 75-horsepower fan on the 500-foot level, and one 50-horsepower fan on the surface at about the 200-foot level.

A 500-kva. substation will be installed on the 750 level to supply these motors.

Upon completion of construction the bunkhouse and cookhouse facilities were shut down.

Initial plant trials commenced on August 1st, and on August 11th the first ore was milled. On August 17, 1968, the first mercury was bottled.

Underground Development Diamond Drilling

	Ft.
By Cameron-McCutcheon Drilling Ltd.	5,366
By Inspiration Drilling Ltd.	648

Underground Development

	By Cameron-McMynn Ltd. (Ft.)	By Cominco Ltd. (Ft.)	Total (Ft.)
Inclines	1,536	.....	1,536
Drifts	872	341	1,213
Crosscuts	1,499	62	1,561
Raises	595	308	903
	4,502	711	5,213
	(Cu. Ft.)	(Cu. Ft.)	(Cu. Ft.)
Miscellaneous slashing	17,270	6,940	24,210

Ore Production

In 1968 about 22 per cent of the ore was mined underground and 78 per cent from surface.

The underground ore was mined by Cominco Ltd., using a mechanized cut-and-fill method, with diesel-powered drilling, loading, and haulage equipment. Deslimed mill tailings with a 1 to 30 proportion of Portland cement is used as backfill material.

In 1968 both the company and Cameron-McMynn Ltd. worked the West Zone open pit. The pit is being mined in 25-foot benches, using two percussion drills, a diesel-powered front-end loader, and two 35-ton diesel haulage trucks. About equal amounts of ore and waste were mined in the pit.

General

During the year 20 staff residences and 30 townhouse apartments were built for occupancy by employees in the village of Fort St. James. Bus transportation is provided for all employees on all three shifts.

At year-end the concentrator and roaster were operating on a continuous basis using three 8-hour shifts per day, and the underground mine was working on three 8-hour shifts five week-days per week. The open pit was operating on one 8-hour shift for five week-days per week.

Crew Strength

At year-end, personnel on roll were as follows:—

Staff		27
General roll—		
Underground and open pit	32	
Surface (plant and maintenance)	39	
Engineering and geology	3	
		74
Contractors' crews		10

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; 1967, p. 117; *B.C. Dept. of Mines*, Bull. 5, 1940, p. 18.

Toad

LOCATION: (54° 124° N.W. and N.E.) At an elevation of 2,300 feet on the south shore of Tezzeron Lake, north of the Pinchi Lake mine.
CLAIMS: Toad 1 to 15.
ACCESS: By logging-road from the Pinchi mine, a distance of 10 miles.
OWNER: Cominco Ltd., 1199 West Pender Street, Vancouver 1; D. W. Heddle, senior geologist.
METAL: Mercury.
WORK DONE: Three trenches were made by bulldozer.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1966, p. 118; 1967, p. 117; Assessment Report No. 1020.

CIN

LOCATION: (54° 124° N.E.) On the northeast shore of Pinchi Lake, northwest of the Pinchi Lake mine.
CLAIMS: CIN group of 70 claims and one fraction.
ACCESS: By road from Fort St. James, a distance of 30 miles.
OWNER: Highland Mercury Mines Limited, 300, 999 West Pender Street, Vancouver 1.
METAL: Mercury.
WORK DONE: Some topographical and geological surveying was done by R. S. Verzosa.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1966, pp. 118–119.

NATION LAKES

Wit, Wag

LOCATION: (55° 125° S.E.) Two miles north of the east end of Chuchi Lake.
CLAIMS: Fifty-two claims, Wit and Wag groups.
ACCESS: From Fort St. James to Chuchi Lake by the Manson Creek road and thence by boat.
OWNER: T. Taylor, of Winfield.
OPERATOR: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, exploration manager.
METALS: Silver, lead, zinc.
WORK DONE: Seven men spent two weeks making geophysical, electromagnetic, and induced polarization surveys.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1965, p. 108; 1967, p. 118.

TAKLA LAKE

Lucy

LOCATION: (55° 125° S.W.) Four miles northeast of Natowite Lake between elevations of 3,000 and 4,000 feet.
CLAIMS: Lucy 1 to 24.
ACCESS: Fifty-five miles by helicopter northeast from Smithers.
OWNER: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5.
METAL: Copper.
WORK DONE: The claims were mapped geologically, and soil samples were taken over the entire claim group for geochemical analysis. Four men worked for half a month under the supervision of G. R. Peatfield, geologist.
DESCRIPTION: Minor pyrite and chalcopyrite were found in small quartz veins and shears in intermediate volcanic rocks.

KWANIKA CREEK

Lustdust

LOCATION: (55° 125° N.E.) Between elevations of 4,300 and 4,800 feet on the east slope of Vital Range, 1 mile west of Takla Mercury mine, north of the junction of Kwanika and West Kwanika Creeks.
CLAIMS: Lustdust 1 to 15, A.G. 1 to 6, Ag 1 to 4, Keno 1 to 8.
ACCESS: The property is accessible from Fort St. James by the Manson Creek road and then the Silver Creek road, a total distance of 170 miles.
OWNER: Anchor-Takla Mines Ltd., 1111, 409 Granville Street, Vancouver 2; Bacon and Crowhurst, consulting engineers.
METALS: Antimony, silver, lead, zinc.
WORK DONE: Diamond drilling underground, 1,881 feet, 17 holes; diamond drilling surface, 4,387 feet, 13 holes.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1953, p. 95; 1954, p. 96; 1960, pp. 14–15; 1965, p. 105.

Houston

LOCATION: (55° 125° N.E.) On the divide between Kwanika and Silver Creeks, 15 miles north of Tsayta Lake.
CLAIMS: Houston 1 to 42.
ACCESS: One hundred and seventy miles by road from Fort St. James.
OWNER: Rip Van Mining Ltd., 020, 640 Seventh Avenue Southwest, Calgary, Alta.; S. J. Hunter, consulting engineer.
METAL: Mercury.
WORK DONE: Soil samples were taken for geochemical determination of mercury.
REFERENCE: Assessment Report No. 1755.

THUTADE LAKE

Firesteel

LOCATION: (57° 126° S.W.) Between elevations of 3,800 and 4,000 feet on Bren Creek, a tributary of the Finlay River, about 2 miles west of the north end of Thutade Lake.
CLAIMS: Fire 1, Brule 2 to 4, Ubble 1 to 11.
ACCESS: By float plane from Telkwa, a distance of 200 miles, or by road to Uslika Lake, thence by float plane to Thutade Lake, an air distance of 100 miles.
OWNER: Emil Bronlund.

OPERATOR: The Granby Mining Company Limited, 507, 1111 West Georgia Street, Vancouver 5; D. H. James, geologist.
METAL: Silver.
WORK DONE: Fourteen trenches were made by hand, and 261 feet of diamond drilling was done in three holes.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1957, p. 13.
DESCRIPTION: Galena, sphalerite, and tetrahedrite occur in narrow, flat quartz veins in silicified limestone.

Kemess

LOCATION: (57° 126° S.E.) Two miles east of the north end of Thutade Lake.
CLAIMS: Kemess 1 to 96.
ACCESS: One hundred and sixty-five miles by fixed-wing aircraft from Smithers.
OWNER: Kennco Explorations, (Western) Limited, 730, 505 Burrard Street, Vancouver 1; R. W. Stevenson, senior geologist.
METAL: Copper.
WORK DONE: The geology of the claims was mapped, and soil and silt samples were taken for geochemical analysis. Two holes totalling 164 feet were diamond drilled. Five men spent two months on the property.
REFERENCE: Assessment Report No. 1705.

Pine

LOCATION: (57° 126° S.E.) Mostly on the southeast side of the Finlay River, 15 miles northeast of Thutade Lake.
CLAIMS: Pine 1 to 134.
ACCESS: One hundred and eighty miles by fixed-wing aircraft from Smithers.
OWNER: Kennco Explorations, (Western) Limited, 730, 505 Burrard Street, Vancouver 1; R. W. Stevenson, senior geologist.
METAL: Copper.
WORK DONE: Claim geology was mapped, and soil and silt samples were taken for geochemical analysis. Six men spent one month on the property.

OSILINKA RIVER

Beveley

LOCATION: (56° 125° S.E. and 56° 124° S.W.) Between elevations of 3,000 and 5,000 feet on the north side of the Osilinka River, one-half mile downstream from the mouth of Wasi Creek.
CLAIMS: Ninety-eight claims, including the Beveley 1 to 4, Donna 1 to 70, Robin 1 to 8, Grouse 1 to 3, and others.
ACCESS: By road from Fort St. James, a distance of 200 miles.
OWNER: Donna Mines Ltd., 642 Clark Drive, Vancouver 6; Emil Bronlund, resident geologist.
METALS: Silver, lead, zinc.
WORK DONE: Eight men worked for seven months. Topographical and geological surveys were made. Nineteen thousand feet of trenching and three test-pits were made by backhoe. A camp, including a cookhouse, assay office, and four bunkhouses, was constructed. An adit was driven 190 feet. A test-hole 200 feet long was made by percussion drilling.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1950, p. 101; 1951, p. 118; 1952, pp. 98–101; 1967, p. 120; Assessment Report No. 1080.

Ruby

LOCATION: (56° 125° S.E.) At elevations between 4,500 and 5,500 feet at the head of Jim May Creek.
CLAIMS: Ruby 1 to 6, Ivan 1 to 4, Tas 1 to 27.
ACCESS: By four-wheel-drive vehicle north from Uslika Lake.
OWNER: Taseko Mines Limited, 248 Second Avenue, Kamloops; J. Foster, superintendent.
METAL: Silver.
WORK DONE: Some soil samples were taken for geochemical analysis, four trenches totalling 600 feet were bulldozed, and three X-ray holes totalling 60 feet were drilled.

CARIBOO MINING DIVISION

GISCOME

Samson, Tin, Can

LOCATION: (54° 122° S.E.) Between 2,000 and 2,600 feet elevation 2 miles east of Giscome.
CLAIMS: Samson 1 to 36, Tin 1 to 14, Can 1 to 40, J.H.G. 1 to 10.
ACCESS: By road from Giscome.
OWNER: Central B.C. Exploration Ltd., 1726 West 14th Avenue, Vancouver 9; J. H. Gerlitzki, president.
METALS: Silver, lead, zinc, copper.
WORK DONE: Eight men spent seven months working on the property. Magnetometer and gravity surveys were made and samples taken on the Can group for geochemical analysis. Some road-building, trenching, and stripping were done. Sixteen holes totalling 4,422 feet were diamond drilled.

TWEEDSMUIR PARK

Boom, Wilf

LOCATION: (52° 126° N.E. and 53° 126° S.E.) At elevations of 4,000 and 4,800 feet in Tweedsmuir Park northeast of Jumble Mountain in the Pattullo Range.
CLAIMS: Boom 1 to 118, Wilf 1 to 18.
ACCESS: Fifty miles north from Bella Coola by helicopter.
OWNER: Kerr Addison Mines Limited, 405, 1112 West Pender Street, Vancouver 1; J. C. Lund, geologist.
METALS: Copper, molybdenum.
WORK DONE: The geology of an area of 1.6 square miles was mapped, a magnetometer survey was run over 180,000 feet of line, and soil samples for geochemical analysis were taken from an area 4,800 by 8,000 feet. Six holes totalling 4,081 feet were diamond drilled. Five company employees and five drillers worked for four months on the property.
DESCRIPTION: Pyrite, chalcopyrite, and molybdenite occur in quartz veins and fractures in hornfelsed Hazelton volcanics and in quartz diorite and quartz monzonite intrusions.

CC

LOCATION: (52° 126° N.W.) In Tweedsmuir Park at elevations of 3,800 to 4,000 feet on the northeast side of Jumble Mountain in the Pattullo Range.
CLAIMS: CC 1 to 6.
ACCESS: Forty-five miles by helicopter north from Bella Coola.

OWNER: Kerr Addison Mines Limited, 405, 1112 West Pender Street, Vancouver 1; J. C. Lund, geologist.
METAL: Copper.
WORK DONE: The geology was mapped in detail, a self-potential survey along 3,700 feet of line was made, and a 15-foot trench was blasted in bedrock. Four men spent two weeks on the property.
DESCRIPTION: Chalcopyrite, pyrite, and specularite with minor bornite occur in fractures in andesitic and basaltic volcanic rocks.

QUESNEL

B

LOCATION: (53° 123° S.E.) Between elevations of 2,500 and 4,000 feet 5 miles east-southeast of the junction of the West Road and Euchiniko River.
CLAIMS: B 1 to 136.
ACCESS: By roads and logging-roads a distance of 55 miles from Quesnel.
OWNER: Rio Tinto Canadian Exploration Limited, 404, 1111 West Georgia Street, Vancouver 5.
METAL: Copper.
WORK DONE: Under the direction of E. W. Johnson, six men spent three months making topographical, geological, geophysical, and geochemical surveys and digging 23 trenches.

Whale

LOCATION: (53° 122° S.E.) On the west side of Cottonwood River between elevations of 2,500 and 2,600 feet 12½ miles north-northeast of Quesnel.
CLAIMS: Whale 1 to 16.
ACCESS: By highway and logging-road from Quesnel, a distance of 16 miles.
OWNER: Anaconda American Brass Limited, Britannia Beach; Peter Hirst, geologist.
METAL: Iron.
WORK DONE: Three men spent two weeks making magnetometer and induced polarization surveys. Six test-pits dug with a backhoe provided profile samples for geochemical analysis.

Thunder

LOCATION: (53° 122° S.E.) On Ahbau Creek 3 miles east of Cinema.
CLAIMS: Thunder 1 to 24, 31 to 34, Kem 1, 2, Mike 3 to 6.
ACCESS: By road 3 miles east from Highway No. 97 at Cinema.
OWNER: Cariboo Minelands Ltd., 210, 1685 Third Avenue, Prince George.
METALS: Copper, silver, gold.
WORK DONE: Fifty thousand square feet was stripped by bulldozer, 12 pits were blasted, and a geological map and a magnetic survey were made. Soil samples were taken for geochemical analysis, and 3½ miles of access road was built. Two men worked on the property for eight months.

McLEESE LAKE

HD, HAS, FFE, Etc.

LOCATION: (52° 122° S.E. and N.E.) East of Cuisson Lake, 10 miles by road from McLeese Lake.
CLAIMS: FFE 1 to 25, HD 1 to 20, BP 1 to 6, FI 1 to 4 Fractions, and others.
ACCESS: By road from Highway No. 97 at McLeese Lake.

OWNER: Gunn Mines Ltd.
OPERATOR: Canex Aerial Exploration Ltd., 800, 1030 West Georgia Street, Vancouver 5; R. W. Cannon, geophysicist.
METALS: Copper, molybdenum.
WORK DONE: Five men spent three months making induced polarization and magnetometer surveys. Ten percussion holes totalling 2,870 feet were drilled.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 121; Assessment Reports Nos. 1641, 1680A, and 1680B.

HA

LOCATION: (52° 122° S.E.) Approximately 3 miles north of McLeese Lake.
CLAIMS: HA group of 129 claims.
ACCESS: Thirty miles north from Williams Lake by road.
OWNER: Gunn Mines Ltd.
OPERATOR: Canex Aerial Exploration Ltd., 800, 1030 West Georgia Street, Vancouver 5.
METALS: Copper, molybdenum.
WORK DONE: Induced polarization, resistivity, magnetic, and geological surveys were made, surface workings were mapped, and 10 holes totalling 5,127 feet were drilled.

LIKELY

Cariboo-Bell

LOCATION: (52° 121° N.W.) Between Bootjack and Polley Lakes about 6 miles southwest of Likely.
CLAIMS: B.J. 1 to 168.
ACCESS: Fifty-four miles by road from Williams Lake.
OWNER: Cariboo-Bell Copper Mines Limited, 300, 999 West Pender Street, Vancouver 1.
METAL: Copper.
WORK DONE: Some geological mapping was done by R. S. Verzosa.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 126–131.

BIG TIMOTHY MOUNTAIN

Boss Mountain Mine By T. M. Waterland and L. Wardman

LOCATION: (52° 120° S.W.) Northeast of 100 Mile House on the east slope of Big Timothy (Takomkane) Mountain.
ACCESS: By road from 100 Mile House via Forest Grove road, a distance of 57 miles.
OWNER: Brynnor Mines Limited (Boss Mountain Division), 1050 Davie Street, Vancouver 5; mine address, Hendrix Lake; A. M. Cormie, mine manager.
METAL: Molybdenum (*see* Table 12 for production).

WORK DONE:

	Ft.
Drifts and crosscuts	1,310
Subdrifts	4,183
Raising	1,422
Diamond drilling	11,532
Blast-hole drilling	490,682

The mill operated for 354 days. Concentrates were marketed in England, France, and the United States. There was no significant change in mine plant or production equipment during 1968.

The following electrical equipment was installed: A 200-c.f.m. Canadian Ingersoll-Rand air compressor driven by a 375-horsepower 2,300-volt synchronous motor was installed in the powerhouse. A Joy ventilation fan driven by a 100-horsepower 550-volt motor was installed on the surface at the No. 56 raise. Two hundred and fifty feet of power cable to supply a 1,000-kva. 7,200–2,400-volt transformer for the hoist and shaft equipment was installed underground. The hoist is a 72- by 60-inch Bertram-Nordberg double-drum hoist, serial No. 31761, driven by a 250-horsepower 2,300-volt 3-phase C.G.E. induction motor. The transformer mentioned was taken from the surface substation and was replaced with a 2,000-kva. 2,400–7,200-volt transformer in the surface substation. Two slushers driven by 50-horsepower 550-volt motors were installed underground.

During 1968 the 5G44 drift south and 5J53 drift north were extended for further diamond-drilling exploration. Subdrifting was carried out on the 5060, 5105, 5160, 5260, and 5340 sublevels, and draw points were completed on the 5045 level. On the 5200 sublevel, a system of scram drifts and box holes was completed in order to mine the south part of the west stringer zone. An ore-pass system was carried to the 5,175-foot elevation in the southwest stringer zone.

Major development on the 5045 level included driving a 400-foot by-pass on the main haulage drift and preparation work for the sinking of a shaft below the 5045 level.

DESCRIPTION: 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.

CLINTON MINING DIVISION

TATLAYOKO LAKE

Tab

LOCATION: (51° 124° N.E.) One-quarter mile from Tatlayoko Post Office, on Homathko River 2½ miles north of Tatlayoko Lake.

CLAIMS: Tab 1 to 29.

ACCESS: Via road from Williams Lake or Bella Coola.

OWNER: E. R. Flesher, c/o P.O. Box 1510, Campbell River.

METAL: Copper.

WORK DONE: Soil-sampling; 68 feet of ⅝-inch diamond-drill hole; 150 feet of bulldozer trenching.

DESCRIPTION: Sparse chalcopyrite in shale.

Lost Fiddle, Evelyn M

LOCATION: (51° 124° N.W.) Near the head of Ottarasko Creek, 10 miles west of the south end of Tatlayoko Lake.

CLAIMS: Evelyn M 1 and 2, Leader 1 and 2, Reel 4, Lost Fiddle 1, 2, and 3 Fraction, and Snap 1 and 2, called the Ottarasko group.

ACCESS: From Tatlayoko Post Office by boat and horse, a distance of 22 miles.

OWNER: E. R. Flesher, P.O. Box 1510, Campbell River.

METALS: Copper, silver, gold.

WORK DONE: Three 10-foot trenches were dug by hand. Seven holes totalling 145 feet were diamond drilled.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 126.

DESCRIPTION: Quartz veins carrying chalcopyrite and arsenopyrite occur in rhyolite.

Morris Mine

LOCATION: (51° 124° S.E.) Four miles south of the south end of Tatlayoko Lake.
CLAIMS: Crown grants Isaac (Lot 701), Spokane (Lot 702), Copper Dyke Extension (Lot 703), and Copper Dyke (Lot 704) and Tat 1 to 9.
ACCESS: By 110-mile road from Williams Lake.
OWNER: Reco Copper (1966) Limited, 2, 821 West Pender Street, Vancouver 5.
METALS: Gold, silver, copper.
WORK DONE: Detailed geological mapping was done on the Crown grants by R. W. Phendler, of Canadian Mine Services Ltd. Three men spent three months on the property.
REFERENCE: Assessment Report No. 1663.

TASEKO LAKES

BB

LOCATION: (51° 123° S.W.) At elevations of 4,500 to 5,000 feet immediately northwest of Fish Lake.
CLAIMS: BB group of about 60 recorded claims.
ACCESS: One hundred and fifty miles by road west from Williams Lake.
OWNER: Taseko Mines Limited, 248 Second Avenue, Kamloops; J. Foster, superintendent.
METAL: Copper.
WORK DONE: Four open cuts were excavated and five X-ray holes totalling 180 feet were diamond drilled.

Eggs

LOCATION: (51° 123° S.W.) At elevation 5,200 feet on the Tchaikazan River west of Taseko Lakes.
CLAIMS: Grin, Bear, Wash, Cleanup, Ham, Sakes (Lots 6831 to 6836), A 1 to 20, Onion 1 to 3, Pork, Beans, Eggs, and Sugar, called the Eggs group.
ACCESS: By road from Williams Lake, 150 miles.
OWNER: H. V. Warren.
OPERATOR: Copper Range Exploration Company Inc., 711, 850 West Hastings Street, Vancouver 1; Alex Burton, district geologist.
METALS: Copper, molybdenum.
WORK DONE: Work was mostly on the Eggs, Beans, Pork, and Sugar claims. The claims and surface workings were mapped, detailed geology in the trenched area was mapped, a magnetometer survey was made, samples of stream silts were taken for geochemical analysis, 4,200 lineal feet of trench was bulldozed, and five open cuts were blasted in bedrock. Five miles of access road was built.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 126.
DESCRIPTION: Chalcopyrite and molybdenite with minor quartz occurs in stockworks in volcanic rocks and porphyritic plugs and dykes.

Banner

LOCATION: (51° 123° S.W. and S.E.) At elevations between 4,500 and 7,500 feet on the east side of Taseko Lakes at the mouth of Chita (Cedar) Creek.
CLAIMS: Banner 1 to 80.
ACCESS: By 130 miles of road from Williams Lake.
OWNER: Bethex Explorations Ltd., 1818, 355 Burrard Street, Vancouver 1.
METALS: Copper, molybdenum.

WORK DONE: Six men spent four months working under the direction of H. Reich, geologist. The geology of an area 2,000 by 6,000 feet was mapped, and soil and stream-sediment samples were taken for geochemical analysis.
REFERENCE: Assessment Report No. 1606.
DESCRIPTION: Chalcopyrite and molybdenite occur disseminated and along fractures in silicified and kaolinized quartz feldspar porphyry.

Taseko

LOCATION: (51° 123° S.E.) On Taseko River and McClure and Grant Creeks.
CLAIMS: Taseko 1 to 89, Spokane 1 to 4, Empress 1 to 5.
ACCESS: One hundred and twenty-five miles by road from Williams Lake, thence 30 miles by jeep-road on the west side of Taseko Lakes.
OWNERS: Under option from E. E. Holbrook and L. J. Russell to Valnicla Copper Mines Ltd. and Cannoo Mines Ltd.
OPERATOR: Cannoo Mines Ltd., P.O. Box 1269, Merritt; R. L. Curnow, secretary-treasurer.
METALS: Copper, molybdenum, gold, silver.
WORK DONE: A geologic survey of the claims was made, and some bulldozer trenching and stripping were done. Thirty miles of access road to the property and 10 miles of drill access road on the property were built. Two holes totalling 361 feet were diamond drilled. Six men were employed for seven months.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1935, pp. F 22–F 25; 1956, p. 35.

R.H.

LOCATION: (51° 123° S.E.) South along Griswold Creek at the head of Taseko Lakes.
CLAIMS: R.H. 1 to 51.
ACCESS: Seventy miles by helicopter west from Clinton.
OWNER: American Smelting and Refining Company, 504, 535 Thurlow Street, Vancouver 5; D. H. Olson, P.Eng.
METAL: Copper.
WORK DONE: Soil-sample survey on upper Taseko River and Griswold Creek.
REFERENCE: Assessment Report No. 1729.
DESCRIPTION: Chalcopyrite is disseminated in quartz monzonite.

LAC LA HACHE

Peach, Tim

By A. Sutherland Brown

LOCATION: (51° 121° N.E.) Southeast of Peach Lake and about 15 miles northeast of Lac la Hache.
CLAIMS: A total of 44 claims known as Peach and Tim.
ACCESS: Fourteen miles by Murphy Lake road from Lac la Hache, access road runs east for 6 miles.
OWNER: Coranex Limited, 1521 Pemberton Avenue, North Vancouver; J. R. Woodcock, exploration manager.
METAL: Copper.
WORK DONE: Two men spent 2½ months on the property doing geological mapping, taking soil samples for geochemical analysis, and making a magnetometer survey. The property was discovered in 1966 by reconnaissance geochemistry.

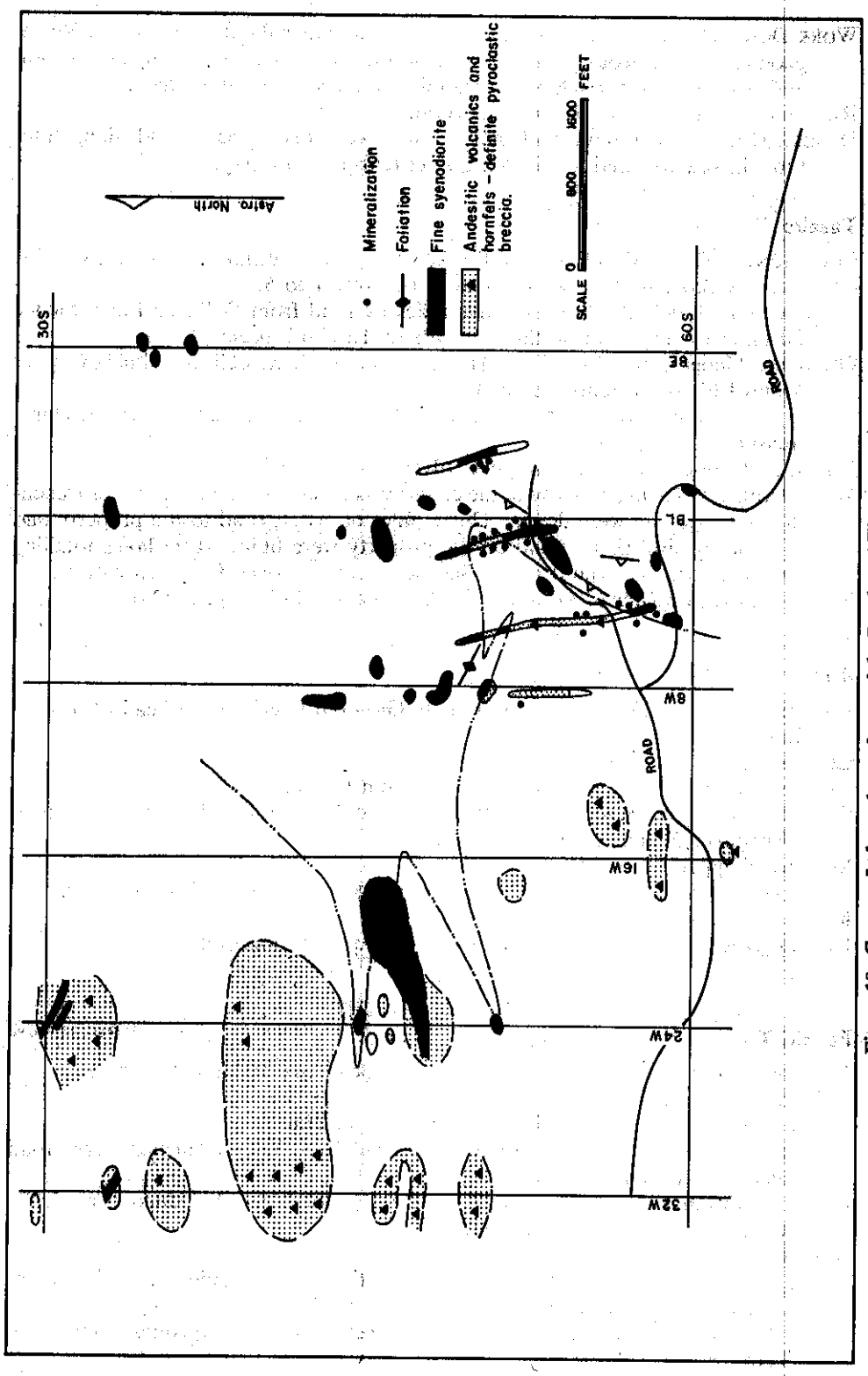


Figure 18. Coranex Ltd., geology of part of the Peach and Tim groups, Peach Lake.

REFERENCES: *Geol. Surv., Canada,* Map 3-1961, Campbell, R. B.; Map 3-1966, Campbell, R. B., and Tipper, H. W.; Federal-Provincial Aeromagnetic Maps 5232G and 5234G; *Minister of Mines, B.C.,* Ann. Repts., 1966, pp. 126–131; 1967, p. 126; Assessment Reports Nos. 1037, 1038, 1131, and 1668.

DESCRIPTION:

The area of the Peach and Tim claims embraces the eastern overlap contact of the Miocene plateau basalt flows on the west and a contact between Triassic Nicola pyroclastic rocks and a complex plutonic mass on the east. This batholith extends eastward from Peach Lake to Takomkane Mountain (Campbell, 1961; Campbell and Tipper, 1966). The Federal-Provincial aeromagnetic maps (5234G and 5232G) show interesting features that can be related in part to the areal geology. An annular magnetic high about 5 miles in diameter tangent to Peach and Sprout Lakes at the south appears to outline a discrete syenite boss that is the westernmost part of a complex pluton. The southern rim of the annular magnetic high treads across the Peach Lake property, and in it a dimple-like low of about 1,000-gamma relief is centred over a largely drift covered area about 3,500 feet northeast of the showings in the trenches. Tangent to the eastern rim of the annular magnetic high is a lineal low that trends north 10 degrees west. This corresponds with sheared rocks on the eastern boundary of the property and probably is a major shear zone.

The attitude of the Nicola pyroclastic rocks is rarely evident, but just west of the area on Figure 18 some laminated tuffs strike north 15 degrees west and dip 35 degrees east.

The vicinity of Peach Lake is approximately on the ice divide north of which ice turned northwestward and south-southwestward. On the property, striæ indicate the ice moved south 25 degrees west.

Petrology

Two rock units underlie a main part of the property, which is shown on Figure 18. Nicola clastic pyroxene-bearing porphyritic andesites are intruded by fine syenodiorite that may be a contact facies of the main pluton or the syenite boss. Metamorphism and metasomatism are fairly intense near the intrusive contact, and mapping of the latter is difficult.

Nicola rocks appear to be entirely clastic tuff breccias of unknown origin. Not far west of the area of Figure 18 they include laminated green and black feldspathic tuffs of probable marine origin. In the area of the figure they are mostly dark grey-green volcanic rocks that on close inspection can be seen to be breccias. Maximum fragment size is chiefly of the order of 1 to 3 inches. Pyroxene-rich phases occur, but these appear to be local concentrations and not a characteristic extensive layer. Microscopically this tuff breccia where least metamorphosed is composed of fragments that are similar but not identical, and which are composed of 20 to 30 per cent augite and 20 to 30 per cent plagioclase in a very fine-grained matrix of feldspar, chlorite, and magnetite. These fragments are embedded in an abundant finely comminuted matrix of similar composition.

The syenodiorite is a fine-grained medium-grey rock of fairly uniform aspect, but with occasional larger pyroxene crystals. Commonly it is foliated by oriented plagioclase laths visible in hand specimen. Its mineral composition can be seen microscopically to be uniform, and the average of eight specimens is as follows:—

	Per Cent
Plagioclase	47.5
Potash feldspar	23.8
Augite	18.1
Biotite	6.5
Magnetite	3.5
Apatite	Accessory
Sphene	Accessory

The texture is characteristic and consists of laths of intense and continuous normally zoned plagioclase (An_{80-20}) with crystals of augite and irregular poikilitic biotite set in a groundmass of either fairly fine or coarse and ophitic potash feldspar. In a few specimens 1 or 2 per cent quartz is present with the potash feldspar. Trachytic orientation of the plagioclase is common. Where the potash feldspar is fine grained, the rock is really a porphyry. Average grain size is less than 1 millimetre, and rare large crystals are only about 2 millimetres long.

Associated with the syenodiorite are small dykelets of syenite which occur in the metavolcanic rocks and are truncated by the syenodiorite. These syenites are composed of about 70 per cent pink potash feldspar, 20 per cent augite, 7 per cent plagioclase, and 2 to 3 per cent magnetite plus apatite and sphene. Plagioclase is oriented parallel to the walls of the dykelet.

Another group of dykelets of somewhat variable aplitic character occur within and without the syenodiorite. These are also red and have pink envelopes of alteration of potash feldspar and plagioclase. They may be an inch or so or just a hairline wide. They are dominated by potash feldspar and actinolite but may include schorl tourmaline or quartz and epidote and chalcopyrite.

Metamorphism, Metasomatism, and Alteration

In the volcanic rocks there is a gradient of metamorphism with increasing intensity toward the syenodiorite. Remote from the intrusive rocks there is some kaolinization and incipient growth of epidote. In most of the area of Figure 18 more extensive growth of epidote has occurred. An additional alteration occurs in patchy small areas in which fragments of the breccia are irregularly replaced by blobs of potash feldspar and minor carbonate. Where most intense this alteration transforms some fragments so they look pink and granitic in hand specimens. The matrix is replaced by some potash feldspar and also epidote but remains dark green. Adjacent to the syenodiorite contact it may be difficult to distinguish in the field between fenitized volcanic rocks and the intrusive rocks. Microscopically the volcanic rocks can be seen to be composed of the original pyroxene crystals set in a variable granulitic matrix of plagioclase, potash feldspar, biotite, epidote, and minor quartz. With most intense alteration, pyroxene also is destroyed and the rock has a completely granoblastic texture dominated by irregular epidote and actinolite with minor calcite and quartz.

Alteration of the syenodiorite is not intense but includes minor potash feldspar flooding or more commonly just red alteration of existing potash feldspar and, to a lesser degree, the plagioclase. This alteration is chiefly associated with the aplites and mineralization.

Mineralization

Chalcopyrite is the only primary ore mineral of importance. Pyrite is relatively scarce, and magnetite is the main iron mineral. Chalcopyrite is sparsely distributed and is associated with amphibole, potash feldspar, and tourmaline coated

joints, small aplitic syenite dykelets, and in dry fractures. The stockwork is most intense in the vicinity of the embayment of the syenodiorite about the trenches and in the easternmost trench. The pattern of the stockwork is partly random but dominated by fractures striking north 60 degrees east and dipping 75 degrees northward or north 65 degrees west and dipping 50 degrees northward. Malachite and pitch copper occurs on joint surfaces in the trenches, but otherwise weathering and leaching does not seem intense. Material of ore grade has not been found as yet.

Similarity between this property and the Cariboo Bell is marked. The syenodiorites are virtually identical (*compare* Ann. Rept., 1966, p. 127) and the pyroclastic rocks also. Exposure at Peach Lake is not good enough to determine if any of the other porphyry phases might be present. In the area of exposures by the trenching, brecciation and alteration are not as intense as Cariboo Bell.

SL

LOCATION: (51° 121° N.E.) Two miles south of Timothy Lake.
CLAIMS: SL 1 to 16.
ACCESS: By road from 100 Mile House, a distance of 25 miles.
OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.
WORK DONE: The claims were mapped geologically, magnetometer and electromagnetic surveys were made, and soil samples were taken for geochemical analysis. Three men spent two weeks on the property.

70 MILE HOUSE

C-Soo

LOCATION: (51° 121° S.E.) Twenty miles northeast of 70 Mile House, elevation 2,800 feet.
CLAIMS: C-Soo 11 to 14, 37, 38.
ACCESS: By road from 100 Mile House.
OWNER: Monarch Metal Mines Limited, 214, 475 Howe Street, Vancouver 1.
METALS: Copper, molybdenum.
WORK DONE: Magnetometer survey on five mineral claims.
REFERENCES: Assessment Reports Nos. 872 and 1212.
DESCRIPTION: Minor chalcopyrite and molybdenite are disseminated in granitic and basaltic rocks.

BD

LOCATION: (51° 121° S.E.) On Rayfield River, south of Green Lake.
CLAIMS: BD 29 to 84.
ACCESS: By road from 70 Mile House, a distance of approximately 23 miles.
OWNER: C. W. Dansey.
OPERATOR: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5; H. W. Sellmer, exploration geologist.
METAL: Copper.
WORK DONE: Surface workings were mapped, and an area 4,000 by 6,000 feet was mapped geologically. Magnetometer and induced polarization surveys were made, and soil samples were taken for geochemical analysis. Six men spent one month on the property.
REFERENCE: Assessment Report No. 1723.
DESCRIPTION: Chalcopyrite and bornite are disseminated and in fractures in altered hornblende syenite.

CL

LOCATION: (51° 120° N.W.) Two miles south of Bridge Lake.
CLAIMS: CL 1 to 20.
ACCESS: From Bridge Lake road, a distance of about 5 miles north.
OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.
WORK DONE: Twelve claims were geologically mapped, magnetometer and electromagnetic surveys were made, and soil samples were taken for geochemical analysis.

POISON MOUNTAIN

Apex, Candy, Snow By T. M. Waterland

LOCATION: (51° 122° S.W.) On Bridge Creek at the head of Churn Creek on Quartz Mountain, southwest of Poison Mountain.
CLAIMS: Apex 1 to 8, Candy 1 to 10, Snow 1 to 12; these claims were located by Frank R. Christy and T. G. Christy, of Lillooet.
ACCESS: Via the Yalakom River road, the property being just south of the Copper Giant.
OWNER: Roosevelt Mines Ltd., 1002 Chancery Hall, Edmonton, Alta.; J. Antol, geologist; Dory Plant, in charge of work.
METAL: Mercury.
WORK DONE: An access road was constructed to the showings, some bedrock trenching (500 cubic yards) was done, three holes totalling 186 feet were diamond drilled, a geological map of the claims was made, and a geochemical survey for mercury was made of the same area.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1946, p. 96.

KELLY CREEK

G.D. By T. M. Waterland

LOCATION: (50° 121° N.W.) On the east side of the Fraser River just downstream from the mouth of Kelly Creek.
CLAIMS: G.D. 5 to 12, Golden Don Ext. 546, G.D. Ext. 1 to 4, formerly Pavillion Gold mine and Big Slide mine.
ACCESS: H. T. Street bulldozed a steep road downhill from Moran Siding.
OWNERS: Mr. and Mrs. Harry J. Street and J. J. Garrett.
METALS: Copper, gold.
WORK DONE: During 1968 an access road from the Pavillion Indian Reserve No. 1 was improved. At the time of examination the owners were planning to reopen the old underground workings.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1933, pp. 184–185.

LILLOOET MINING DIVISION

GUN CREEK

M.T.

LOCATION: (51° 123° S.E.) Extending southwest up Copper Creek from Trigger Lake, 20 miles east-southeast of south end of Taseko Lakes.
CLAIMS: M.T. 7 to 10, 13 to 15, 19, and 20, formerly Trigger group.
ACCESS: From Minto via road and trail up Gun Creek for approximately 20 miles.
OWNERS: Harold Armes, Clifford Gunn, and partners, of Williams Lake. (The property was optioned to Northwood Mining Limited and assigned to Trigger Lake Mines Ltd.)

OPERATOR: Trigger Lake Mines Ltd., 506, 540 Burrard Street, Vancouver 1.
METALS: Copper, silver.
WORK DONE: Reconstruction of 4.9 miles of road east of Roxey Creek and construction of 1.5 miles of new road west of Roxey Creek along the north side of Gun Creek.
DESCRIPTION: Chalcopyrite mineralization is reported in the Coast Range granites and granodiorites near their contact with older volcanics. Locally the contact is mapped as a diorite and the zones of interest as a brecciated granodiorite or as a quartz breccia.

YALAKOM RIVER

Eagle

By T. M. Waterland

LOCATION: (50° 122° N.E.) On the Yalakom River 7 miles from Moha.
CLAIMS: Eagle 1 to 10, Red Eagle, and Yalakom 1 to 28.
ACCESS: Via Bridge River road from Lillooet, a distance of about 20 miles, and thence 8 miles up Yalakom River road.
OWNER: Condor Mines Ltd., 123, 845 Hornby Street, Vancouver 1; D. M. Basco, geologist.
METAL: Mercury.
WORK DONE: Surface workings were mapped, and both reconnaissance and detailed geologic mapping was done. Nineteen holes totalling 3,200 feet were diamond drilled.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 137.
DESCRIPTION: Cinnabar and minor stibnite occur in bedded and shear zone hydrothermal deposits in altered agglomerates, tuffs, sandstones, and shales.

TYAUGHTON CREEK

Silverquick Mine

By T. M. Waterland

LOCATION: (51° 122° S.W.) On Tyaughton Creek just west of Relay Creek.
CLAIMS: Ninety claims located as the Dot, Silverquick, Mills, Woods, Quicksilver, Bob, Kim, Harry, and other groups.
ACCESS: Via Bridge River road and Tyaughton Creek road from Lillooet.
OWNER: Silverquick Development Co. (B.C.) Ltd., 8, 22374 Lougheed Highway, Haney; S. H. Glassmire, consultant.
METAL: Mercury.
WORK DONE: A start was made on the construction of a 500-tons-per-day concentrator. Foundation and steel frame of a steel-clad building were completed.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 129.

Lucky Strike, Ricky, Bob

LOCATION: (50° 122° N.W. and 51° 122° S.W.) At elevations of 5,500 to 7,500 feet between the heads of Eldorado and Taylor Creeks, the latter a tributary of Tyaughton Creek.
CLAIMS: Sixty-three Crown grants and 73 located claims including the Lucky Jem and Northern Light and the Lucky Strike, Ricky, and Bob groups.
ACCESS: Eleven miles by road from Tyaughton Lake.
OWNER: Bridge River United Mines Ltd., 1368 West 47th Avenue, Vancouver 13; R. R. Taylor, manager.
METALS: Silver, gold, copper, lead, zinc.
WORK DONE: Detailed geological mapping was done on four Lucky Jem claims, and stream-sediment samples were taken from Taylor Creek and its tributaries for geochemical analysis for heavy metals. Two men were employed for five months.

CAYOOSH CREEK

Excelsior, Jumbo, Surprise

By T. M. Waterland

LOCATION: (50° 122° N.E.) At the head of Cayoosh Creek southwest of Lillooet.

CLAIMS: Mineral leases Nos. 34 to 40, Jumbo (Lot 376), Excelsior (Lot 387), Blue Pete (Lot 405), Eagles Nest (Lot 407), Maud (Lot 524), White Slide and White Slide 1 to 3 (Lots 7373 to 7375), Ruby (Lot 372), Surprise (Lot 521), Omega Fraction (Lot 522), and Alpha Bell Fraction (Lot 523).

ACCESS: Approximately one-half mile of steep, narrow access road leaves the Cayoosh Creek forest access road approximately 2.7 miles from the Seton Lake road.

OWNER: Michael Mines Ltd., P.O. Box 718, Lillooet.

METALS: Copper, gold, silver, lead.

WORK DONE: Two hundred and seventy-five feet of diamond drilling was done, and approximately 2½ miles of drill access road was built.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1935, pp. F 6–F 9.

Pat, Nels, Jim, Tom

LOCATION: (50° 122° S.E.) Approximately at 6,000 feet elevation between the head of Elliot and Lawlawton Creeks in the Twin Lakes area toward the head of Haylmore Creek.

CLAIMS: Pat, Nels, Jim, Tom, Climax 1 and 2.

ACCESS: From D'Arcy at the south end of Anderson Lake, a distance of approximately 22 miles by road.

OWNER: Barkley Valley Mines Ltd., 96—67th Street, Ladner; W. Leaf, foreman.

METAL: Silver.

WORK DONE: Three holes totalling 105 feet were diamond drilled.

DESCRIPTION: It is reported that tetrahedrite occurs in veins in greenstone and serpentine.

BRIDGE RIVER

Gray Rock

LOCATION: (50° 122° N.W.) At elevation about 6,800 feet at the head of Truax Creek.

CLAIMS: The Gray Rock group comprises the Ant 1 to 11, Roy 1 to 4, and Robin 1 to 6.

ACCESS: Eighteen miles by road from Gold Bridge.

OPERATOR: Rayrock Mines Limited, 1011, 2200 Yonge Street, Toronto, Ont.; Bacon and Crowhurst, consultants.

WORK DONE: Four holes totalling 1,295 feet were diamond drilled.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1954, pp. 100–107.

Bralorne Mine

By T. M. Waterland

LOCATION: (50° 122° N.W.) The mine is on Cadwallader Creek 75 miles by road from Lillooet.

OWNER: Bralorne Pioneer Mines Limited, 355 Burrard Street, Vancouver 1; mine address, P.O. Box 367, Bralorne; G. H. Davenport, president; E. H. Hall, resident manager; W. E. Field, manager of mining; D. B. Cameron, mine superintendent.

METAL: Gold (*see* Table 12 for production).

WORK DONE: Drifting, 202 feet; sinking, 198 feet; diamond drilling, 942 feet.

DESCRIPTION:

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. 44 level and is now under development. Rock temperature on No. 43 level is 128 degrees Fahrenheit.

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 1968 all production was from the 77 vein with no change in production methods. A winze was sunk from the eastern extension of the 77 vein on 43 level for the purpose of exploring below 43 level. The winze was sunk in the vein at minus 51 degrees. At year-end 198 feet had been sunk and some drifting completed on the 44 level.

For the purposes of the winze, a 30-horsepower single-drum air hoist was installed on the 43 level and all development rock was handled be means of a 1-ton monorail-mounted sinking-bucket.

Additional exploration undertaken during 1968 included diamond drilling from 43 level to test for the western extension of the 77 vein below the level.

NESIKEP CREEK

Mud, Cherry, Rickhill, Sharon (Dalex Mines Ltd.)

(50° 121° S.W. and N.W.) *See under* Kamloops Mining Division, page 175.

KAMLOOPS MINING DIVISION

VAVENBY

Leonie, Brenda, Sonja

LOCATION: (51° 119° N.W.) Elevations 1,500 to 2,000 feet on the north side of the North Thompson River at the mouth of Crossing Creek.
CLAIMS: Leonie 1, Brenda 1 to 4, Sonja 4 to 6.
ACCESS: By 1 mile of forestry road.
OWNER: R. J. Franks.
METALS: Gold, silver, lead, copper.
WORK DONE: Twenty days were spent in digging seven trenches, total length 100 feet, stripping 500 square feet of bedrock, and digging 10 pits by hand.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1913, p. 215 (Bonnie Jean).

Elva

LOCATION: (51° 119° N.W.) Elevations 1,500 to 1,800 feet adjoining the Leonie at the mouth of Crossing Creek.
CLAIMS: Elva 1 to 3, Sonja 1.
OWNER: G. W. Adams, Vavenby.
METALS: Lead, zinc, silver, copper.
WORK DONE: Hand work, seven trenches (total length 75 feet), 100 square feet of bedrock stripped, and three open cuts dug.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1913, p. 214 (Bonnie Jean).

Big Chief, Chieftain, Lenie

LOCATION: (51° 119° N.W.) Elevations 1,500 to 1,600 feet on the east side of Peavine Creek, 2 miles west of Vavenby.
CLAIMS: Big Chief, Chieftain, Lenie.
ACCESS: Half a mile from Highway No. 5.
OWNER: R. J. Franks.
METALS: Gold, silver, copper, lead.
WORK DONE: Five hundred square feet of bedrock stripped, 10 open cuts dug by hand, 11 pits blasted in bedrock.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1913, p. 214 (Bonnie Jean).

BIRCH ISLAND

Rexspar

LOCATION: (51° 119° N.W.) On ridge at 3,000 to 5,000 feet elevation 5 miles south of Birch Island.
CLAIMS: Ray 11, 12, 19 to 30, 37 to 48 claims.
ACCESS: By road about 7 miles from Highway No. 5 at Birch Island.
OWNER: Consolidated Rexspar Minerals & Chemicals Limited.
OPERATOR: Denison Mines Limited, 307, 402 West Pender Street, Vancouver 3; J. W. Hogan, geologist.
METALS: Uranium, thorium, fluorite, celestite.
WORK DONE: Some geological mapping, an airborne gamma ray and magnetometer survey, and silt and soil sampling for geochemical analysis. Nine men were employed for one month.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1954, pp. 108–110; 1963, p. 141.

FH

LOCATION: (51° 119° N.W.) On Foghorn Creek 3 miles south of Birch Island.
CLAIMS: FH 1 to 41.
OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.
METAL: Copper.
WORK DONE: Topographic and geologic mapping of 27 claims, magnetometer survey and soil-sampling of the same area, three trenches, total length 700 feet, bulldozed. Four men worked for one month on the property.
REFERENCES: Assessment Reports Nos. 1597 and 1624.

Bullion

LOCATION: (51° 119° N.W.) At mouth of Lute Creek, 3 miles east of Birch Island.
CLAIMS: Bullion 1 to 12, Pat 2 to 4.
OWNER: J. J. Doyle, formerly Deer Horn Mines Limited.
OPERATOR: The Granby Mining Company Limited, 507, 1111 West Georgia Street, Vancouver, 5.
METAL: Uranium.
WORK DONE: Under the supervision of D. H. James, geologist, one man spent two months putting in by hand 20 trenches totalling 400 feet. Also 3,500 feet of bulldozer stripping was done.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1958, p. 30.
DESCRIPTION: Uraninite, pyrite, fluorite, and biotite replace trachytic volcanic rocks similar in occurrence to the Rexspar occurrence but lower in grade.

Ray

LOCATION: (51° 119° N.W.) At the head of Foghorn Creek.
CLAIMS: Twenty-six claims—Ray 11, 12, 19 to 30, 37 to 48.
ACCESS: Birch Island.
OWNER: Consolidated Rexspar Minerals & Chemicals Limited, 550 Sherbrooke Street West, Montreal, P.Q.; J. W. Hogan, geologist.
METALS: Uranium, fluorite.
WORK DONE: Airborne radiometric and magnetometer surveys.

My, Ray

LOCATION: (51° 119° N.W.) At Birch Island, on the north side of the North Thompson River between Raft River and Crossing Creek.
CLAIMS: My 1 to 122, Ray 13 to 18, 31 to 36, 49 to 52.
ACCESS: From Birch Island.
OWNER: Canadian Nepheline Corporation Ltd., 4, 2265 West 41st Street, Vancouver 13; J. W. Hogan, geologist.
WORK DONE: Airborne radiometric and magnetometer surveys.

Goof, Sue, Beth

By T. M. Waterland

LOCATION: (51° 119° N.W.) Near the head of Harper Creek, south of Birch Island.
CLAIMS: Fifty-nine Goof, Sue, and Beth claims.
ACCESS: Via a 9-mile access road which leaves the Birch Island–Vavenby road on the south side of the North Thompson River 6.2 miles from the Birch Island ranger station.
OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vanvouver 5; A. Soregaroli, regional geologist; W. I. Nelson, geologist.
METALS: Copper, zinc.
WORK DONE: The claims were surveyed, a topographic map was made, and surface workings were mapped. The geology of an area 8,600 by 8,200 feet was mapped, an electromagnetic survey was made, and soil samples along 5 miles of line were taken for geochemical analysis. Seven trenches totalling 1,640 feet were bulldozed, 20 shallow pits were excavated, and 17 holes totalling 6,897 feet were diamond drilled. Three and one-half miles of access road was built. Nine men spent six months on the property.
DESCRIPTION: Chalcopyrite and sphalerite occur in quartz lenses conformable with the schistosity and also as disseminations in the chlorite, sericite schists.

CLEARWATER

CL, OX

LOCATION: (51° 120° N.E.) On Corsica Lake 5 miles south of Mahood Lake.
CLAIMS: CL 1, 3, 5 to 24, OX 1 to 3.
ACCESS: By 25 miles of road from Clearwater.
OWNER: Anaconda American Brass Limited, Britannia Beach; P. E. Hirst, senior geologist.
METAL: Molybdenum.
WORK DONE: Induced polarization and magnetometer surveys were run over all the claims, and soil samples were taken in selected areas for geochemical analysis. Six men were employed for a month.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 131.

Wet, Sun, Aku

LOCATION: (51° 120° N.E.) Eighteen miles northwest of Clearwater, and to the northwest and southeast of Patricia Lake.

CLAIMS: One hundred and twenty-one claims located as the Wet, Sun, and Aku groups.

ACCESS: By logging-road 23 miles from Clearwater.

OWNER: Falconbridge Nickel Mines Limited, 500, 1112 West Pender Street, Vancouver 1; S. Pilcher, geologist.

METAL: Molybdenum.

WORK DONE: The geology of nine claims was mapped and five diamond-drill holes totalling 2,731 feet were drilled. Five men were employed for two months.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 131.

DESCRIPTION: Molybdenite and pyrite in quartz occur in a fracture zone in leucocratic quartz monzonite.

Tim, AX, NX

LOCATION: (51° 119° N.W.) Between elevations of 4,000 and 8,000 feet on the summit and northwest slope of Trophy Mountain, about 15 miles northeast of Clearwater.

CLAIMS: Tim 101 to 112, AX 1 to 74, NX 75 to 100.

ACCESS: By helicopter or 5 miles by pack-trail from Clearwater road.

OWNER: Secondo Mining Ltd., 401, 1111 West Hastings Street, Vancouver 1; H. M. Jones, geologist.

METAL: Molybdenum.

WORK DONE: Soil samples for geochemical analysis were taken along two reconnaissance lines totalling 22,000 feet. Four holes totalling 334 feet were diamond drilled. Eight men spent three months on the property.

LITTLE FORT

EC

LOCATION: (51° 120° N.E. and S.E.) North side of Eakin Creek, 10 miles northwest of Little Fort.

CLAIMS: EC group of about 60 claims.

ACCESS: By road from Little Fort.

OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.

METALS: Copper, molybdenum.

WORK DONE: Six men spent three weeks on the property. Induced polarization, electromagnetic, and magnetometer surveys were run over the EC 22 to 32 and 45 to 55 claims.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 132; Assessment Report No. 1639.

Silver

LOCATION: (51° 120° N.E.) Between elevations of 4,600 and 5,000 feet between Silver and Friendly Lakes.

CLAIMS: Silver 1 to 56, 101 to 136; Mae 1 to 4; Bill 1 to 4; SP 1 to 6. (The showings were discovered in the autumn of 1967.)

ACCESS: Eleven miles by Bridge Lake road from Little Fort thence 10 miles north to the property.

OWNER: United Copper Corporation Limited, 1800, One Bentall Centre, Vancouver 1; R. Jury, consultant.

METALS: Copper, zinc.

WORK DONE: Detailed geological mapping of the Silver 1 to 12 claims was done and a magnetometer survey of the property was made. Eleven trenches, total length 1,100 feet, were bulldozed, and some shallow rock cuts were drilled and blasted. Two miles of access road was built. Five men were employed for five months.

REFERENCES: Assessment Reports Nos. 981, 1061, 1169, and 1690.

DESCRIPTION: Skarn is mineralized with pyrrhotite, pyrite, magnetite, chalcopyrite, and sphalerite.

RO, SO, TC, RL, LO

By A. Sutherland Brown

LOCATION: (51° 120° N.W. and N.E.) At Friendly Lake between elevations of 4,500 and 5,500 feet.

CLAIMS: One hundred and eighty-five claims located as the RO, SO, TC, RL, and LO groups.

ACCESS: By 20 miles of highway and forest access road from the Bridge Lake store.

OWNER: Anaconda American Brass Limited, Britannia Beach; P. E. Hirst, senior geologist.

METALS: Copper, molybdenum, silver, lead.

WORK DONE: Some geological mapping, seismic depth determinations to bedrock, a magnetometer survey on 50 line miles, an induced polarization survey on 22 line miles, deep soil-sampling for geochemical analysis, 10 diamond-drill holes totalling 1,300 feet, and two bulldozer trenches totalling 300 feet. Nine men spent four months at the property.

REFERENCES: *Geol. Surv., Canada,* Map 3-1966, Campbell, R. B., and Tipper, H. W.; Federal-Provincial Aeromagnetic Maps 5228G and 5229G; *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 133.

DESCRIPTION:

The regional geology in the vicinity of the claims is shown on Geological Survey of Canada Map 3-1966 (Campbell and Tipper). Federal-Provincial aeromagnetic maps (5228G and 5229G) provide additional information. A major lineal low trends northeast about 3 miles east of Friendly Lake. This probably marks the trace of a major fault, although it does not coincide precisely with any shown on Map 3-1966. From its continuity it may be one of the major strands of the southern part of the Pinchi fault system. Southeast of the fault, Upper Triassic Nicola Group and Lower Jurassic sedimentary and pyroclastic rocks are sliced into many fault blocks and intruded by small syenite plutons.

Outcrop is neither abundant nor continuous and faults are numerous so that the stratigraphic succession in the claim area is not known with any certainty. However, it appears that a thick section of dark-green pyroxene andesite breccias with minor volcanic conglomerate and other sedimentary rocks (Nicola Group?) are overlain by a thinner succession consisting of hard fine light-coloured laminated tuffs, pebble conglomerate, and uppermost dark-grey argillite (Lower Jurassic, Unit 15, Map 3-1966?). The stratified rocks are intruded by two small plutons of foliated leucocratic pink syenite. Map 3-1966 shows three small bodies, but the western two are parts of a single arcuate pluton. Many fine pink trachytic syenite dykes radiate from the plutons. Skarny alteration of the andesites and widespread hedenbergite-orthoclase veinlets are associated with the syenite.

Numerous geochemical and geophysical anomalies occur on the property. Bulldozer trenching on some of these has revealed some mineralization. Two to three thousand feet north of Friendly Lake an area of disseminated argentiferous galena occurs within a shear zone that strikes north 60 degrees west and dips 65 degrees southward. In the same general area highly fractured andesite breccias contain disseminated pyrite with minor chalcopyrite. In an area of andesite breccia cut by numerous syenite dykes 3 miles northwest of Friendly Lake and just east of the crescentic syenite body, one small locality has intensely disseminated chalcopyrite. Surrounding this locality disseminated chalcopyrite occurs in minor amounts. Throughout the property most rocks are pyritic, commonly containing 1 to 3 per cent of irregularly disseminated pyrite.

Hidden Creek

LOCATION: (51° 121° S.E.) On Eakin Creek 3 miles northwest of Little Fort.
CLAIMS: Hidden Creek and Canyon Creek.
OWNER: Howard Hansen.
METALS: Gold, silver, copper.
WORK DONE: One hundred feet of hand trenching and 1,000 square feet of stripping by hand.

PC

LOCATION: (51° 120° N.E.) At the head of Phinetta Creek, 3 miles northwest of Janice Lake.
CLAIMS: PC 2, 4, 6, 19 to 24, 37 to 46.
ACCESS: Twenty-five miles from Little Fort via the Bridge Lake road.
OWNER: Anaconda American Brass Limited, Britannia Beach; P. E. Hirst, senior geologist.
METAL: Copper.
WORK DONE: Induced polarization and magnetometer surveys were run over four lines, total length 13,700 feet. Five men were employed for one month.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 133; Assessment Report No. 1193.

BARRIERE

Renning, Grizzly, Cu, Ken

LOCATION: (51° 119° S.W.) On the southeast side of East Barriere Lake at the mouth of Deadfall Creek.
CLAIMS: Renning 1 to 6, Grizzly 1 to 6, Cu 1 to 7, Ken 1 to 12.
ACCESS: Twenty-two miles by road from Barriere.
OWNER: K. F. Brunning.
OPERATOR: Westbrun Exploration Ltd., 614 Sixth Avenue Southwest, Calgary, Alta.
METALS: Copper, zinc, silver.
WORK DONE: An electromagnetic survey of 26 claims was made, five trenches totalling 1,500 feet in length were bulldozed, and a 150-foot hole diamond drilled.
DESCRIPTION: Chalcopyrite and sphalerite are disseminated in the metasedimentary rocks of the area, but no mineralization of commercial grade was found.

Shaw

LOCATION: (51° 120° S.E.) On Poison Creek, a tributary of Fishtrap Creek.
CLAIMS: Shaw 1 to 6.
ACCESS: By road 15 miles from Barriere.

Joins Figure 19A

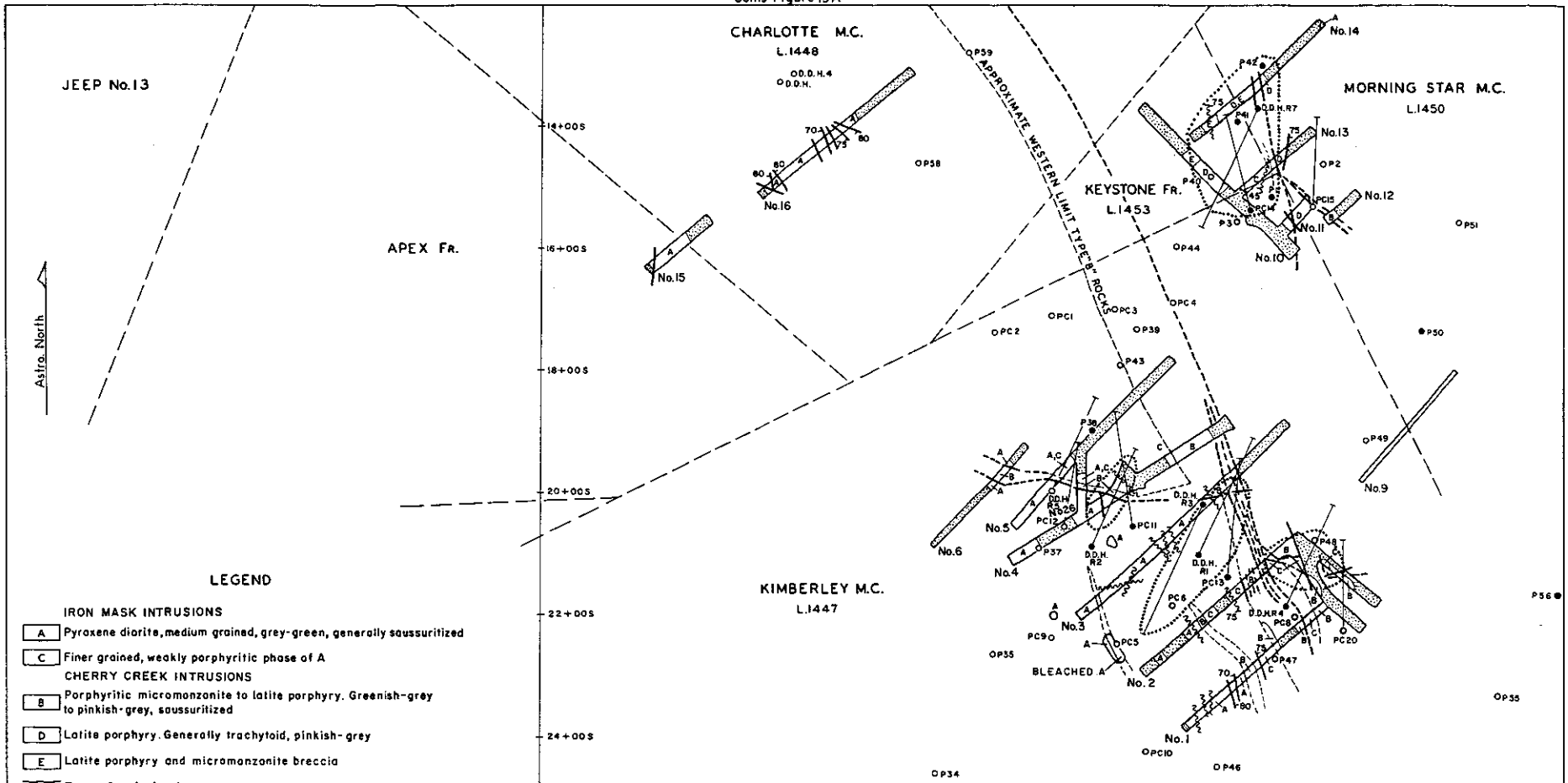


Figure 19

KIMBERLEY COPPER MINES LTD.

TRENCH GEOLOGY OF KIMBERLEY GROUP

Tape and compass survey

Claim, drill hole and trench plan modified from company plans

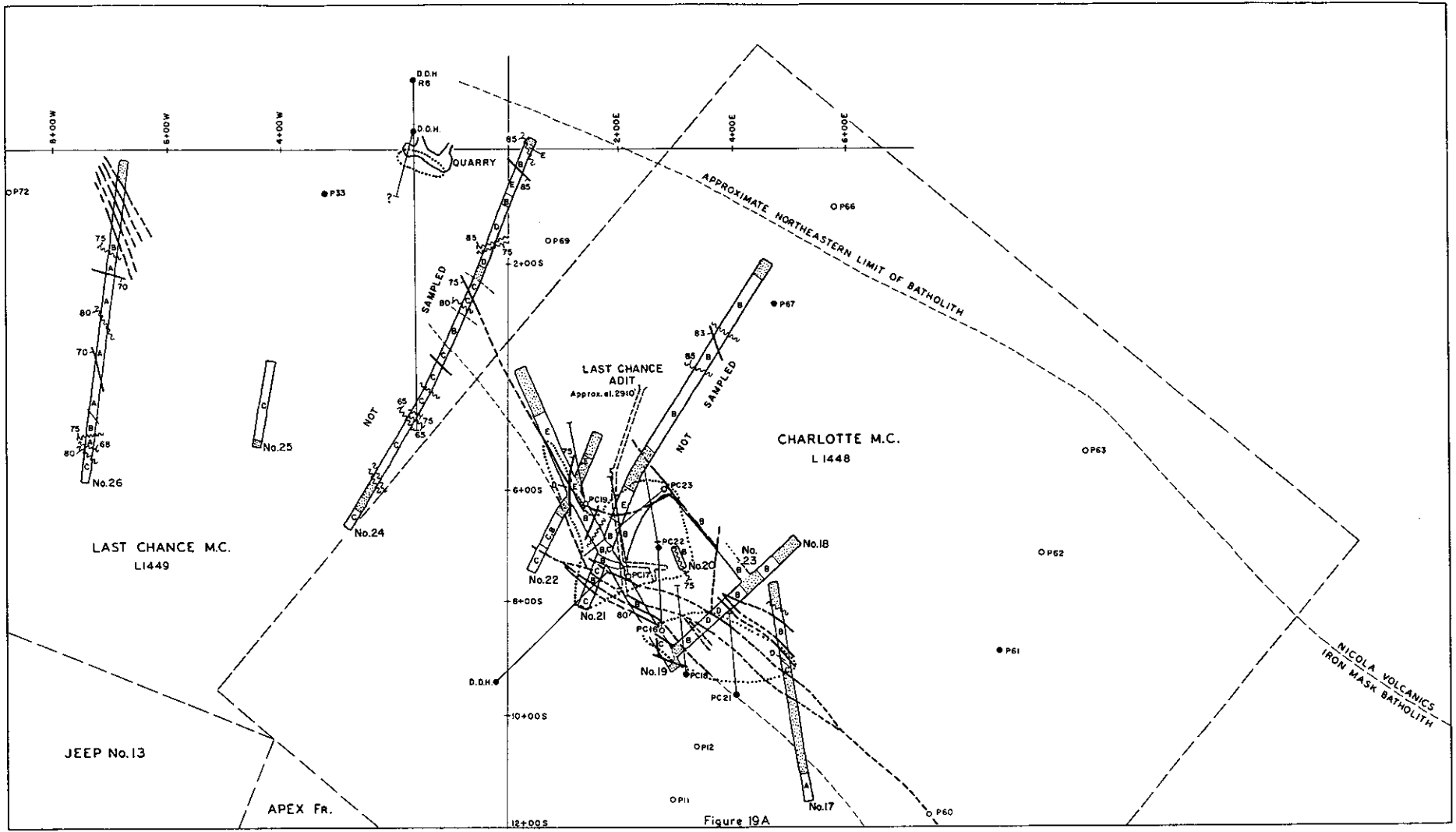


Figure 19A
Joins Figure 19
For legend see Figure 19

OWNER: Z. L. Shaw.
OPERATOR: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5; J. R. Loudon, district geologist.
WORK DONE: Four men spent a week taking soil samples for geochemical analysis.

H, M

LOCATION: (51° 119° S.W.) On Harper Creek, north of North Barriere Lake, approximately 20 miles east of Barriere.
CLAIMS: H 1 to 20, M 16 to 18.
ACCESS: By road, east from Barriere.
OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, exploration manager.
METAL: Molybdenum.
WORK DONE: Soil samples were taken on six claims for geochemical analysis. Two men spent two weeks on the property.
REFERENCE: Assessment Report No. 1669.

Bex

LOCATION: (51° 119° S.W.) At about 3,500 feet elevation on John Creek, east of East Barriere Lake.
CLAIMS: Bex 1 to 14, Bex B1 to B16, Dun 1 to 3, *et al.*, totalling 67 in all.
ACCESS: Twenty-two miles by road and trail from Barriere.
OWNER: Barriere Explorations Ltd., Barriere.
METALS: Copper, nickel.
WORK DONE: An electromagnetic survey of Bex 1 to 4 claims was made, a trench 125 feet long was bulldozed, and two holes totalling 239 feet were diamond drilled. Two men were employed for four months.
REFERENCE: Assessment Report No. 1634.

SHUSWAP LAKE

Bluenose

LOCATION: (50° 119° N.E.) Between 1,150 and 2,600 feet elevation on the east side of Shuswap Lake 3 miles north of Sicamous.
CLAIMS: Bluenose 1 to 14, 19 to 30.
ACCESS: By boat from Sicamous, a distance of 3 miles.
OWNERS: H. Oppelt and N. Basaraba.
OPERATOR: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.
METALS: Copper, zinc.
WORK DONE: Two men worked for three weeks. Magnetometer and electromagnetic surveys were made, some geological mapping was done, and two diamond-drill holes totalling 141 feet were drilled.

KAMLOOPS

Kimberley

By V. A. G. Preto

LOCATION: (50° 120° N.E.) Three miles south of Kamloops and 1½ miles northwest of Knutsford.
CLAIMS: Kimberley (Lot 1447), Charlotte (Lot 1448), Last Chance (Lot 1449), Morning Star (Lot 1450), Stemwinder (Lot 1451), Occidental (Lot 1452), Keystone Fraction (Lot 1453), and 77 recorded claims comprising the Alf, Jeep, and Dan groups.

ACCESS: Three miles south of Kamloops on Highway No. 5, then three-quarters of a mile west on country road.

OWNER: Kimberley Copper Mines Ltd., 17th Floor, One Bentall Centre, Vancouver 1.

OPERATOR: Kimberley Copper Mines Ltd. till mid-July, 1968, then the property was optioned by Phillips Petroleum Co. Ltd., of Bartlesville, Oklahoma, and direction of the exploration programme was assumed by that company through J. J. Crawford and A. R. McGrew, resident geologists.

METAL: Copper.

WORK DONE: Four men were employed for 11 months. In 1968 an induced polarization survey of the central area and a geochemical survey of the whole property were done; 7,271.5 feet of BQ-NQ size diamond drilling in 17 holes, 5,900 feet of 2¼-inch percussion drilling in 23 holes, and 2,700 feet of bulldozer trenching in 12 trenches were also completed. During the first part of the year, supervisory and engineering services were rendered by Velocity Surveys Ltd. through C. T. Pasieka, engineer in charge, and M. A. Mitchell, resident engineer.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 137–147.

DESCRIPTION:

Recent trenching and diamond drilling have supplied additional information on the geology of the Kimberley group. Figures 19 and 19A, a geological map of the property, show the main zones of known mineralization and their relationship to major structures and lithological units. The Kimberley trenches are near the northeastern contact of the Iron Mask Batholith with volcanic rocks of the Nicola Group, in a zone roughly parallel to this contact and typified by the presence of younger rocks belonging to the Cherry Creek intrusive suite. Four apparently separate zones of copper mineralization are known to occur in a northwesterly trending area approximately 2,800 feet long and up to 800 feet wide. Within this area, which occupies the Charlotte and Keystone claims and part of the Last Chance and Kimberley claims, rock exposures are largely limited to bulldozer trenches. Continuity of geological information between groups of trenches therefore relies heavily on borehole and geophysical or geochemical data.

Iron Mask Intrusions

Rocks belonging to the Iron Mask Intrusions are designated as map-units A and C on Figures 19 and 19A. Both rock types consist of medium-grained, grey-green, generally altered pyroxene diorite, commonly containing 3 to 5 per cent pyrite as a coating on fractures and an appreciable amount of magnetite as disseminations and veinlets. The only difference between type A and type C rocks is more apparent than real and consists of a moderately porphyritic texture characteristic of type C and accentuated by a light-grey to nearly white alteration of the finer-grained feldspathic portion of the rock which surrounds subhedral and euhedral crystals of plagioclase and of altered mafic minerals, generally less than 3 millimetres long. Although under the microscope it is apparent that there is very little difference both in texture and in composition between rocks of types A and C, the two units are mapped separately since they can easily and consistently be distinguished in the field. In thin-section both rock types show extensive saussuritization of the feldspathic component and an advanced alteration of pyroxene to actinolitic amphibole, chlorite, and epidote. Replacement of the feldspathic matrix by pink potash felds-

par is widespread but varies in intensity from place to place. Type A and C rocks commonly contain 7 per cent or less potash feldspar, but in several instances pink feldspar has replaced as much as 30 per cent of the original rock.

Cherry Creek Intrusions

Rocks of the Cherry Creek suite are roughly monzonitic in composition, medium to fine grained, and are either porphyries, porphyry breccias, or at least porphyritic textured. They occur as dykes or irregular masses cutting through Iron Mask diorite, and are found almost entirely to the east of a northwesterly trending line which cuts approximately through the middle of the Charlotte claim. This line also marks the western limit of almost all the known copper mineralization in the area. An area of type A rocks found in the immediate vicinity of the northeastern end of trench No. 14 is probably close to the northeastern boundary of the zone occupied by Cherry Creek rocks.

The general description of the finer phases of Cherry Creek Intrusions that has been given in the Annual Report for 1967 (pp. 138–140) applies to map-units B, D, and E. The breccia of type E, in particular, is very distinctive in character, generally intensely altered and commonly associated with copper mineralization. Pink potash feldspar, either as disseminations or in veinlets, is found in all types of Cherry Creek rocks in amounts ranging from 15 to 35 per cent. Where disseminated in the generally highly altered fine-grained matrix of the rocks, this feldspar is difficult to identify as to origin, and makes the classification of the rock difficult.

Structure

Steeply dipping fault and fracture zones are the only structures that have been recognized on the Kimberley group. On Figures 19 and 19A, faults and fault zones with appreciable gouge are distinguished from fracture zones showing little or no evidence of movement. The strongest set of fractures and faults trends northwesterly, roughly paralleling the trend of the Iron Mask Batholith. A second set of fractures trends northerly to northeasterly and is probably complementary to the northwesterly trending set. This second set is believed to be stronger than shown on Figures 19 and 19A, but its intensity is probably masked by the preferred orientation of the trenches along which the fracture measurements were taken. The intensity of fracturing and faulting appears to be greater in areas containing copper mineralization, as exemplified in the vicinity of the Last Chance adit on the Charlotte claim. This greater intensity of fracturing, however, could, at least in part, be only apparent, due to the larger number of trenches that have been dug on and near the mineralized areas.

Mineralization

Four apparently separate zones of copper mineralization are known to occur on the Kimberley group. They are all found within or close to rocks of the Cherry Creek suite, near their contacts with Iron Mask rocks. Mineralization consists of chalcopyrite, pyrite, and magnetite coating fractures in, and disseminated through rocks of, the Cherry Creek suite and, but not as commonly, in altered Iron Mask rocks. Malachite and azurite are common secondary copper minerals. The mode of occurrence of copper mineralization can best be described as being irregular and unpredictable. In the vicinity of trench No. 3 and near the intersection of trenches Nos. 19 and 21, however, mineralized zones appear to follow northeasterly to north-northeasterly trends. The relatively small areas of copper mineralization are flanked by much larger zones of strong pyrite and magnetite mineralization which tends to

be strongest near, but not exactly at the sites of, copper mineralization. This fact may be used advantageously as a prospecting guide in the area, by using results of geophysical and geochemical surveys.

Makaoo

LOCATION: (50° 120° N.E.) Six miles west of Kamloops.
CLAIMS: About 182 claims comprising the Python, Dot, Cub, Jet Line, and other groups.
ACCESS: Three miles by road south of Highway No. 1.
OWNER: Rolling Hills Copper Mines Limited, P.O. Box 4183, Vancouver; J. McAskill, geologist.
METAL: Copper.
WORK DONE: Sixteen thousand seven hundred and eighty feet of percussion drilling was done in 163 holes on the Jet No. 19 claim.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1956, pp. 47–69; Assessment Report No. 640.

Bob

LOCATION: (50° 120° N.W.) Near Pass Lake at the head of Tranquille Creek.
CLAIMS: Bob 1 to 4.
ACCESS: By road from Kamloops.
OWNER: F. Swiatkevich.
METAL: Gold.
WORK DONE: Six trenches, total length 150 feet, and six pits 6 feet deep were dug and blasted in overburden and bedrock.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1932, p. 145; *B.C. Dept. of Mines,* Bull. No. 1, 1933, p. 67.

Gold Bug, Lucky Strike

LOCATION: (50° 120° N.E.) Jamieson Creek, north of Kamloops.
CLAIMS: Gold Bug, Lucky Strike.
ACCESS: Seven miles west, by logging-road, from Westsyde road at a point approximately 12 miles north of Kamloops.
OWNER: Mike Salk, 1344 Eighth Street, Kamloops.
METALS: Gold, silver, lead, zinc, molybdenum, copper.
WORK DONE: Fifteen feet of adit was driven in 1968.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 147.

IM

LOCATION: (50° 120° N.E.) At Knutsford.
CLAIMS: IM 1 to 67, formerly Satan.
ACCESS: By road from Kamloops, a distance of 10 miles.
OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.
METAL: Copper.
WORK DONE: Three men worked for one month. A magnetometer survey of all the claims was made, and soil samples were taken for geochemical analysis.

B

LOCATION: (50° 120° N.E.) North side of Campbell Creek, 2 miles west of Barnhart Vale.
CLAIMS: B 1 to 18, 20 to 32.

ACCESS: By road from Kamloops, a distance of 10 miles.
OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.
WORK DONE: One man spent one week making an electromagnetic survey and a geological map.
REFERENCE: Assessment Report No. 1600.

CRISS CREEK

Art, Colin

LOCATION: (50° 120° N.W.) At the head of Criss Creek.
CLAIMS: Art 1 to 27, Colin 1 to 6, Les 1 to 14, Roy 1 to 40, and others totalling 101 claims.
ACCESS: By road from Kamloops, a distance of 26 miles north of the Trans-Canada Highway from a point at the west end of Kamloops Lake.
OWNER: Criss Creek Mines Ltd., P.O. Box 230, Osoyoos (by purchase from Silver Summit Mining Co. Ltd. in November, 1968).
METALS: Molybdenum, gold, silver, lead, zinc.
WORK DONE: Some geological mapping was done by H. D. Forman, 10 trenches totalling 5,000 feet were bulldozed, and six pits were excavated. One and one-half miles of access road was built.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 147.

GREENSTONE MOUNTAIN

GB

LOCATION: (50° 120° N.W.) At the head of Durand Creek between Durand and Dominic Lakes.
CLAIMS: The GB group of claims was allowed to lapse.
ACCESS: By 14 miles of road from Savona.
OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; J. T. Walker, geophysical co-ordinator.
METALS: Copper, molybdenum.
WORK DONE: Two men spent one week on the property. An induced polarization survey along 4,000 line feet on the GB 55 to 58 claims was made.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 148; Assessment Report No. 1099.
DESCRIPTION: Chalcopyrite occurs in altered Nicola volcanics.

CACHE CREEK

Maggie Mine

By J. M. Carr

LOCATION: (50° 121° N.E.) Between 1,900 and 2,600 feet elevation on the hillside adjoining the west bank of the Bonaparte River about 3 miles northwest of Cache Creek.
CLAIMS: The Eiggam group, comprising mineral lease No. 33 (Lots 410 to 421 named Avoca, Atrato, Avon, Amazon, etc.) and 10 recorded claims named Beth.
ACCESS: By a gravel road which is on the west bank of the Bonaparte River parallel to Highway No. 16 and is reached from the highway either at Scottie Creek or from the south via the Pavilion Lake road.
OWNER: Bethlehem Copper Corporation Ltd., P.O. Box 520, Ashcroft.
METALS: Copper, lead, zinc, silver.
WORK DONE: Mapping; percussion drilling, 746 feet.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1907, p. 134; 1915, p. 366; 1930, p. 199.

DESCRIPTION: The property is centred on a large conspicuous gossan adjacent to old workings comprising a tunnel and a shaft. Former work included three diamond-drill holes by the Kennecott organization in about 1952 and limited drilling by Frobex Ltd. and partners in 1963. The property is reported to be underlain variously by argillite, greenstone, and fragmental volcanics assigned to the Cache Creek Group, intruded by serpentine bodies and acid dykes.

ASHCROFT

Red Hill

LOCATION: (50° 121° N.E.) Five miles southwest of Ashcroft.

CLAIMS: A total of 66 claims known as Jerry, M, Loring, Babkirk, Phillips, Dunbar, D.K., Gordon.

ACCESS: One-half mile by road from the Trans-Canada Highway.

OWNERS: Delkirk Mining Ltd. and H. Reynolds.

OPERATOR: Quintana Minerals Corporation, 2160, One Bentall Centre, Vancouver 1; D. C. Malcolm, consulting geologist.

METALS: Copper, molybdenum.

WORK DONE: Seven men spent two months on the property. The geology and the surface workings were mapped, and four rotary holes totalling 2,646 feet were drilled.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1962, pp. 42, 46.

DESCRIPTION: Chalcopyrite with malachite and azurite occur in a large pyritic gossan.

MEADOW CREEK

Ash, Cash

LOCATION: (50° 120° S.W. and N.W.) Elevation 4,000 feet on upper Meadow Creek 3 miles northeast of the junction with Guichon Creek.

CLAIMS: Ash 5 to 8, Cash 1 to 10, 15 to 19.

ACCESS: The Lac Le Jeune to Mamit Lake road crosses the property.

OWNER: Cannoo Mines Ltd., P.O. Box 1409, Merritt.

METAL: Copper.

WORK DONE: One hole 255 feet deep was diamond drilled.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1929, p. 228; 1967, p. 148.

SPENCES BRIDGE

MSG

LOCATION: (50° 121° N.E.) One mile east and southeast of Venables Lake, 13 miles north of Spences Bridge, and 5 miles northwest of Martel.

CLAIMS: MSG 1 to 8, formerly Martel Gold Mines Ltd.

ACCESS: Eight miles via Venables Lake road from the Spences Bridge–Cache Creek highway.

OWNER: Cannoo Mines Ltd., P.O. Box 1409, Merritt.

METAL: Molybdenum.

WORK DONE: Four holes totalling 128 feet were diamond drilled.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 149; *B.C. Dept of Mines,* Bull. No. 9, 1940, p. 9.

DESCRIPTION: Molybdenite occurs in quartz veins that are fracture fillings and replacements in Cache Creek argillite.

LYTTON

Park

LOCATION: (50° 121° S.W.) At elevation 4,500 feet 4 miles up Izman Creek and about 12 miles north of Lytton.
CLAIMS: Park 1 to 30.
ACCESS: By road from Lytton.
OWNER: T. C. Scott.
OPERATOR: Arbutus Mining and Exploration Limited, 3680 Collingwood Street, Vancouver, 8.
METAL: Copper.
WORK DONE: Two men spent one month on the property. Silt samples were taken over the 30 claims for geochemical analysis; some reconnaissance geological mapping was done.

NESIKEP CREEK

Mud, Cherry, Rickhill, Sharon

LOCATION: (50° 121° S.W. and N.W.) On the west side of the Fraser River 20 miles south of Lillooet.
CLAIMS: Rusty 1 to 4, Cherry 1 to 14, Rickhill 1 to 8, Sharon 1 and 2, Joyce 1 to 11, Mud 1 and 2, Nancy 1 to 15.
ACCESS: By road from Lillooet.
OWNER: Dalex Mines Ltd., 8, 515 Granville Street, Vancouver 2; S. A. Mouritsen, consulting engineer.
METALS: Copper, silver.
WORK DONE: Eight men spent two weeks on the property. An induced polarization survey was made over the Rickhill 1 to 4 claims.
REFERENCE: Assessment Report No. 1098.

HIGHLAND VALLEY

The main events during 1968 in this flourishing porphyry copper camp southeast of Ashcroft were: An annual production exceeding 50 million pounds of copper was achieved by Bethlehem Copper Corporation Ltd.; Valley Copper Mines Limited found and began exploration of a huge buried deposit just west of Divide Lake; underground sampling and exploration of the Lornex, Highmont, Alwin (O.K.), and South Seas (Trojan) deposits were continued or completed; and a copper-leaching pilot plant was operated at the Victor. Although now partly changed in outline, an index map previously published as Figure 24 in the Annual Report for 1966 shows most of the properties in the area. Numerous properties in the area received work, and a number of new ones came into existence. In addition to the work recorded below, work recorded in Assessment Reports Nos. 1161, 1248, 1575, 1727, and 1739 was done on other properties, of which no other official description has been received. These other properties are as follows: H.J., Dab (Alwin Mining Co. Ltd.); Lorex (Northlode Exploration Ltd.); Den (Adera Mining Limited); Key, MB, Plus (Pyramid Mining Co. Ltd.); JAN, HI (Centura Mines Ltd.).

The geology of a part of the area is shown on Preliminary Map (1966), Highland Valley Area, Department of Mines and Petroleum Resources, and the entire area is covered by a geological map which accompanies the following publication (in press): The Geology and Geochronology of the Guichon Creek Batholith, by K. E. Northcote, Department of Mines and Petroleum Resources Bulletin No. 56.

ED

LOCATION: (50° 121° N.E.) North of the Ashcroft–Highland Valley road, on Woods Creek 7 miles northwest of Divide Lake.

CLAIMS: ED 5 to 28, 35 to 80.

ACCESS: One and one-half miles by fire access road from Highland Valley road.

OWNER: Rolling Hills Copper Mines Limited, P.O. Box 4183, Station D, Vancouver 9; J. Baird, engineer.

METAL: Copper.

WORK DONE: An induced polarization survey was made of the entire group of claims.

REFERENCE: Assessment Report No. 1740.

Krain, Dansey, Etc. By J. M. Carr

LOCATION: (50° 120° N.W.) In the north part of the Highland Valley area, extending from Guichon Creek westward to Forge Mountain at elevations between 3,500 and 6,500 feet and covering partly the same ground as the former F, Cat, Dog, and Rez claims.

CLAIMS: One hundred and twenty-six recorded claims in three separate blocks and named, from east to west successively, Tom, J.B., Bill and Mike, AB, Krain and D.W., Jack. The Krain claims are optioned from Comet Krain Mining Corp. Ltd., a partly owned company.

ACCESS: Variously from the Highland Valley road, the Bethlehem mine road, or the Savona–Merritt road.

OWNER: North Pacific Mines Ltd., 408, 409 Granville Street, Vancouver 2; R. J. Wiley, president; D. W. Pringle, consulting engineer.

METAL: Copper.

WORK DONE: Three men worked for six months under A. Fustos. Some bulldozer trenching was done, an airborne magnetometer survey was made, a topographic map was produced, and a tectonic analysis was made from air photographs by D. A. Chapman. The geology of the Krain claims was mapped by Marcel Guiguet.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1964, p. 88; 1965, p. 146; 1967, pp. 149–151; Assessment Reports Nos. 135, 137, 172, 207, 806, and 1585.

DESCRIPTION:

Trenches were cleaned out and new ones made on the J.B. claims, east of the Dansey showing formerly described as on claims of the C.L. group (*see* Ann. Rept., 1964). In a trench on the west side of a pronounced draw, a major fault is exposed for a distance of about 200 feet in a northerly direction. The fault contains lenticular masses, or fragments, of mineralized and oxidized rock which dip northwest and are enclosed in gouge. The fault lies east of exposed quartz diorite containing disseminated chalcopyrite, and the fault probably possesses a northerly strike and a left-handed post-mineral component of movement. A trench on the east side of the gully exposes strongly weathered and fractured quartz diorite containing small amounts of malachite, with which chalcopyrite was reported to have been found.

Lux, Forge, Jean By J. M. Carr

LOCATION: (50° 120° N.W.) In the north part of the Highland Valley area, extending northward from Bose Hill to Forge Creek; the south part of the property partly covers the former Salmo Prince property.

CLAIMS: About 120 recorded claims in the Lux, Forge, and Jean groups.

ACCESS: By roads leading north and east from the Trojan–Krain road.
OWNER: Canzac Mines Ltd., 818, 510 West Hastings Street, Vancouver 2; R. A. Sostad, manager.
METAL: Copper.
WORK DONE: Diamond drilling, 470 feet in three holes.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1956, p. 43; 1965, p. 146; 1967, p. 151; Assessment Reports Nos. 171, 174, and 781.

DESCRIPTION:

The diamond drilling was at the old Ann trenches, on or near the Lux No. 63 claim immediately north of the Trojan–Krain road (*see* Prelim. Geol. Map, Highland Valley, May, 1966). The core was not seen by the writer, but the trenches at one time exposed copper mineralization in shear zones.

The core from six out of eight holes drilled in 1965 was examined (*see* Ann. Rept., 1965). The eight holes were drilled with westerly inclinations in two groups, both near the east boundary of the Lux group. In the southerly group on the Lux No. 40 claim, a northernmost hole was abandoned after penetrating a feldspar porphyry intrusion for a short distance, and a central hole intersected Tertiary andesite flow rock and underlying sediments throughout the 600-foot length. In the northerly group on the Lux No. 44 claim, three holes in the vicinity of the old Loco trenches intersected wide alteration zones and narrow shear zones locally with copper mineralization in the Guichon quartz diorite. Two holes farther south on the claim intersected weaker alteration and shear zones, with minor quartz veining and hematite mineralization lacking copper.

Trenches made in 1967 and not seen by the writer are reported to be on the Jean claims and to expose copper mineralization at a fault zone. Late in 1968 the property was optioned to Kalco Valley Mines Ltd.

Cindy, Joe

By J. M. Carr

LOCATION: (50° 120° N.W.) On Forge Creek north and east of the Canzac property.
CLAIMS: About 28 recorded claims in the Cindy and Joe groups (formerly part of the Canzac property).
ACCESS: Via the Canzac property.
OWNER: Liberty Mines Ltd., 645 Hornby Street, Vancouver 1.
METAL: Copper.
WORK DONE: A Ronka EM16 survey was made.
REFERENCE: Assessment Report No. 1632.
DESCRIPTION: The property was visited, and trenches possibly made in 1967 were seen close to Forge Creek. They failed to expose bedrock.

Trojan

By J. M. Carr

LOCATION: (50° 120° N.W.) About 5,300 feet elevation on the south slope of Bose Hill, 3 miles north of the Bethlehem mine.
CLAIMS: Fifty-four claims, including 24 Crown-granted claims in the Bill group.
ACCESS: Three miles from the paved Bethlehem mine road and about 27 miles from Ashcroft.
OWNER: South Seas Mining Limited.
OPERATORS: (1) Phelps Dodge Corporation of Canada, Limited, 404, 1112 West Pender Street, Vancouver 1. (2) South Seas Mining Limited, 390 West Hastings Street, Vancouver 2.
METAL: Copper.

WORK DONE: (1) Surface diamond drilling in two holes totalling 800 feet, supervised by James Brander. (2) Drifting and crosscutting, 1,177 feet, underground long-hole drilling, 956 feet; installation of a 200-tons-per-day crushing and sampling plant; bulk sampling from underground; induced polarization survey; surface diamond drilling, 3,278 feet; supervised by P. Mulloy.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1964, pp. 85–86; 1967, pp. 151–152.

DESCRIPTION:

Phelps Dodge Corporation of Canada, Limited, optioned the property early in the year, and a few hundred feet north of the Trojan breccia pipe diamond drilled two surface holes which failed to discover mineralization. James Brander supervised this work. The option was subsequently relinquished, and South Seas Mining Limited on its own then drove short headings in the existing western and northeasternmost workings of the 150-foot level at the Trojan mine, and also a 720-foot long crosscut in an east-southeasterly direction from a point roughly midway along the northeast crosscut (*see* Ann. Rept., 1966, Fig. 19). This work was done under contract by Gremac Construction, Ltd. The new workings were bulk sampled, and they intersected some copper mineralization, which is only locally of good grade. An examination by the writer of the newly made workings and also of core from holes drilled in 1964 and 1965 by the Mitsui Mining and Smelting Company, Limited, suggests that no mineralized shoot comparable in size and grade to that in the western part of the breccia exists at explored depths elsewhere in the pipe.

Several surface holes were diamond drilled to test induced polarization anomalies at widely separated localities on the property, with results partly unknown to the writer.

Transvaal

LOCATION: (50° 121° N.E.) Between Forge and South Forge Mountains at about 5,700 feet elevation.

CLAIMS: Eleven claims, mostly Crown granted.

ACCESS: By the Novak road, about 5 miles from the Bethlehem mine road.

OWNER: K. D. Houghton.

OPERATOR: Taseko Mines Limited, 248 Second Avenue, Kamloops; J. A. B. Whist, executive vice-president.

METAL: Copper.

WORK DONE: Surface diamond drilling, 1,500 feet in five holes; trenching, 3,000 feet in eight trenches; blasting four pits; induced polarization surveying; H. D. Forman, consulting engineer.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1962, p. 46.

Bug, Go, Le, Do

By J. M. Carr

LOCATION: (50° 120° N.E. and N.W.) Between 4,000 and 6,400 feet elevation on Burr Creek and the north and west slopes of Forge Mountain.

CLAIMS: Ninety-nine recorded claims in the Bug, Go, Le, and Do groups. The southern claims partly cover the former E.D. and other claims of Tri-Side Mining Corporation Limited (*see* Ann. Rept., 1956, p. 43).

ACCESS: By road about 5 miles from the Bethlehem mine road via the Transvaal property.

OWNER: Cadco Enterprises Ltd., 408, 409 Granville Street, Vancouver 2; Arpad Fustos, field supervisor; D. W. Pringle, consulting engineer.

WORK DONE: Three thousand one hundred feet of percussion drilling in 11 holes. Four of the holes were widely spaced on a newly constructed road on the south and west flanks of Forge Mountain at roughly the 5,900-foot elevation, and they were drilled to a maximum depth of 400 feet in Tertiary volcanic rocks. The remaining holes, which were in the vicinity of Burr Creek, partly on the old road west of the creek and partly farther east near the old E.D. trenches, penetrated quartz diorite without evidence of mineralization. A topographic map covering the property and adjacent country was made under contract.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1956, p. 43; Preliminary Geological Map of Highland Valley, 1966; Assessment Reports Nos. 131, 134, and 806.

Burl

LOCATION: (50° 120° N.W.) Between 4,500 and 5,000 feet elevation about 2 miles north of Bose Lake.

CLAIMS: Fifteen recorded claims in the Burl group, which adjoins the east boundary of the Trojan property and covers ground that was recently part of the Sam group.

ACCESS: By road eastward for about 2 miles from a point north of the Trojan mine.

OWNER: Burlington Mines Ltd., 818, 510 West Hastings Street, Vancouver 2; R. A. Sostad, manager; G. L. Mill, consulting engineer.

WORK DONE: Claim surveying and electromagnetic surveying. Trenching was done in 1967.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1956, pp. 43–44; 1966, p. 149; Assessment Reports Nos. 131 and 134.

DESCRIPTION: The property is believed to cover the same ground as the former Jan claims, on which trenching by Tri-Side Mining Corporation Limited in 1956 failed to find copper mineralization in place, although mineralized float was reported to occur nearby (*see* Assessment Report No. 134, p. 11). Porphyry dykes are reported on the property, which is mostly underlain by the Guichon quartz diorite and partly by Tertiary volcanic rocks.

Bethlehem Mine By David Smith, L. Wardman, and J. M. Carr

LOCATION: (50° 120° S.W.) East of Quiltanton (Divide) Lake in the Highland Valley.

CLAIMS: The company holds 64 Crown-granted and 421 recorded claims and fractions.

ACCESS: By paved road from Ashcroft, a distance of 30 miles.

OWNER: Bethlehem Copper Corporation Ltd., 1821, 355 Burrard Street, Vancouver 1; mine address, P.O. Box 520, Ashcroft; P. M. Reynolds, president; T. P. Liss, general manager; C. W. Overton, manager, mill production; H. G. Ewanchuk, manager, mine production; D. C. Stevens, manager, engineering.

METALS: Copper, molybdenum (*see* Table 12 for production).

WORK DONE:

Bethlehem Copper Corporation Ltd. is presently mining in the Jersey pit on a continuous three-shift basis. Production during the year 1968 was 5,095,759 tons of ore and 10,288,265 tons of waste. This is an over-all mining ratio of 1.87 to 1. Equipment utilized during 1968 included 15 Haulpak 50-ton trucks, two 45-R rotary drills, a 900-cubic-feet-per-minute compressor, three 88-B diesel-electric shovels, a 777 motor-grader, one Airtrac drill, three D-8H Caterpillar tractors, one D-4 Cater-

pillar tractor, one 988 Caterpillar loader, a Michigan 475-A loader, two T-800 dump trucks, one T-850 sand and water truck, and several ½-ton service pick-ups.

In 1968 the mill was operated at a capacity of 14,000 tons per day. Additions were made to the pit shop and machine-shop. There was no molybdenite production. 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. Further work was done on the rock-fill dam to increase the storage capacity for tailings.

On the Bethlehem property an extensive programme of percussion drilling was undertaken; 88 holes totalling 18,060 feet were drilled. Total diamond drilling was 20,370 feet in 21 holes drilled in the Huestis and Lake zones.

The Lake zone lies on the LTK and H.H. claims at about 4,000 feet elevation immediately west of Quiltanton (Divide) Lake.

The LTK and H.H. claims cover part of a very large deposit discovered early this year on the Valley Copper property, which adjoins to the south and west. Although diamond drilling was interrupted by a drillers' strike, nine holes were variously started or completed by year-end. They were drilled to vertical depths of as much as 1,500 feet, including as much as 300 feet in overburden. The orebody as a whole has no outcrop and is known as the Valley deposit, whilst the Bethlehem portion is named the Lake deposit.

No housing is provided at the property; employees commute from Ashcroft, where company housing is provided for employees. A 40-unit apartment block and 16 town-house units were completed in February, and an additional 20-unit apartment block was completed in December.

The 1,250-horsepower No. 7 mill motor was replaced with a 1,750-horsepower motor. Three 75-kva. 4,160–600-volt transformers were installed at the pit shop, and three 50-kva. 2,300–600-volt transformers were installed at No. 1 thickener. The voltage of the decant line was raised from 550 to 4,160 volts.

Pay

LOCATION: (50° 120° N.W.) About 2 miles east of Spud Lake, to the east of the Bethlehem Copper property.

CLAIMS: About 24 recorded claims in the Pay group.

ACCESS: From the Highland Valley road.

OWNER: Bethlehem Copper Corporation Ltd., 1821, 355 Burrard Street, Vancouver 1; mine address, P.O. Box 520, Ashcroft; P. M. Reynolds, president; T. P. Liss, general manager.

METAL: Copper.

WORK DONE: One thousand feet of trenching was supervised by R. J. Nethery, geologist.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 53; Assessment Report No. 1112.

Eden, Ezra, Job

LOCATION: (50° 121° N.W.) At 4,000 feet elevation north of Witches Brook and west of Guichon Creek.

CLAIMS: Ezra 1 to 20, Job 1 to 17, Eden 1 to 20, Indian 1 to 8 Fractions, CL 60 to 69.

ACCESS: By road turning northward off the Highland Valley road a short distance west of the Jericho camp.

OWNERS: Vananda Explorations Ltd. and New Indian Mines Ltd., 661 Hornby Street, Vancouver 1; T. E. Blossom, president of both companies; F. J. Hemsworth, consulting engineer.

METAL: Copper.

WORK DONE: Four men were employed for one month. An induced polarization survey was made of the Job 1 to 17 claims.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, p. 153; Assessment Reports Nos. 606, 608, and 711.

Valley

By J. M. Carr

LOCATION: (50° 121° S.E.) The Valley deposit underlies the south slope of Highland Valley immediately west of Quiltanton (Divide) Lake between 4,000 and 4,500 feet elevation.

CLAIMS: About 320 claims, of which only a few are Crown granted. The property is in two blocks lying northeast and southwest of the Bethlehem property respectively, and it includes the D.F. and H.H. recorded claims, which overlie the Valley deposit and were formerly parts of the Bethsaida and Bethlehem properties respectively.

ACCESS: From the paved Highland Valley road.

OWNER: Valley Copper Mines Limited, a company controlled by Cominco Ltd.; exploration office, 1199 West Pender Street, Vancouver 1; F. L. Wynne, supervising exploration geologist.

METALS: Copper, molybdenum.

WORK DONE: Surface diamond drilling 15,500 feet in 21 holes; percussion drilling 11,000 feet in 41 holes; induced polarization surveying; claim-surveying; construction of core-sample storage facilities; road-building.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 156; Assessment Report No. 537.

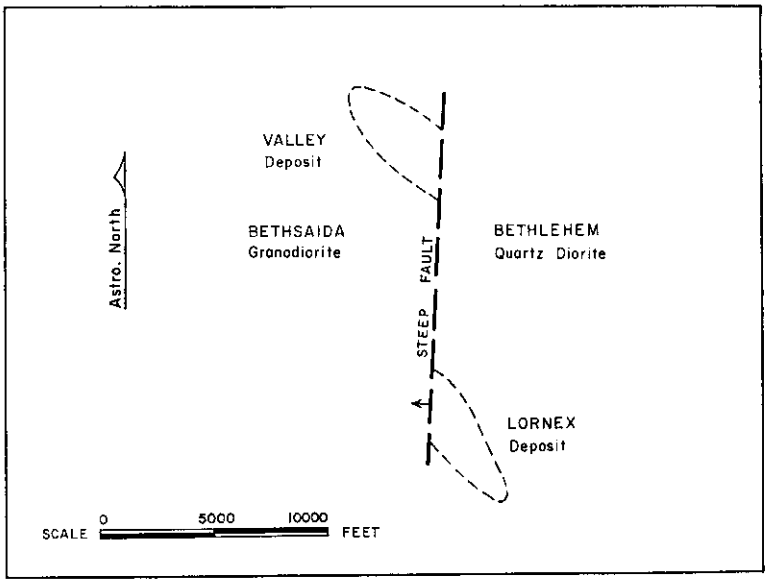


Figure 20. Diagram showing the possible relationship between the Valley and Lornex mineral deposits.

DESCRIPTION:

The Valley deposit was discovered early in 1968 apparently by geological reasoning followed by geophysical surveying and percussion drilling. This drilling and the subsequent diamond drilling was done on a basic 600-foot rectangular grid, with holes drilled to depths much exceeding 1,000 feet. The little knowledge available to the writer indicates that the deposit occurs in the Bethsaida granodiorite, with mineralization including chalcopyrite, bornite, and chalcocite and occurring largely in, or adjacent to, quartz veins which are mostly slender and follow several directions. Sericite and other alteration products occur in the mineralized rock. Figure 20 illustrates a possible separation by post-mineral faulting of the Valley and Lornex deposits, which together may originally have formed a single deposit of roughly lenticular outline. The actual shape of the Valley deposit has not yet been revealed, and its illustrated outline is largely conjectural.

Aye

LOCATION: (50° 121° S.E.) The claims cover Indian Reserve No. 13 at 4,000 feet elevation at the headwaters of Witches Brook in Highland Valley, on and immediately east of Quiltanton (Divide) Lake.

CLAIMS: Aye 1 to 16.

ACCESS: By the Highland Valley paved road, 27 miles from Ashcroft.

OWNER: Darkhawk Mines Ltd., 728 West Hastings Street, Vancouver 1; D. D. Campbell, consulting geologist.

WORK DONE: Road construction, bridging, trenching, mapping, geochemical surveying.

DESCRIPTION: The property is entirely covered by surficial deposits and lacks bedrock exposures. Previous work included a seismographic survey.

A.L., I.C.

LOCATION: (50° 121° N.E. and S.E.) Adjoining the O.K. road about 1 mile west of Quiltanton (Divide) Lake at elevations between 4,000 and 4,500 feet.

CLAIMS: About 45 recorded claims in the A.L. and I.C. groups immediately west of the claims on which the Valley deposit occurs.

ACCESS: From the O.K. road.

OWNER: Arlington Silver Mines Ltd.; B. I. Nesbitt, president.

OPERATOR: Cominco Ltd., 1199 West Pender Street, Vancouver 1; F. L. Wynne, exploration geologist.

WORK DONE: Geological mapping, magnetometer surveying. One diamond-drill hole totalling 900 feet and eight percussion-drill holes totalling 2,300 feet were drilled.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 155; Assessment Report No. 1155.

DESCRIPTION: Geological mapping and drilling indicate that much of the property is underlain by Tertiary volcanic rocks.

Cleveland

By J. M. Carr

LOCATION: (50° 121° S.E.) Southwest of Pukaist Creek, mainly at elevations between 4,000 and 5,000 feet.

CLAIMS: One hundred and twenty-one claims, known as the KAM, TAM, JAC, RAF, MER, CM, and CLEV, which adjoin the northern boundary of the Arlington property (A.L., I.C. groups).

ACCESS: From the O.K. road.
OWNER: Cleveland Mining & Smelting Co. Ltd., 615, 850 West Hastings Street, Vancouver 1; J. E. Cleveland, president.
METAL: Copper.
WORK DONE: Six men were employed for a period of three months under the direction of F. J. Hemsworth, consulting engineer. Work included bulldozing nine trenches totalling 1,590 feet, chain and compass survey, an induced polarization survey, and mapping of surface workings.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, p. 154; 1967, p. 153; Assessment Report No. 1638.
DESCRIPTION: Examination was confined to the core of holes Nos. CC-1 and CC-2, which were diamond drilled with westerly inclinations in 1967 by Utah Construction & Mining Co. on induced polarization anomalies at locations one-half mile apart near an east-flowing creek on either the RAF or TAM claims, about 1 mile west of Indian Reserve No. 12. The holes were each about 500 feet in length, and they intersected Tertiary volcanic breccias of mainly light-coloured and reddish andesites which include small, rare quartz diorite fragments, probably of the Beaver or Chataway variety and possessing trace amounts of chalcopyrite.

Nim

LOCATION: (50° 121° N.E.) South of Pukaist Creek, 2 miles east of Jim Black Lake.
CLAIMS: Nim 1 to 22.
ACCESS: From the O.K. road through the Cleveland property, a distance of 30 miles by road from Ashcroft.
OWNER: New Indian Mines Ltd., 661 Hornby Street, Vancouver 1; T. E. Blossom, president; F. J. Hemsworth, consulting engineer.
METAL: Copper.
WORK DONE: Two men worked for one month. Seven trenches totalling 1,210 feet were bulldozed.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 155; Assessment Report No. 1019.

O.K. (Alwin)

By J. M. Carr

LOCATION: (50° 121° S.E.) Three miles west of Quiltanton (Divide) Lake between 4,500 and 5,500 feet elevation.
CLAIMS: Twenty-four claims including the O.K., Apex, and I.O.U. Crown-granted claims which contain the old O.K. mine and the new Alwin workings and recorded claims named Ezz, Call, O.K., and Pal.
ACCESS: By 5 miles of improved road from the paved Highland Valley road at a point just west of the Bethlehem mine turn-off.
OWNER: Alwin Mining Company Ltd., 1111, 409 Granville Street, Vancouver 2; H. E. Jacques, president; A. R. Wells, property superintendent; W. W. Cummings, geologist; Bacon and Crowhurst, consulting engineers. The Crown-granted claims are held by agreement with Thompson River Mining Co. Ltd.
METAL: Copper.
WORK DONE: Tunneling, crosscutting, drifting, 4,399 feet; surface diamond drilling, 24,747 feet in 56 holes; underground diamond drilling, 23,826 feet in 50 holes; bulldozer trenching, 1,420 lineal feet; construction of trailer camp and mine facilities; road improvement, 4 miles; property surveying, geological mapping, and soil-sampling. As many as 30 men were employed, partly under contract.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 155; Assessment Report No. 1028.

DESCRIPTION:

Following an induced polarization survey in 1967, surface diamond drilling on 100-foot line-spacing in 1967 and 1968 gave numerous intersections of high-grade copper mineralization to the east of the old O.K. mine, mainly on the I.O.U. claim. Starting in mid-1968 from a portal at 4,680 feet elevation on the Apex claim, an adit was driven eastward through the O.K. and I.O.U. claims for a length of almost 2,700 feet, from which a northerly crosscut and connecting drifts were made (*see* Fig. 21). These are the Alwin workings. The crosscut heads east of north and is parallel to drilled sections. Conforming to these sections, drill stations were slashed at 108-foot intervals in the adit.

The following notes on the geology are based on visits made between July and November, and also on maps and other information kindly provided by the mine staff. Mineralization exposed underground is of two kinds—namely, high-grade bodies in the crosscut and drifts and low-grade sub-commercial mineralization which is widely dispersed on fractures in the rest of the workings. The workings lie wholly in the Bethsaida granodiorite, which is a whitish rock becoming altered near fractures, mainly either to a reddish colour because of increased potash feldspar or to greys and greens largely because of introduced sericite. Aplite veins, or lenses, occur partly in the red altered granodiorite and are most numerous in the first 700 feet of the adit, where they strike mostly east or northeast and possess steep dips. Elsewhere in the adit the aplites adopt other attitudes. Seen in drill core, aplite locally forms a network of small veins in brecciated granodiorite.

Small occurrences of breccia were seen at two places in the adit. At the No. 46 slash the breccia contains fragments identified only as granodiorite, whereas breccia immediately west of the crosscut includes other small fragments variously of aplite and a mineralized sericite-rich rock similar to that in the high-grade bodies.

Grey altered quartz feldspar porphyry forms a 20-foot-wide dyke immediately west of the crosscut and possibly other narrow dykes elsewhere. The 20-foot-wide weakly mineralized dyke is emplaced mainly in granodiorite and locally in breccia, and it strikes east of north through the west drifts. Its chilled contacts enclose rare fragments of vein-quartz and, although quite irregular, these contacts mainly possess moderate easterly dips.

Outside the adit portal, light-coloured biotite-andesite forms a deeply weathered outcrop and is similar to rock which forms post-mineral Eocene dykes elsewhere in Highland Valley. At the portal, narrow dark-grey andesite dykes that probably are offshoots of a main dyke intrude granodiorite which is sheared, mineralized, and weathered.

Fractures in the granodiorite adopt numerous attitudes and, in the adit, partly occur in two principal sets, the one striking east with steep dips, the other striking north-northeast with moderate dips to the east. Some fractures are practically empty, others are filled by a variety of minerals, including quartz, potash feldspar, calcite, chlorite, sericite, hematite, sulphides, and possibly kaolinite. East-dipping fractures partly contain mineralized quartz veins that are as wide as 4 inches. The fractures partly show movement, with fillings that may be crushed, sheared, and partly converted to clay; some of the east-striking fractures were observed to be offset a few inches by northerly fractures. Fractures in granodiorite adjoining the porphyry dyke mostly fail to continue into the latter, and the dyke may therefore be emplaced later than part of the fracturing.

Faults containing black graphic gouge are probably post-mineral, and they mostly possess northerly strikes and moderate easterly dips; faults with a paler, sericitic, or clay gouge may be partly pre-mineral. The strongest fault exposed is one with as much as 2 feet of black and white gouge.

Faults seen in the workings range in size from narrow shears on veins and fractures to a few strongly gougy faults as much as 2 feet wide. Faults with a black graphitic gouge mostly strike north-northeast and dip east; they apparently post-date the mineralization and may be later than those with a paler, sericitic, or clay gouge, which partly strike eastward and dip steeply in the high-grade bodies. The largest fault observed has both kinds of gouge and is partly post-mineral since it cuts off a high-grade body lying to its east. This fault partly follows the crosscut, and it extends northward through the west drifts; its walls are conspicuously altered partly to a red colour, as though the fault were partly an early feature that localized the red alteration.

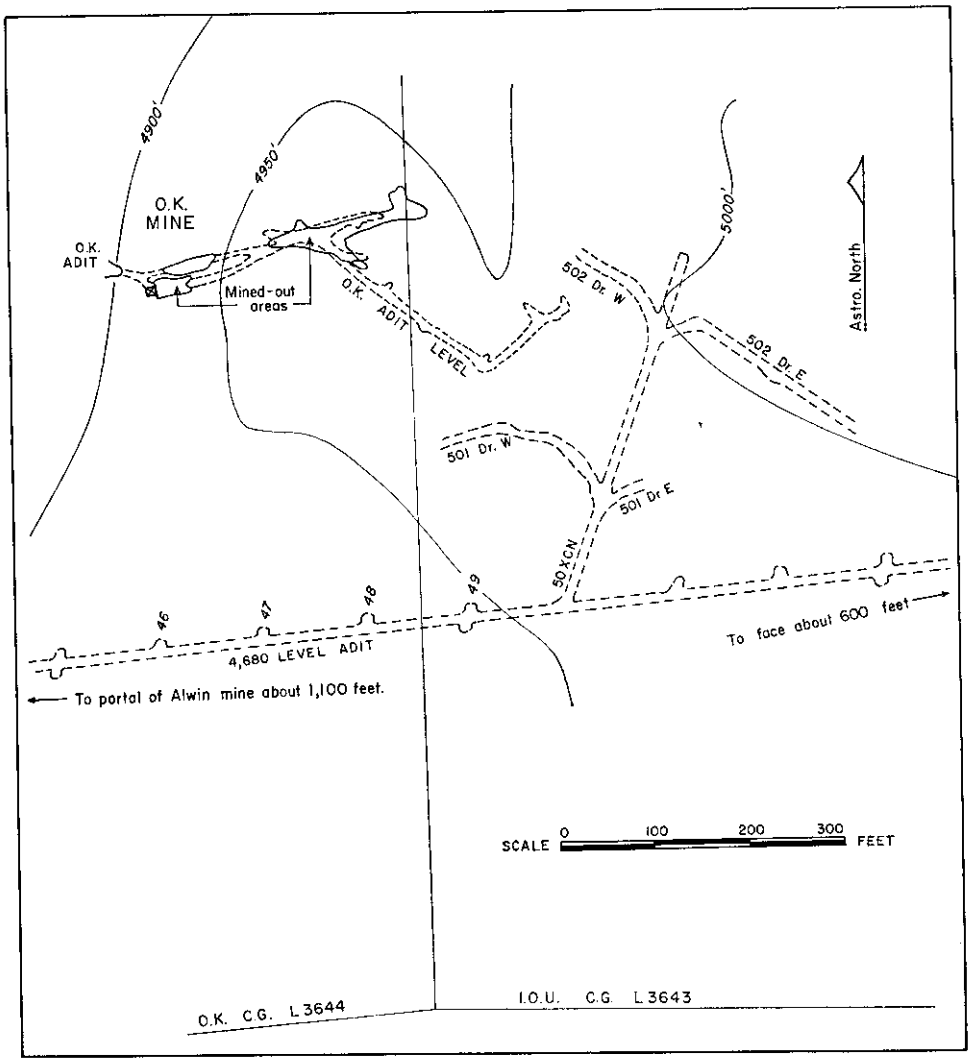


Figure 21. Alwin Mining Company Ltd., sketch-map showing the location of the Alwin and O.K. mines, Highland Valley.

The widespread sub-commercial mineralization related to fracturing is conspicuous in the first few hundred feet of the adit. Chalcopyrite, bornite, molybdenite, pyrite, specular hematite, and, in one place, galena, variously accompany either white or grey quartz and white, pink, or green calcite and other gangue in locally vuggy veins and fracture fillings. Except at the portal, malachite or other secondary minerals were not seen, and therefore oxidation of the sulphides is negligible.

Bodies of high-grade copper mineralization in the crosscut and drifts are some of those intersected by surface drilling. The largest exposed by November was the No. 3 zone, which, from a fault termination in the west drift, mainly follows the line of the No. 502 drift for a length of as much as 200 feet with widths partly greater than the drift. The No. 2 zone, which is exposed for a much shorter distance, terminates westward at the same fault and is as much as 20 feet wide in the crosscut. Both zones strike roughly west-northwest and are mainly steeply dipping, although locally their walls are irregular and are controlled apparently by fracture planes of various attitudes. West of the fault in the No. 501 west drift, a narrow similar body is exposed for a few tens of feet starting a short distance west of the porphyry dyke. This third body tails out westward and possesses more or less the same attitude as did the old O.K. lode—namely, north of east. In the crosscut between the Nos. 501 and 502 drifts, a number of narrow high-grade stringers occur more or less parallel to the main zones, and they consist of the same kind of material as in the zones, which is largely a fine- or medium-grained granular and partly vuggy aggregate of quartz, sericite, zoisite, calcite, sulphides, and, in places, specular hematite that is appreciably magnetic. The sulphides are mainly chalcopyrite and bornite as coarse disseminations and discontinuous veins, with pyrite seen in some drill core. Despite having generally sharp contacts with more or less fresh granodiorite, this highly altered mineralized rock appears to have formed by replacement, probably as the result of a localized intense fracturing adjacent to shear zones in the granodiorite.

On the Apex claim, trenching followed soil-sampling and is reported to expose widely spaced bornite stringers in the Bethsaida granodiorite.

Pearl, Vera, Dia

LOCATION: (50° 121° N.E.) Mainly between 3,700 and 4,700 feet elevation on both sides of Pukaist Creek about 5 miles northwest of Quiltanton (Divide) Lake.

CLAIMS: Forty-five recorded claims, mostly named Pearl, Vera, Dia, which are partly relocations of the former Temac claims.

ACCESS: Partly from the paved Highland Valley road which traverses the property 20 miles distant from Ashcroft. Access to the Pearl claims is by jeep-road from the O.K. (Alwin) road via the Cleveland property.

OWNER: Kel-Glen Mines Ltd., 1614, 1030 West Georgia Street, Vancouver 5; Gordon V. Murray, president; A. P. Fawley, consulting engineer; E. J. Lees, supervising engineer.

OPERATOR: Canex Aerial Exploration Ltd., 800, 1030 West Georgia Street, Vancouver 5.

WORK DONE: Geochemical surveying in 1967 and Ronka EM16 surveying in 1968 by Kel-Glen Mines Ltd.; induced polarization surveying in 1968 by Canex Aerial Exploration Ltd.

REFERENCES: Assessment Reports Nos. 1676 and 1710.

Lornex

By T. M. Waterland and J. M. Carr

LOCATION: (50° 121° S.E.) Extending southward from Indian Reserve No. 13 near Quiltanton (Divide) Lake for as much as 6 miles at elevations between 4,000 and 5,600 feet.

CLAIMS: Skeena Copper, Award, Lornex, Iris, Zone, Apex, Ben (204 claims, of which 14 are optioned from Consolidated Skeena Mines Ltd.). The Lornex deposit is on the Award, Skeena Copper, and A.M. claim groups and the Lornex No. 1 Fractional claim at surface elevations between 4,600 and 5,100 feet.

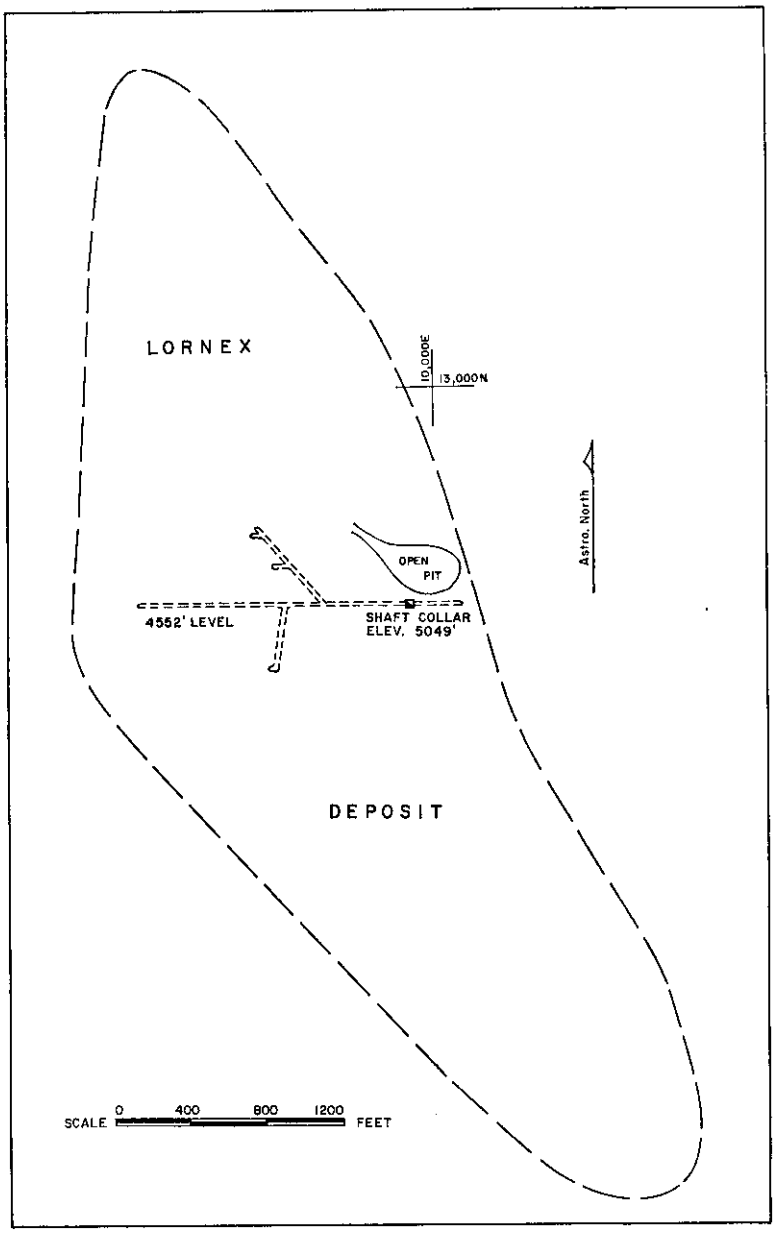


Figure 22. Lornex Mining Corporation Ltd., location of the underground workings on the Lornex.

ACCESS: By road southward from the Highland Valley road, a distance of 3 miles to the Lornex shaft.

OWNER: Lornex Mining Corporation Ltd., 202, 580 Granville Street, Vancouver 2, which is controlled by Rio Algom Mines Limited and The Yukon Consolidated Gold Corporation Limited; T. R. Sullivan, property superintendent; G. M. Godfrey, programme manager.

METALS: Copper, molybdenum.

WORK DONE: Underground bulk sampling and diamond drilling, as well as mill testing, were completed in July, and the property was placed on a caretaker status pending completion of feasibility studies. During the year 2,000 feet of crosscutting was done for the underground bulk-sampling programme and 4,900 feet of underground diamond drilling. Surface work in addition to mill testing included 9,000 feet of percussion drilling in 35 holes.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1965, p. 148; 1966, pp. 155–157; 1967, pp. 157–158; Assessment Report No. 290.

DESCRIPTION:

Figure 22 shows the location of the exploratory underground level in relation to the trial open pit and a generalized outline of the Lornex deposit. Descriptions were previously given of the geology and were based on examinations of surface outcrops and drill core (*see* Ann. Repts., 1966 and 1967). The following additional impressions were gained from company personnel and by examining the open pit and from brief underground examination, as the mine was about to close. The only rock type noted was Bethlehem quartz diorite. In the open pit a 100-foot-wide sericitic fault zone strikes west of north, dips apparently steeply east, and may extend southwards to the east of the shaft. The zone is rusty and oxidized, with malachite, and its hangingwall contains conspicuous molybdenite in narrow quartz veins as well as numerous fractures lacking visible mineralization. Farther east in the pit, where there are abundant fractures filled variously with quartz, sericite, chalcopyrite, barite, and molybdenite, many fractures strike north-northeastward and dip moderately steeply to the east. Some fracture fillings are sheared, whilst most are not. Quartz locally forms veins as wide as 5 inches which lie partly in faults that follow various directions and frequently exhibit horizontally directed slickensides.

Little could be gleaned underground in the way of geological observations because the workings are extensively lagged or gunited. Mineralization is principally in fractures and faults, the former following numerous directions, of which the commonest appears to be north or north-northeast. In the western part of the workings, fractures which strike more or less eastward are said also to be abundant. Faults are so numerous that they may rarely be correlated from one place to another in the workings or the drill-holes. Apparently many faults strike more or less northward, but there are some which strike probably west-northwestward.

Victor

By J. M. Carr

LOCATION: (50° 121° S.E.) At approximately 4,900 feet elevation about 1 mile northeast of the Lornex shaft.

CLAIMS: Divide Copper group.

ACCESS: Southward from the Highland Valley road past the Lornex camp, a distance of less than 2 miles.

OWNER: Consolidated Skeena Mines Ltd., 716, 602 West Hastings Street, Vancouver 2; F. A. McGonigle, president.

OPERATOR: Parts of four claims which cover an area measuring about 800 by 1,000 feet are leased by Copper-Can Developments Ltd., 106, 1090 Homer Street, Vancouver 3; Rex Lexier, president; F. P. Hodgson, manager. (This company was formed in 1968 by amalgamation of Fleurmont Placer Development Ltd. and Bio Metals Corporation Ltd. Late in 1968 its name was changed to SMI Processes Ltd.)

METAL: Copper (*see* Table 12 for production).

WORK DONE: A 50,000-ton heap was constructed in 1966–67 from material excavated at surface in the vicinity of the old Victor adit, and a pilot copper-recovery plant was built. Having proved unsatisfactory, this heap was partly destroyed and replaced in 1967 by a 3,500-ton heap. Ten holes were percussion drilled in the area of a proposed pit.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1956, p. 46; 1957, p. 27; 1966, p. 158; Assessment Report No. 1574.

DESCRIPTION:

By stripping and surface mining, a sheared, altered, partly mineralized and oxidized zone in the Bethlehem quartz diorite (Skeena variety) has been exposed for approximately 1,200 feet in a northerly direction, between the limits of the property. In its central and northern part the zone contains an eastward-dipping quartz lode, which is irregular in attitude and thickness, and was formerly exposed underground in the Victor workings. Chalcopyrite and pyrite occur mainly in the quartz but have a weak distribution elsewhere in the zone, which is as much as 50 feet wide. At its south end, the zone is a highly coloured gossan to the east of an irregularly shaped andesite dyke, which is post-mineral and known to be Eocene.

When visited in September the leaching plant was producing small amounts of copper precipitate daily. MacDonald Consultants Ltd. was retained to design a plan for solution-mining the mineralized zone in place.

AM, IDE (Highmont)

By J. M. Carr

LOCATION: (50° 121° S.E.) West slopes of Gnawed Mountain at elevations of as much as 5,700 feet.

CLAIMS: About 34 recorded claims named AM, IDE, Ann, and Phyllis.

ACCESS: Southward from Highland Valley by a road 6 to 7 miles long, passing the Lornex shaft.

OWNER: Highmont Mining Corp. Ltd., 702, 850 West Hastings Street, Vancouver 1; R. W. Falkins, president; H. H. Waller, mine manager; L. J. Manning and Associates Ltd. and W. G. Hainsworth, consulting engineers.

METALS: Copper, molybdenum.

WORK DONE: Drifting and crosscutting, 1,843 feet; raising, 291 feet; surface diamond drilling, 16,269 feet; underground drilling, 2,503 feet; bulk sampling, surveying, geological mapping, trenching.

REFERENCES: *Minister of Mines, B.C.*, Ann Rept., 1967, p. 150, 158–159; Assessment Reports Nos. 247 and 290.

DESCRIPTION:

A bulk-sampling and exploration programme begun in 1967 with the support of Nippon Mining Company, Limited, was continued till April and then resumed with new financing in August. It included driving an adit at 5,407 feet elevation southward across the east zone and drifting, crosscutting, raising, and drilling further to explore this zone. Surface diamond drilling was partly on this zone and partly elsewhere on the property. Work done on the property from 1962 to February, 1969, includes the following: Drifting and crosscutting, 2,757 feet; raising,

536 feet; surface percussion drilling, 63,866 feet; surface diamond drilling, 33,954 feet; underground diamond drilling, 3,978 feet. The following geological summary is based on examinations made and information kindly given in November. At that time the extent of workings is shown on Figure 23 and backs were as much as 150 feet.

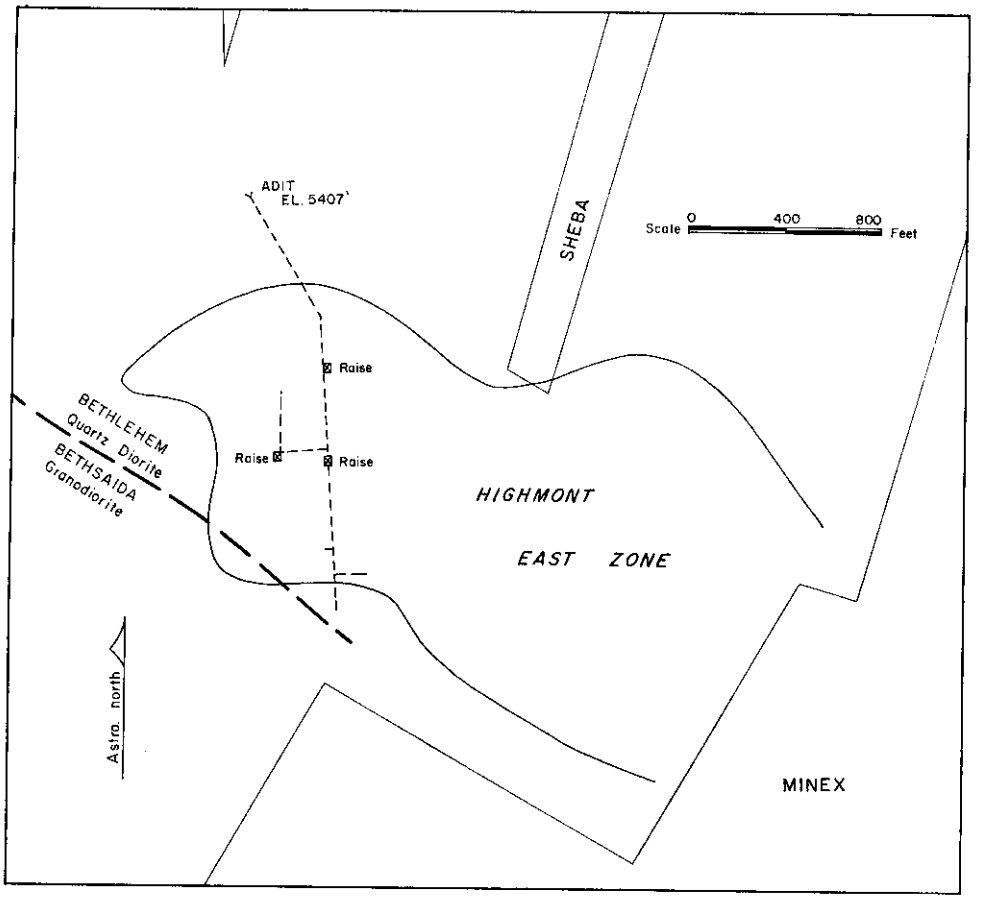


Figure 23. Highmont Mining Corp. Ltd., location of the Highmont adit, Highland Valley.

Except at the south end, the workings lie entirely in the Bethlehem quartz diorite of the Skeena variety, which has quartz " eyes " rarely as large as 6 millimetres and a barely perceptible foliation, which strikes roughly north and dips partly steeply. This rock is succeeded at the south end by the Bethsaida granodiorite, which has quartz " eyes " partly larger than 1 centimetre, much less hornblende than the previous rock, and an unchilled contact against the latter. In the east drift and the adit 100 feet to the north of this contact, a 30-foot-wide dyke of porphyry is emplaced in the quartz diorite partly as breccia, and it possesses large quartz phenocrysts resembling the quartz " eyes " in the Bethsaida granodiorite. The porphyry dyke and the Bethsaida granodiorite have surface locations which indicate that both these bodies trend west-northwestward and dip moderately steeply northward.

Rock alteration and mineralization are closely associated with fractures and faults. Fracturing varies from moderate to intense, and the fractures have numerous attitudes, of which the commonest and most strongly mineralized possess north-northeasterly strikes and northerly dips which range from moderate to steep. Narrow lenses of aplite, and occasionally of pegmatite, occur in the quartz diorite on early formed fractures, mostly with northeasterly strikes and easterly dips. Many fractures are partly or wholly filled and their margins replaced by a variety of minerals, including pink potash feldspar, biotite, tourmaline, quartz, epidote, chlorite, sericite, white to yellowish, or dark, kaolinite and possibly other clay minerals, red zeolite, specular hematite, and sulphides which include pyrite, chalcopyrite, bornite, and molybdenite. The veins and lenses thus formed are mainly of quartz and partly of accompanying minerals, and they range in width rarely to as much as 1 foot. Faults are fairly common and may contain altered rock, gouge, and brecciated mineralized quartz veins across widths rarely as much as 6 feet. The faults may be in pairs with a central sheared and altered zone as much as 20 feet wide containing weakly disseminated sulphides, including pyrite. Gouge in the faults is variously black, dark green, white, and red, depending on the content of graphite and chlorite, sericite and clay minerals, and hematite. Movement is partly post-mineral, with molybdenite and other sulphides occurring partly as smears. In the adit for a distance of about 1,200 feet from the portal, mineralization occurs largely in quartz veins at faults having northeasterly strikes and northerly dips. This form of mineralization gives way southward in the adit, apparently at a steep north-northwesterly fault which crosses the adit and west drift, to a more uniformly distributed mineralization which is predominantly in north-northwest fractures and partly in other fractures. Minor jogs and offsets on various fractures and faults throughout the workings suggest that a relative compression acted more or less horizontally in a north-south direction during the period of fracturing and faulting.

AM, IDE, Ann, VM, Snow (Minex)

By J. M. Carr

LOCATION: (50° 120° S.W.) Between 5,500 and 5,900 feet elevation mainly on the south and east slopes of Gnawed Mountain, partly adjoining the Highmont and Sheba properties.

CLAIMS: Thirty-four recorded claims named AM, IDE, Ann, VM, and Snow.

ACCESS: From the Highland Valley road southward by road through the Sheba or Lornex and Highmont properties.

OWNER: Minex Development Ltd., 8, 558 Howe Street, Vancouver 1.

OPERATOR: Canadian Superior Exploration Limited, 2201, 1177 West Hastings Street, Vancouver 1, optioned the property in March, 1968; R. A. Dujardin, chief geologist.

METALS: Copper, molybdenum.

WORK DONE: Geological mapping, soil-sampling, induced polarization surveying, trenching, and 7,000 feet of percussion drilling in 28 holes mainly on the AM No. 32 fractional claim and the adjoining IDE No. 2 claim and in the vicinity of the AM No. 16 claim.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1963, p. 47; 1964, p. 89; 1965, p. 148; 1966, p. 159; Assessment Reports Nos. 247 and 290.

DESCRIPTION: The AM No. 32 fractional claim and the IDE No. 2 claim are immediately east and south, respectively, of the Highmont East zone, and they contain mineral showings which have been explored by trenching and drilling over a period of several years. Work nearly 1 mile farther south near the AM No. 16 claim is related to the occurrence of geochemical and other anomalies in an area mainly covered by overburden.

Royal, Cana

LOCATION: (50° 121° S.E.) Highland Valley, at Calling Lake.
CLAIMS: Total of 45 claims known as the Royal, Cana, and RC.
ACCESS: Via the O.K. road a distance of 25 miles from Ashcroft.
OWNER: Royal Canadian Ventures Ltd., 270, 180 Seymour Street, Kamloops; N. B. Vollo, manager.
METAL: Copper.
WORK DONE: Three men worked for one month. Half a mile of access road was built, and three BQ holes totalling 1,240 feet were diamond drilled.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1961, pp. 29–30; 1966, p. 155; Assessment Reports Nos. 380, 381, 848, and 854.

Lake, Laken, Bron, PM, PIM

LOCATION: (50° 121° S.E.) Between 5,000 and 6,000 feet elevation north and south of Pimainus Lake, in the southwestern part of the Highland Valley area.
CLAIMS: Seventy-four recorded claims named Lake, Laken, Bron, PM, and PIM.
ACCESS: Southward from the Highland Valley road through the Lornex property.
OWNER: T.C. Explorations Ltd., 201, 569 Howe Street, Vancouver 1; Howard T. James, president.
METAL: Copper.
WORK DONE: Geological mapping and a small amount of soil-sampling.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1966, pp. 159–160; Assessment Reports Nos. 191, 231, 853, and 855.

Lorna

LOCATION: (50° 121° S.E.) Between 5,100 and 5,500 feet elevation northwest of Pimainus Lake, adjoining the west boundary of the Lake, Laken, etc., property.
CLAIMS: Ninety-six recorded claims, mostly named Lorna, Mat, and Zen.
ACCESS: From the Highland Valley road either through the Lornex property or past Calling Lake via the Alwin (O.K.) road.
OWNER: Zenith Mining Corporation Ltd., 216, 744 West Hastings Street, Vancouver 1; F. S. Hoffman, president; R. H. D. Philp, consulting engineer.
METAL: Copper.
WORK DONE: Line cutting, trenching.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 156; Assessment Report No. 1137.

Act

LOCATION: (50° 121° S.E.) Between 4,000 and 4,900 feet elevation mainly south of Pimainus Creek in the southwestern part of the Highland Valley area.
CLAIMS: Thirty-eight recorded claims in the Act group on the west side of the Lorna property.
ACCESS: From the Highland Valley road, 9 miles by road.
OWNERS: K. Owens and J. Kirkpatrick.
OPERATOR: Taseko Mines Limited, 248 Second Avenue, Kamloops; J. A. B. Whist, vice-president; H. D. Forman, consulting engineer.
WORK DONE: Induced polarization and soil-sampling supervised by J. H. Foster.

DEB

LOCATION: (50° 121° S.E.) Between 4,100 and 5,200 feet elevation on either side of Skuhost Creek, about 5 miles southwest of Gnawed Mountain.

CLAIMS: Sixty recorded claims named DEB adjoin the southeastern boundary of the Lake, Laken, etc., property and cover ground formerly part of the Rio group.

ACCESS: Twenty miles by road from the Spences Bridge–Merritt highway at Mile No. 14.

OWNER: R. B. Stokes.

OPERATOR: Highpoint Mines Limited, 12, 425 Howe Street, Vancouver 1; MacDonald Consultants Ltd., consulting engineers.

METAL: Copper.

WORK DONE: Line cutting, soil and stream-silt sampling, magnetometer surveying, and production of a topographic map from air photographs; J. P. Henry, field supervisor.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 161; Assessment Reports Nos. 780 and 997.

Sheba

LOCATION: (50° 120° S.W.) North and east slopes of Gnawed Mountain, mainly between 4,500 and 5,500 feet elevation.

CLAIMS: Jay, Do, CU, Dawn, Lynn, Sheba, Ann groups, a total of 106 claims.

ACCESS: By road southward from the Highland Valley road at a point a short distance east of the Lornex road or through the Highmont camp.

OWNER: Sheba Copper Mines Limited, 501, 535 Thurlow Street, Vancouver 5; R. C. Spall, president. Work done in the first part of the year was managed and financed by Sumitomo Metal Mining Co. of Canada Ltd. (Vancouver office, 1126, 510 West Hastings Street).

METALS: Copper, molybdenum.

WORK DONE: Nine men worked for five months under the supervision of G. R. Hilchey, exploration manager, and carried out geological mapping, soil-sampling, 8,400 feet of bulldozer trenching in 42 trenches, and 1,785 feet of percussion drilling in five holes.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 158; Assessment Reports Nos. 247 and 1087.

DESCRIPTION: Bornite, chalcopyrite, molybdenite, and chalcocite occur with quartz in altered Bethlehem quartz diorite. In November the property was optioned to Anaconda American Brass Limited.

Nat, Bud, Gap, Fargo

LOCATION: (50° 120° S.W.) Between 4,000 and 5,000 feet elevation on the south side of Highland Valley.

CLAIMS: Thirty-eight recorded claims named Nat, Bud, Gap, and Fargo adjoin the east side of the Sheba property.

ACCESS: From the Highland Valley road by road through either the Sheba property or the Jericho property.

OWNER: Gaza Mines Ltd., 71, 553 Granville Street, Vancouver 2; Hamlin B. Hatch, president; Alrae Exploration Ltd., consulting engineers.

METALS: Copper, molybdenum.

WORK DONE: Percussion drilling, 400 feet.

DESCRIPTION:

The drilling is said to be at the main showing, which is in the vicinity of the former Nat Nos. 1 and 2 claims at approximately 4,650 feet elevation and about 5 miles distant by road from the Highland Valley road through the Jericho property.

In a stripped area at the showing, measuring approximately 100 by 100 feet, irregular east-northeasterly shears as much as 2 feet wide contain chlorite, sericite, and malachite, and they occur mainly in the younger quartz diorite, which is strongly fractured on steep planes trending predominantly north-northeasterly and easterly respectively. The fractures exhibit potash feldspar alteration and they contain malachite. Zeolites such as stilbite and heulandite occur on some fractures and may be post-mineral. At the southwest side of the showing, older Guichon- or Chataway-type quartz diorite contains aplite veins, potash feldspar alteration, and fractures and shears with malachite on trends partly similar to those previously mentioned and partly northeasterly. The over-all grade at the showing was judged to be approximately 0.3 per cent copper.

Al

LOCATION: (50° 120° S.W.) Between 4,700 and 5,000 feet elevation on all sides of Billy Lake except north.

CLAIMS: Forty recorded claims in the Al group adjoin the south boundary of the Jericho property.

ACCESS: From Highland Valley by 6 miles of road via the Jericho property, or from the south via the Chataway property.

OWNER: Bornite Ridge Mines Ltd., 549 Howe Street, Vancouver 1; John Luttin, president; W. J. Weymark, consulting engineer.

METALS: Copper, molybdenum.

WORK DONE: Diamond drilling three holes, 910 feet, supervised by T. McArthur. Previous work on the property from 1965 to 1967 included geomagnetic surveying, induced polarization surveying, surface sampling, and diamond drilling.

Aug, Cal

LOCATION: (50° 120° S.W.) At elevation 4,000 feet on Dupuis Creek, 2 miles northwest of Mamit Lake.

CLAIMS: Aug 1 to 6, Cal 1 to 20, 27 to 29, 31, 33 to 41. (The property covers the old Fiddler showing.)

ACCESS: Two miles by British Columbia Hydro and Power Authority access road from Mamit Lake.

OWNER: Cannoo Mines Ltd., P.O. Box 1409, Merritt.

METALS: Copper, molybdenum.

WORK DONE: Eight men worked for four months under the supervision of R. L. Curnow. Self-potential, induced polarization, and resistivity surveys were made, 22 trenches (total length 3,525 feet) were bulldozed, and one hole 330 feet deep was diamond drilled. The property is underlain by rocks mainly of the Guichon batholith.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1958, p. 24; 1965, p. 149; 1967, p. 161; Assessment Reports Nos. 140 and 255.

By J. M. Carr

Chataway

LOCATION: (50° 120° S.W.) Between 3,000 and 5,100 feet elevation in the southeastern part of the Highland Valley area, extending southeastward nearly from Roscoe Lake to Guichon Creek at a point north of Broom Creek.

CLAIMS: Four hundred and sixty-two recorded claims partly named Dot, Gar, D.J., Jay, Len, Pal, Rex, Sho, Tom, TDM, and Wiz. The last-named claims include the old Vimy mine.

ACCESS: From Lower Nicola at the Craigmont turn-off by road northward for 18 miles via Broom Creek.

OWNER: Chataway Exploration Co. Ltd., 301, 550 Burrard Street, Vancouver 1; S. W. Wright, president and managing director.
OPERATOR: King Resources Company, 1300 Elveden House, Calgary, Alta.; B. T. Gallant, exploration superintendent; M. C. Robinson, consulting engineer.
METAL: Copper.
WORK DONE: Claim-surveying, topographical mapping, geological mapping by W. Meyer, L. Debriske, and M. Sanguinetti; geochemical, magnetometer, and induced polarization surveying; cleaning out old trenches. A maximum crew of 22 men was employed from May to November.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1923, pp. 161–162; 1925, p. 183; 1926, p. 199; 1956, p. 46; 1957, p. 27; 1959, p. 35; 1964, pp. 90–91; 1965, pp. 149–150; 1966, pp. 164–165; 1967, pp. 159–160.
DESCRIPTION: The property is underlain locally on the east by Nicola rocks and mostly by several phases of the Guichon batholith, which contain scattered showings variously of chalcopyrite, bornite, and chalcocite.

SPA, SKU, Alta, Lark, Scat

LOCATION: (50° 120° S.W.) Elevation 4,200 feet at the head of Skuhun Creek, north of Farr Lake and northwest of Tyner Lake.
CLAIMS: SPA 1 to 18, SKU 1 to 10, Scat 1 to 16, Lark 1 to 8, Jeff 1 to 14, Alta 13 to 32.
ACCESS: Nine miles by road from Highway No. 8.
OWNER: Mercury Explorations Limited, 700, 1281 West Georgia Street, Vancouver 5.
METAL: Copper.
WORK DONE: An induced polarization survey was run over an area of 4 square miles.
REFERENCE: Assessment Reports Nos. 257, 407, and 1594.

NICOLA MINING DIVISION

HIGHLAND VALLEY

Al (Bornite Ridge Mines Ltd.)

(50° 120° S.W.) *See under* Kamloops Mining Division, page 194.

Aug, Cal (Cannoo Mines Ltd.)

(50° 120° S.W.) *See under* Kamloops Mining Division, page 194.

Chataway (King Resources Company)

(50° 120° S.W.) *See under* Kamloops Mining Division, page 194.

MAMIT LAKE

Etta, Etc.

LOCATION: (50° 120° S.W.) Lower Nicola.
CLAIMS: Etta 1 to 8, OK 1 to 9, Paquet 1 to 8, Retan 1 to 8, Peg 1 to 62, Sandy 3 to 4, and others totalling 113 claims.
ACCESS: By road from Lower Nicola, a distance of 3 miles.
OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5.
METAL: Copper.

WORK DONE: Two men worked for one month under the supervision of J. T. Walker, geophysical co-ordinator, doing induced polarization, electromagnetic, and magnetometer surveys.
REFERENCE: Assessment Reports Nos. 1684 and 1777.
DESCRIPTION: Chalcopyrite and pyrite occur in Nicola volcanic rocks.

OK, Donny, Al, Mad Arab, Cam

LOCATION: (50° 120° S.W.) At elevation 4,000 to 5,500 feet on the west slope of Mount Guichon, at the head of Rey and Phelps Creeks, east of Mamit Lake.
CLAIMS: Al 2, 4, 6, 8, 10; Donny 1 to 40; OK 1, 3, 5, 7, 9; Mad Arab 1 to 10; Cam 1 to 32.
ACCESS: By road north from Lower Nicola.
OWNER: Cambridge Mines, Limited, 102, 569 Howe Street, Vancouver 1.
WORK DONE: Magnetometer and electromagnetic surveys were made and soil samples were taken for geochemical analysis. One hole 259 feet deep was diamond drilled.
REFERENCE: Assessment Report No. 1213.

GUICHON CREEK

Flag, Elkroc, Tap

LOCATION: (50° 120° S.W.) Junction of Tyner and Guichon Creeks at elevations between 2,700 and 4,000 feet.
CLAIMS: Fifty-one recorded claims named Flag, Elkroc, Tap.
ACCESS: From Lower Nicola at the Craigmont turn-off by road northward for 9 miles.
OWNER: Carolin Mines Ltd., P.O. Box 1269, Merritt.
METAL: Copper.
WORK DONE: Work on the property was under the supervision of O. Gillespie, president, and consisted of an induced polarization survey, a magnetometer survey, and 1,140 feet of BQ diamond drilling in two holes.

H.C.

LOCATION: (50° 120° S.W.) Guichon Creek at the confluence with Broom Creek.
CLAIMS: Twenty-four Crown-granted and recorded claims in the H.C. group.
ACCESS: By road across Guichon Creek from the Mamit Lake road or from Lower Nicola at the Craigmont turn-off by road northward for about 10 miles.
OWNER: Bethlehem Copper Corporation Ltd., P.O. Box 520, Ashcroft.
METAL: Copper.
WORK DONE: Mapping and 260 feet of trenching.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1957, p. 28; Assessment Report No. 1557.

SWAKUM MOUNTAIN

Sunshine, Lo, Lee By David Smith

LOCATION: (50° 120° S.W.) On the western slope of Swakum Mountain, at the headwaters of Steffens and Tolman Creeks, between 4,000 and 5,500 feet elevation.
CLAIMS: One hundred and forty claims located as the Sunshine, Lo, and Lee groups.
ACCESS: 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.

OWNER: Highland Lode Mines Limited.
OPERATOR: San Doh Mines Ltd., 814, 510 West Hastings Street, Vancouver 1; W. A. McClelland, mine superintendent.
METALS: Zinc, lead, copper.
WORK DONE: In 1968 a camp was established on the north shore of Tolman Lake. Using trackless mining equipment, an adit, 985 feet in length, was driven to explore at depth an area denoted as Zone 3, which on surface had been tested by 16 diamond-drill holes totalling 2,829 feet. Test-holes were drilled in the walls as the face was advanced. Three new trenches were bulldozed. A crew of seven men was employed.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 162–163.

AC

LOCATION: (50° 120° S.W.) At the head of Kirby Creek on the southeast side of Swakum Mountain.
CLAIMS: AC 1 to 6, 9 to 16, 23, 24.
ACCESS: Eight miles by logging-road from Nicola.
OWNER: Valnicla Copper Mine Ltd., P.O. Box 1269, Merritt.
METAL: Copper.
WORK DONE: Three EXT holes totalling 255 feet were diamond drilled.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 163.
DESCRIPTION: Sulphides occur as disseminations and replacements in quartz-carbonate altered zones in volcanic and sedimentary rocks of the Nicola Group.

CA

LOCATION: (50° 120° S.W.) At the head of Clapperton Creek 1½ miles southeast of Swakum Mountain.
CLAIMS: CA 1 to 20, formerly Peacock.
ACCESS: Five miles by logging-road from Nicola.
OWNER: Valnicla Copper Mine Ltd., P.O. Box 1269, Merritt.
METAL: Copper.
WORK DONE: Five holes totalling 291 feet were diamond drilled.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1907, p. 138.
DESCRIPTION: Chalcopyrite occurs in irregular quartz veins in andesite and granodiorite.

MERRITT

Craigmont Mine

By D. Smith and L. Wardman

LOCATION: (50° 120° S.W.) Between 3,800 and 4,200 feet elevation between the forks of Birkett Creek, 8 miles north from Merritt.

CLAIMS: The Craigmont orebodies are on the Merrell Nos. 7 and 8 and McLeod Nos. 5 and 6 claims. The company holds 106 mineral claims and fractions, 32 of which comprise 10 mineral leases.

ACCESS: By road north from Highway No. 8 at Lower Nicola.

OWNER: Craigmont Mines Limited, 700, 1030 West Georgia Street, Vancouver 5; mine address, P.O. Box 3000, Merritt; A. J. Petrina, mine manager; R. Cockayne, mine superintendent.

METAL: Copper (*see* Table 12 for production).

WORK DONE:

Underground work is summarized as follows: Lateral development, 18,825 feet; raising, 3,147 feet. Diamond drilling was continued underground.

The following work was done to improve the haulage system: On 2400 level the trolley line was extended into the 846 and 811 drifts and the installation of a system of block lights was completed. A trolley substation, No. 37, was installed at 761 shoot on 2400 level. The transformer is 100 kva. 4,160–300 volts. A control for the haulage trains operating from the caboose end of the train was put into service.

Other improvements for the mine consisted of: A 112.5-kva. transformer was transferred from substation No. 35 on 3500 level to substation No. 36 on 3339 level. A 3.5-horsepower pump was installed in the sump of No. 1 hoist shaft. The capacity of fans and motors of the mine air-heaters was increased to raise the air flow across the burners.

On the surface the following changes and additions were made: A new 35-horsepower Sala pump, an auxiliary 550-volt panel addition to 3A control centre, and 3-horsepower 550-volt motors for 12A and 12B conveyors were installed in the mill. The feed control for No. 2 mill section was changed from weight to sound control.

Lighting was installed in the new extension to the machine-shop on 2400 level. Automatic control was installed for the reclaim pump at No. 3 pumphouse.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1960, pp. 35–40; 1961, pp. 31–37.

DESCRIPTION:

Mining and milling operations were continuous in 1968, except for 10 days lost due to a labour strike in June. Production was from stockpiled ore from the open pit and from underground. During the year, 886,034 tons of ore was reclaimed from the open-pit stockpiles and 860,913 tons of underground ore was mined. Mill feed, including ore from stockpile, totalled 1,764,230 tons, which produced 59,085 tons of copper concentrates. Copper concentrates were loaded at Coyle Siding and hauled by Canadian Pacific Railway to Vancouver for shipment to Japan.

Sublevel caving, adopted as a mining method by Craigmont Mines Limited, is a retreat method of mining. Using scooptrams, drill jumbos, and Unimogs, the orebody is mined in a sequence of horizontal slices from the top down, and from one side of the orebody to the other.

At the Craigmont mine it is essential to have a cover of waste over the orebody in order to confine the blasted ore exposed in the bottom of the open pit. This was provided in the open pit, where the entire floor of the completed open pit was covered with waste rock to a controlled depth. As underground mining progresses downward, caving of walls and subsidence of the pit floor will provide the necessary control to subsequent blasting.

Starting just below the floor of the open pit, sublevels are driven across the orebody at 31-foot intervals. The ore is broken by drilling a fan of 2-inch-diameter holes upward, in series, and blasting them one fan at a time, removing the ore after each blast, and dumping it into ore-passes to the tramming level on the 2,400-foot level.

Work proceeds on three or more sublevels simultaneously—blasting and loading on the upper sublevels, production drilling and development on the lower sublevels. All equipment as indicated is rubber-mounted, diesel-driven, and can be quickly moved from sublevel to sublevel via inclined drifts.

Marb

LOCATION: (50° 120° S.W.) On the height of land 2 miles west of Craigmont mine and 6 miles northwest of Lower Nicola.
CLAIMS: Marb group of about 44 claims.
ACCESS: Eighteen miles by road from Merritt.
OWNER: Torwest Resources (1962) Ltd., 702, 850 West Hastings Street, Vancouver 1.
METAL: Copper.
WORK DONE: Magnetometer and electromagnetic surveys were made of the 12-claim western part of the group, and soil samples were taken for geochemical analysis.
REFERENCE: Assessment Report No. 735.

LD

LOCATION: (50° 120° S.W.) On the southwest side of Godey Creek 2½ miles west of Garcia Lake.
CLAIMS: LD 1 to 20.
ACCESS: Three miles by logging-road from the Coldwater road.
OWNER: Valnicla Copper Mine Ltd., P.O. Box 1269, Merritt.
METALS: Copper, silver.
WORK DONE: Trenches totalling 2,500 feet in length were bulldozed, and 130 feet of hole was diamond drilled.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 167.

Hit

LOCATION: (50° 120° S.W.) One mile southwest of Highway No. 5 and 4 miles west of Lundbom Lake, about 5 miles east of Merritt.
CLAIMS: Hit 1 to 24.
ACCESS: Half a mile by access road from the Merritt–Princeton highway.
OWNER: Valnicla Copper Mine Ltd., P.O. Box 1269, Merritt.
METALS: Copper, silver.
WORK DONE: Work consisted of 186 feet of AXT diamond drilling and 150 feet of EXT drilling under the direction of O. Gillespie.

Lucky Todd (Comstock)

By J. M. Carr

LOCATION: (50° 120° S.W.) Between 4,500 and 5,500 feet elevation on the summit and southern slopes of Iron Mountain, 5 miles southeast of Merritt.
CLAIMS: Sixty recorded claims named Makelstin.
ACCESS: The old shaft near the summit of Iron Mountain is 6½ miles by road from the Coldwater road and 15 miles by road from Merritt.
OWNER: Acaplomo Mining & Development Co. Ltd., P.O. Box 277, Merritt; S. F. Kelly, president.
METALS: Copper, lead, zinc, silver.
WORK DONE: Line cutting and magnetometer, Ronka EM16 electromagnetic, and geochemical surveying.
REFERENCES: *Geol. Surv., Canada,* Mem. 249, 1948, p. 81; *Minister of Mines, B.C.,* Ann. Repts., 1947, p. 136; 1951, p. 128.
DESCRIPTION: The property was visited in August in company with Mr. Kelly. No new exposures have been made in the vicinity of the old inclined shaft, from which lead ore, with minor contents of zinc and silver, was shipped many years

ago, and where it is said the last physical work done was two surface holes diamond drilled in 1966 by a previous company. Stripping was seen about 2,000 feet farther northeast, on the Makelstin No. 22A claim, and it exposed weak oxidized copper mineralization in the form of chalcocite and malachite on and near fractures and joints over widths of as much as 10 feet and intermittently for a length of as much as 250 feet in a more or less northerly direction. The mineralization occurs in strongly altered volcanic breccia, probably originally either rhyolite or dacite, which consists largely of sericite and quartz and contains a few more or less barren flat-lying quartz lenses an inch or so wide and a foot or two long. Rocks exposed on the west side of the showing are massive rhyolites, which are not visibly mineralized. Another nearby rock is a volcanic breccia containing both latite and andesite fragments whose attitudes suggest that the Nicola strata strike northward with steep dips.

Ski

LOCATION: (49° 120° N.W. and N.E.) East of Quilchena Creek, 2 miles north of Pothole Lake.

CLAIMS: Ninety-three Ski claims, Cu No. 5 and No. 6 Fractions, and Adit No. 1 claim.

ACCESS: From Merritt, by truck, a distance of 12 miles.

OWNER: Chataway Exploration Co. Ltd., 301, 550 Burrard Street, Vancouver 1.

METAL: Copper.

WORK DONE: Five men were employed for two months under the direction of M. H. Sanguinetti, geologist. Two induced polarization reconnaissance lines totalling 16½ miles were run across the property.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 159–160.

DESCRIPTION: Chalcopyrite is in shears, quartz veins, and disseminations in latite porphyry and quartz monzonite porphyry.

Mouse

By J. M. Carr

LOCATION: (50° 120° S.W.) Between 2,000 and 4,500 feet elevation immediately south of the west end of Nicola Lake, from the cut-off road on the west and within 2 miles of Quilchena Creek on the east.

CLAIMS: About 133 recorded claims named Mouse.

ACCESS: From the Merritt–Kamloops and Merritt–Princeton highways by road.

OWNER: Nicola Lake Mining Company Ltd., 601, 850 West Hastings Street, Vancouver 1; W. A. Gerber, president; J. M. Ashton, exploration manager.

METALS: Copper, lead.

WORK DONE: In 1967 and 1968, in addition to geochemical surveying as previously recorded, prospecting, geological mapping by I. F. Morton, magnetometer and reconnaissance induced polarization surveying, fracture density studies, and about 2,000 feet of diamond drilling in three holes.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 169; Assessment Reports Nos. 890, 1052, 1053, and 1798.

DESCRIPTION: The property covers partly the same ground as the former Ding and Hot claim groups and was partly explored by the Merritt Mining Syndicate in 1961. It is underlain largely by Nicola strata, including greenstones, tuffs, tuff breccias, volcanic conglomerate, and variously black or white limestone beds. In part the bedding appears to strike northeastward with dips which are variously steep or to the east at moderately steep angles. Weak widespread mineralization consisting of narrow vuggy quartz-calcite veins with some siderite and minor amounts of galena, bornite, and chalcopyrite is exposed

at two or more showings at elevations of as much as 4,000 feet on a hill to the north of a lake which lies about 2 miles north-northeast of Hamilton Lake. A north-northeasterly fault which is inferred under the lake should pass east of the showings. Immediately northwest of the lake, hole No. 1, which was drilled steeply westward intersected tuff and black limestone containing fault gouge, and pyrite disseminations and fracture fillings. Twelve hundred feet to the west, hole No. 2 was drilled vertically, and it intersected volcanic rocks without evident mineralization. Hole No. 3 was drilled nearly 2 miles farther west, and its core was only partly examined; it was of unmineralized basaltic volcanic rock with some chlorite and calcite.

Can

LOCATION: (50° 120° S.E.) At elevations of 3,000 to 4,000 feet at the head of Wasley Creek, 2 miles from Minnie Lake.
CLAIMS: Can 1 to 10, 27 to 42.
ACCESS: Two miles by logging-road from Minnie Lake.
OWNER: Cannoo Mines Ltd., P.O. Box 1409, Merritt.
METALS: Copper, molybdenum.
WORK DONE: Thirteen trenches, total length 170 feet, were drilled, blasted, and hand-mucked, and two holes totalling 114 feet were diamond drilled.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 169.

SPIUS CREEK

Gossan

LOCATION: (49° 121° N.E.) On Spius Creek 10 miles east of Boothroyd.
CLAIMS: Gossan 1 to 40.
ACCESS: Twenty-seven miles by road from Merritt.
OWNER: J. E. Nott.
OPERATOR: Orequest Exploration Syndicate, 808, 837 West Hastings Street, Vancouver 1.
METALS: Copper, molybdenum, silver.
WORK DONE: Eight thousand feet of bulldozer trenches and open cuts.

ASPEN GROVE

Echo, Toe

LOCATION: (49° 120° N.E.) At Tommy and Paradise Lakes.
CLAIMS: Total of 148 claims in the Echo and Toe groups, formerly Malachite, Chalcocite, HN, WEN.
ACCESS: By road from Merritt, a distance of 15 to 20 miles.
OWNER: Consolidated Skeena Mines Ltd., 528, 789 West Pender Street, Vancouver 1; William M. Sharp, consulting geologist.
METALS: Copper, molybdenum.
WORK DONE: Six men worked for 11 months. All the claims were geologically mapped, electromagnetic and induced polarization surveys were made on 44 Toe claims, and soil samples were taken for geochemical analysis. Four trenches totalling 4,000 lineal feet were bulldozed.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 174; Assessment Reports Nos. 1049, 1586, 1589, and 1703.
DESCRIPTION: Disseminated chalcopyrite and molybdenite occur in Nicola volcanics and granite.

Blue Jay, Bee

LOCATION: (49° 120° N.W.) On the east side of Highway No. 5, 8 miles north of Aspen Grove.
CLAIMS: Blue Jay 1 to 16, Blue Jay 1 to 5 Fractions, Bee 1 to 10.
ACCESS: Via Highway No. 5 from Merritt and Aspen Grove.
OWNER: H. Nesbitt, of Aspen Grove.
OPERATOR: Ashland Oil & Refining Company, 736 Eighth Avenue Southwest, Calgary, Alta.; E. A. Schiller, manager.
METALS: Copper, silver, gold.
WORK DONE: Six men worked for one month. The geology was mapped and induced polarization and magnetometer surveys were made.
DESCRIPTION: Native copper, chalcocite, and chalcopyrite occur as disseminations in Nicola volcanic rocks.

Halo

LOCATION: (49° 120° N.W.) Aspen Grove, east side of Highway No. 5, 3 miles north of Kidd Lake.
CLAIMS: Fifty-two claims comprising the Halo, Touch, Broatch, Chalco, Lou, Magnus, Ram.
ACCESS: Via Highway No. 5, 6 miles north of Aspen Grove.
OWNER: David Minerals Ltd.
OPERATOR: Norranco Mining & Refining Co. Ltd., 500, 736 Eighth Avenue Southwest, Calgary 2, Alta.; A. D. Tidsbury, consulting engineer.
METALS: Copper, silver.
WORK DONE: Induced polarization and magnetometer surveys were run along 10 line miles; 12 men were employed for five months.
REFERENCE: Assessment Report No. 1620.

HH, Mix

LOCATION: (49° 120° N.W.) Five miles south and 2 miles east of Aspen Grove.
CLAIMS: Total of 30 claims known as 3 Way, Bunny, Mix 1 to 12, HH 1 to 6.
ACCESS: From Aspen Grove by highway and logging-road for a distance of 7 miles.
OWNER: Aspen Grove Mines Ltd., 826, 510 West Hastings Street, Vancouver 2; George Mill, consultant.
METAL: Copper.
WORK DONE: An induced polarization survey was made on the HH 1 to 4, 6 and Mix 5, 7, and 8 claims.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 156.

WHITEROCKS MOUNTAIN

Night Owl (Texas Gulf Sulphur Company)

(50° 119° S.W.) *See under* Vernon Mining Division, page 222.

SIMILKAMEEN MINING DIVISION

PEACHLAND

Decano (Juniper Mines Ltd.)

(49° 120° N.W. and N.E.) *See under* Osoyoos Mining Division, page 217.

HAYES CREEK

Rosso No. 1, Top, Fix, Rex

LOCATION: (49° 120° N.E.) At the junction of Siwash and Teepee Creeks, northeast of Princeton.

CLAIMS: One hundred and three claims located as the Rosso No. 1, and Top, Fix, and Rex groups.

ACCESS: Thirty miles by road northeast from Princeton.

OWNER: Spa Mines Limited, 407, 475 Howe Street, Vancouver 1; H. L. Williams, exploration manager.

METALS: Silver, lead, copper.

WORK DONE: Four men worked the full year on the property, bulldozing cuts and stripping bedrock.

Empress

LOCATION: (49° 120° N.E.) East of the head of Empress Creek between elevations of 4,500 and 6,100 feet and 3 miles southeast of Osprey Lake.

CLAIMS: One hundred and fifty-two Empress claims.

ACCESS: By road from Princeton, 7 miles from Osprey Lake.

OWNER: Anaconda American Brass Limited, Britannia Beach.

METAL: Molybdenum.

WORK DONE: Ten men worked six months under the direction of J. M. McAndrew, geologist. Work included geological mapping of the 110 northern claims, magnetometer and induced polarization surveys of the 54 western claims, and geochemical surveys covering the entire group; seven trenches, total length 1,200 feet, were bulldozed and 800 feet of bulldozer stripping was done.

DESCRIPTION: Molybdenite associated with pyrite and magnetite is in fractures and quartz stringers and is disseminated in quartz monzonite and alaskite. The rocks have undergone slight sericite, chlorite, and kaolinite alteration.

SUMMERS CREEK

Axe

LOCATION: (49° 120° N.W.) Immediately west of Summers Creek, 3 miles southeast of the south end of Allison Lake.

CLAIMS: One hundred and thirty-three recorded claims—Axe, Lox, Bud groups.

ACCESS: Approximately 14 miles north of Princeton via Highway No. 5 and the Summers Creek road.

OWNER: J. Stinson, New Westminster.

OPERATOR: Quintana Minerals Corporation, 2160 One Bentall Centre, Vancouver 1; D. C. Malcolm, consulting geologist.

METALS: Copper, molybdenum.

WORK DONE: On Axe Nos. 9, 11, 21, 22, 24, and 26. Three men were employed by the company and five by contractor for four months. The surface showings were geologically mapped at a scale of 1 inch equals 400 feet. Four 4⅞-inch rotary-drill holes totalling 3,303 feet and approximately 7 miles of bulldozer trenches were completed.

DESCRIPTION: Chalcopyrite and molybdenite occur in intensely altered volcanic and sedimentary rocks of the Nicola Group. Types of rock alteration include feldspathization, silicification, pyritization, and development of skarn.

Snow

LOCATION: (49° 120° N.W.) At the junction of Summers and Rampart Creeks.
CLAIMS: Forty recorded claims—Snow, Pat, Ted, Dig, Ken groups.
ACCESS: Approximately 11 miles north of Princeton via Highway No. 5 and the Summers Creek road.
OWNER: Tom Coyne, Princeton.
OPERATOR: Quintana Minerals Corporation, 2160 One Bentall Centre, Vancouver 1; D. C. Malcolm, consulting geologist.
METALS: Copper, molybdenum, lead, gold, silver.
WORK DONE: On Snow No. 1, Ted No. 2 and No. 4. Three men were employed by the company and five by contractor for two months. Three 4⅞-inch rotary-drill holes totalling 1,536 feet were completed.
DESCRIPTION: Copper carbonates and galena occur in limestone of the Nicola Group in contact with granitic rock.

Pip, Cop

LOCATION: (49° 120° N.W.) On Rampart Creek, 2½ miles upstream from its junction with Summers Creek.
CLAIMS: Pip and Cop groups totalling 49 recorded claims.
ACCESS: Approximately 15 miles north of Princeton via Highway No. 5 and the Summers Creek road.
OWNER: Meridian Exploration Syndicate; Angus J. MacDonald and Joseph H. Montgomery.
OPERATOR: Quintana Minerals Corporation, 2160 One Bentall Centre, Vancouver 1.
METALS: Copper, molybdenum.
WORK DONE: On Cop No. 5 and No. 7 and Pip No. 7 claims. Three men were employed by the company and five by contractor for two months. Work was supervised by D. C. Malcolm, consulting geologist. Four 4⅞-inch rotary holes totalling 2,646 feet were drilled.
DESCRIPTION: Pyrite, chalcopyrite, and molybdenite are disseminated and occur along fractures in brecciated quartz diorite and in volcanic and sedimentary rocks of the Nicola Group. Rock alteration resulted in development of epidote, quartz, and red feldspar.

OD, OB, OC

LOCATION: (49° 120° N.E.) Near Missezula Lake, 25 miles north of Princeton.
CLAIMS: OD 1 to 30, OB 1 to 40, OC 1 to 40, cover a showing formerly known as the King George.
ACCESS: By road from Princeton.
OWNER: Primer Group Minerals Ltd., 201, 1836 West Fifth Avenue, Vancouver 9; D. W. Pringle, consultant.
METALS: Copper, gold, silver.
WORK DONE: Ten and one-half line miles of induced polarization survey, 500 lineal feet of bulldozed trenches, 12 holes totalling 3,463 feet diamond drilled, and nine holes totalling 2,010 feet percussion drilled. Two miles of access road was built.

TULAMEEN RIVER

Polaris

LOCATION: (49° 120° S.W.) Between Badger and Arrastra Creeks immediately upstream from their junction.
CLAIMS: Polaris 1 to 45, 51 to 53.

ACCESS: By road from Coalmont, a distance of 10 miles.
OWNER: Anaconda American Brass Limited, Britannia Beach.
METAL: Copper.
WORK DONE: Five men worked for 1½ months under Paul A. Lindberg, geological engineer. Some detailed geological mapping was done, and induced polarization, magnetometer, and geochemical surveys were made. Eight trenches, total length 1,400 feet, were bulldozed on the Polaris 2 to 5.
DESCRIPTION: Chalcopyrite is disseminated in hornblende pyroxenite.

RC

LOCATION: (49° 120° S.W.) On Lodestone Mountain north of Lodestone Lake.
CLAIMS: RC 1 to 10, 17 to 26.
ACCESS: By road from Coalmont, a distance of 8 miles.
OWNER: Bethex Explorations Ltd., 1818, 355 Burrard Street, Vancouver 1.
METAL: Iron.
WORK DONE: Four men worked for 1½ months under the direction of I. M. Watson, geologist. A topographic map on a scale of 1 inch to 400 feet was made, and a magnetometer survey was made over 12 claims.
REFERENCE: Assessment Report No. 1566.
DESCRIPTION: Magnetite is disseminated through peridotite, gabbro, and pyroxenite.

H-G, Iron, EV, DB

LOCATION: (49° 120° N.W.) At elevations between 5,600 and 6,200 feet on Lodestone Mountain, 15 miles due west of Princeton.
CLAIMS: One hundred and thirty-one claims located as the H-G, Iron, DB, and EV groups.
ACCESS: By 12 miles of logging-road from Coalmont.
OWNER: Imperial Metals and Power Ltd., 501, 535 Thurlow Street, Vancouver 5.
METAL: Iron.
WORK DONE: Two men worked for two weeks under E. Mullins; 512 square feet of bedrock was stripped by bulldozer.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1959, pp. 39–53; 1965, p. 161; 1966, p. 175.

PRINCETON

Verde No. 3, New York

LOCATION: (49° 120° S.E.) Eight miles south of Princeton and 2 miles north of the old Copper Mountain camp.
CLAIMS: Mineral lease 62, comprising Verde No. 3 (Lot 1600), No. 35 (Lot 3363), and No. 2 (Lot 1773) and mineral lease 63 comprising New York (Lot 3574) and the Kathleen Fraction and Margaret Fraction.
ACCESS: By road from Princeton, a distance of 8 miles.
OWNER: Giant Explorations Limited, 1825, 355 Burrard Street, Vancouver 1; D. M. Wilson, geologist.
METAL: Copper.
WORK DONE: The geology of the Verde No. 3 was mapped, and magnetometer and electromagnetic surveys of the claims were made. A geochemical survey was made covering all the claims. A total of 14,000 square feet of stripping was done, and one test-pit dug with a D-7 bulldozer. Three men worked for one month.

REFERENCE: Assessment Report No. 1579.

DESCRIPTION: Chalcopyrite is scattered along north- to northeast-trending joints in gabbro of the Voigt stock.

Copper Mountain Mine

By V. A. G. Preto

LOCATION: (49° 120° S.W.) On Copper Mountain, approximately 12 miles south of Princeton.

CLAIMS: One hundred and twenty-eight Crown-granted and recorded claims.

ACCESS: Via the Copper Mountain road, 12 miles from Princeton.

OWNER: Similkameen Mining Company Limited, P.O. Box 520, Princeton.

METALS: Copper (molybdenum, gold).

WORK DONE: Eleven men were employed by the company and 40 by contractor for 12 months. Work was done on Princess Maud, Annie L, Ada B, Silver Dollar, Red Eagle, Princess May, Copper King, Copper Reef, Copper Bench, Triangle Fraction, Bell Fraction, Sunset, Vancouver, Gardner, Oriole, G. Republic, and other claims. Work included detailed geological mapping of 480 acres of ground and induced polarization and magnetometer surveys over approximately 740 acres. In addition, 22 trenches totalling 17,200 feet were bulldozed, a 200-ton bulk sample was taken from pit No. 2, a road and bridge to Ingerbelle Mines Limited were constructed, and a field office building was erected. Diamond drilling totalled 98,894 feet in 155 holes of BQ size; percussion drilling totalled 38,496 feet in 162 holes of 2-inch diameter.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 178–180; *Geol. Surv., Canada,* Mem. 171, 1934; Montgomery, J. H., 1967, Petrology, Structure and Origin of the Copper Mountain Intrusions near Princeton, British Columbia, unpublished Ph.D. thesis, *U.B.C.*

DESCRIPTION: The mineral deposits presently under investigation consist mainly of pyrite-chalcopyrite mineralization, with subordinate bornite, occurring as disseminations and delicate fracture fillings in andesitic volcanic and sedimentary rocks of the Nicola Group and porphyritic intrusive rocks of dioritic, monzonitic, and syenitic composition. Rock alteration consists of extensive albitization, development of pink feldspar, both pervasive and along fractures, and widespread formation of biotite and epidote. Scapolite, a typical and widespread alteration mineral at Ingerbelle Mines Limited, is not as abundant, but is found at several localities. Layered Nicola rocks trend parallel to the northern contact of the Copper Mountain stock and dip vertically or very steeply to the north for a distance of more than 1,000 feet away from the contact and over a belt which extends from pit No. 7 at elevation 3,500 feet on Copper Mountain to the Honeysuckle break on the Fraser mineral claim, west of the Similkameen River. Elsewhere on Copper Mountain, dips are generally shallower, but their distribution is as yet inadequately known. Distribution of copper mineralization appears to be in part related to and controlled by widespread and prominent northwest- and northeast-trending fault and fracture zones.

Cumont

By V. A. G. Preto

LOCATION: (49° 120° S.W.) Immediately to the north, east, south, and west of Copper Mountain on the east and west sides of the Similkameen River.

CLAIMS: Ten mineral leases comprising 46 claims; 50 claims held by record; 23 Crown-granted claims held under option; 11 Crown-granted claims owned by and registered in the name of the company.

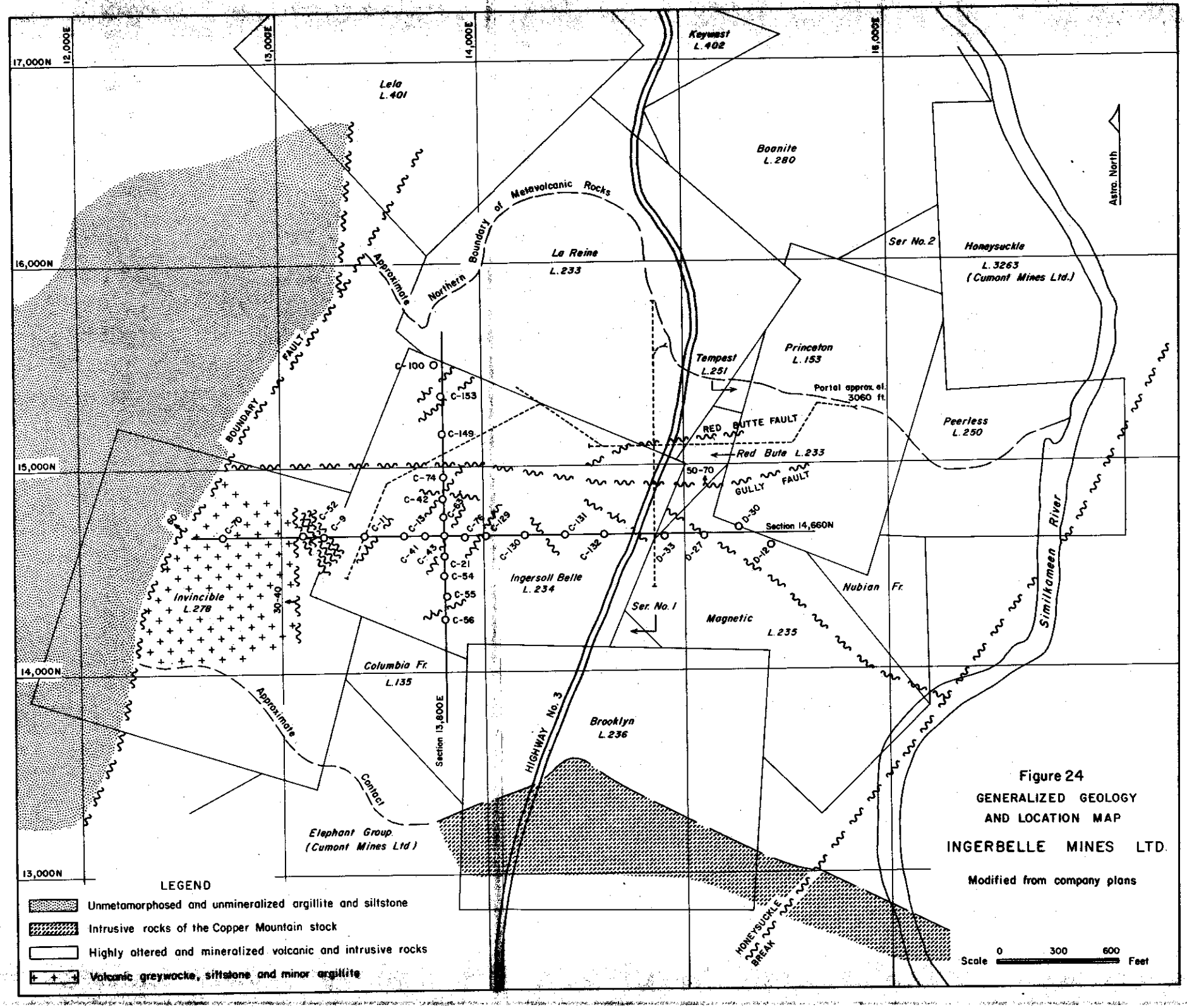


Figure 24

GENERALIZED GEOLOGY AND LOCATION MAP

INGERBELLE MINES LTD.

Modified from company plans

ACCESS: Via the Copper Mountain road from Princeton for a distance of 11 miles and (or) via Highway No. 3 south from Princeton for a distance of 13 miles.

OWNER: Cumont Mines Limited, 302, 550 Burrard Street, Vancouver 1.

METALS: Copper (molybdenum).

WORK DONE:

On mineral leases M39 and M45; on recorded claims—Doug Nos. 1 and 2 Fractions, Queen E. Fraction, Queen G. Fraction, Queen H. Fraction, Queen J. Fraction, Queen I. Fraction, Queen D. Fraction, Elephant Nos. 1, 3, 4, Copper Bluff Fraction, BEM Nos. 1 to 9; on Crown grants—New Wolf Fraction, No. 73 Fraction, No. 51 Fraction, No. 71, No. 50 Fraction, No. 52, No. 70, No. 53, Virginia, Automatic Fraction, No. 18 Fraction, No. 5, No. 18, Nelson Fraction, No. 1, No. 14, No. 33, Duke of York, Honeysuckle, Fraser Fraction, Hamilton, Falum, Copper Cliff, Copper Bluff, Oronoco.

The company carried out geological, geophysical, and geochemical surveys, bulldozer trenching, and percussion drilling under the direction of F. Lee, of Western Geological Services Ltd., and supervision of R. H. Seraphim, consulting engineer. In particular, geological mapping was done on the No. 14, Falum, South Camp, and Elephant groups, and on the Honeysuckle, Doug, Copper Cliff, and Copper Bluff claims.

A ground magnetometer and a geochemical survey were carried out on the eastern section of the BEM group and on the Virginia, No. 14, Falum, and South Camp groups. An induced polarization survey was carried out on all of the BEM group except for mineral lease No. 49, on the Virginia and South Camp groups, on the northern part of the Elephant group, and on the No. 1, Doug No. 1 Fraction, and Copper Cliff Crown-granted claims. In addition, 23 trenches totalling approximately 11,000 feet were bulldozed, and 21 percussion holes totalling approximately 4,900 feet were drilled.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 180; *Geol. Surv., Canada,* Mem. 171, 1934, pp. 20–34.

DESCRIPTION:

The company's holdings cover a large area which is underlain by volcanic rocks of the Nicola Group and by intrusive rocks of the Copper Mountain and Voigt stocks. Two main types of copper deposits may be distinguished on the basis of their mineralogy, host rocks, and associated alteration. Chalcopyrite-pyrite mineralization is found as disseminations and thin fracture fillings mostly in andesitic volcanic rocks of the Nicola Group. The nature of these deposits is, in some respects, somewhat similar to that of chalcopyrite-pyrite mineralization found on the north slopes of Copper Mountain and on the Ingerbelle property on the west side of the Similkameen River. The deposits are found chiefly in metamorphosed volcanic rocks, locally highly altered by extensive development of pink feldspar, epidote, biotite, chlorite, and, in places, scapolite. The distribution of mineralization appears to be in part related to northeast- and northwest-trending faults and fracture zones which are found at several localities in the Copper Mountain-Kennedy Mountain area.

A second type of copper mineralization consists of generally coarse fracture fillings of chalcopyrite and pyrite in a gangue of magnetite, hematite, calcite, and pink feldspar. These deposits are primarily found as replacement veins in dioritic rocks of the Voigt stock near its western contact in the vicinity of Voigt camp.

Ingerbelle

By V. A. G. Preto

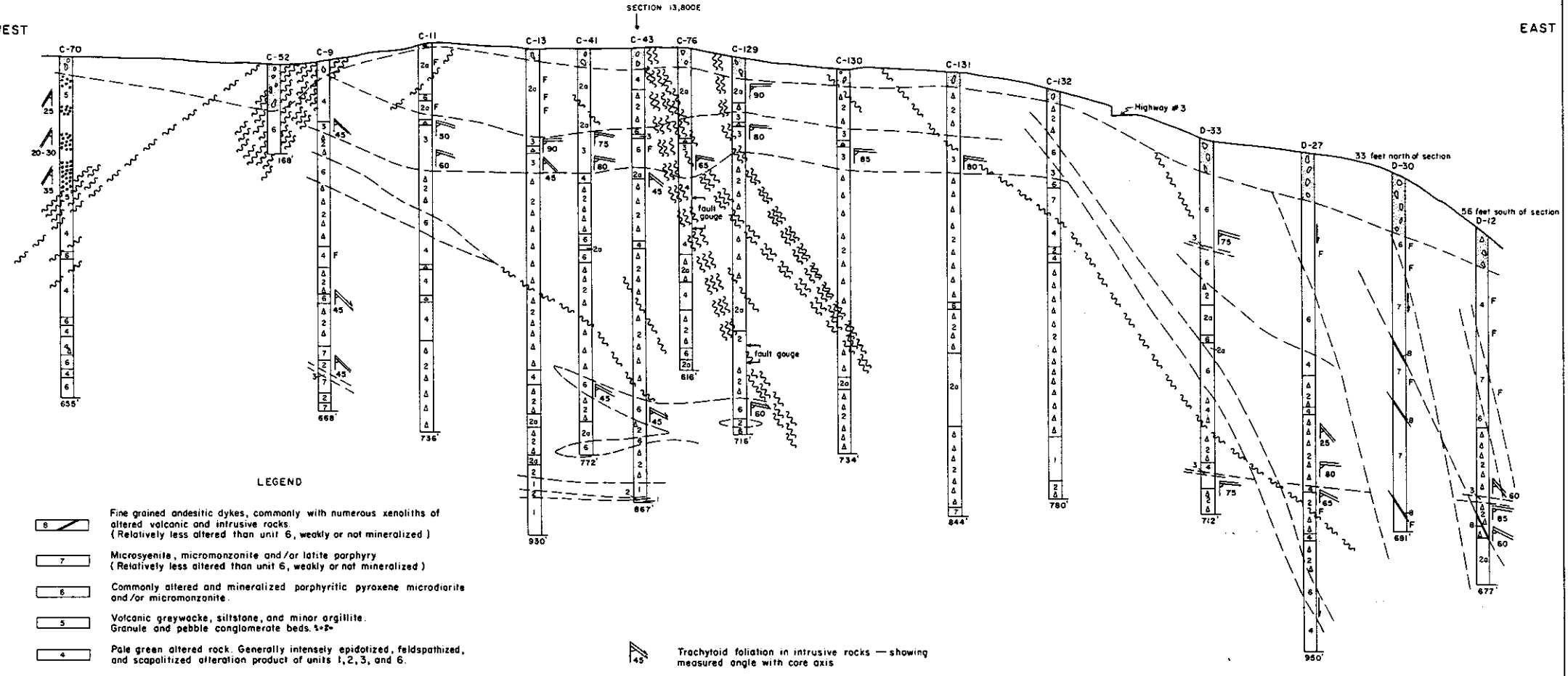
LOCATION: (49° 120° S.W.) On Highway No. 3, 13 miles south of Princeton.
CLAIMS: Sixty-six Crown-granted and recorded mineral claims.
ACCESS: Via Highway No. 3.
OWNER: Ingerbelle Mines Limited, P.O. Box 520, Princeton.
METALS: Copper (molybdenum, gold).
WORK DONE: Sixteen men were employed by the company and 40 by contractor for 12 months; supervision by J. McCue. Detailed geological mapping, ground magnetometer, induced polarization, and soil geochemical surveys over the whole property, one adit totalling 3,722 feet; 97,900 feet of BQ-size diamond drilling in 224 surface holes; 30,500 feet of AQ-size diamond drilling in 104 underground holes; 51,500 feet of 2-inch-diameter percussion drilling in 200 holes.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, pp. 177–178; 1967, pp. 181–182; *Geol. Surv., Canada,* Mem. 171, 1934; Montgomery, J. H., 1967, "Petrology, Structure and Origin of the Copper Mountain Intrusions near Princeton, British Columbia," unpublished Ph.D. thesis, *U.B.C.*

DESCRIPTION:

The extensive work which was commenced on the Ingerbelle property in 1966 continued in 1968 and culminated with the completion of the exploratory underground workings and of a major surface and underground drilling programme. This work, accompanied by further surface and underground mapping, has led to the following simplified understanding of the geology of the property.

Most of the known copper mineralization of economic interest occurs in a block of intensely altered volcanic rocks of the Nicola Group which are cut by a host of dykes and sills of dioritic and monzonitic composition. This block of rocks, designated as the Ingerbelle block, is centred on the Ingersoll Belle (Lot 234) and La Reine (Lot 233) claims and is bounded to the north by a diorite-monzonite-syenite complex which begins approximately at line 16,000 N (*see* Fig. 24), and to the west by a sharp north-by-northeast trending fault which dips steeply to the west and brings virtually unmetamorphosed argillite and siltstone of the Nicola Group in contact with the highly altered Ingerbelle rocks. At the west end of section 14,660 N, a concealed north-trending fault has been discovered by drilling. This fault is probably a subsidiary of the main boundary fault immediately to the west. It dips to the west at 40 degrees and brings unmetamorphosed and unmineralized volcanic greywacke, siltstone, argillite, and conglomerate in contact with highly altered and sparsely mineralized intrusive and volcanic rocks. To the south the boundary of the Ingerbelle block is marked by the Copper Mountain stock. The eastern boundary is marked by the Honeysuckle break, a fracture and fault zone which trends northeasterly and dips steeply. Although this break marks a sudden change in the attitude and lithology of the Nicola rocks, copper mineralization continues sporadically to the east of it on the west side of Copper Mountain and may be traced, though with many interruptions and irregularities, to those areas to the east which either were sites of former mining operations or are presently under intense examination.

A major east-trending fault, locally known as the Gully Fault, cuts the Ingerbelle block (*see* Fig. 24 and section 13,800 E) in two markedly different parts. The northern part consists almost entirely of intensely altered volcanic and intrusive rocks, the original lithology of which at best can be deciphered only with great difficulty. The most common types of alteration found in these rocks are intense albitization, pink feldspathization, and scapolitization, accompanied by abundant and widespread development of epidote, biotite, pyroxene, and sphene. Within



LEGEND

- 8 — Fine grained andesitic dykes, commonly with numerous xenoliths of altered volcanic and intrusive rocks. (Relatively less altered than unit 6, weakly or not mineralized)
- 7 — Microsyenite, micromonzonite and/or latite porphyry (Relatively less altered than unit 6, weakly or not mineralized)
- 6 — Commonly altered and mineralized porphyritic pyroxene microdiorite and/or micromonzonite.
- 5 — Volcanic greywacke, siltstone, and minor argillite. Granule and pebble conglomerate beds.
- 4 — Pale green altered rock. Generally intensely epidotized, feldspathized, and scapolitized alteration product of units 1, 2, 3, and 6.
- 3 — Well to poorly laminated albite-epidote hornfels, with varying amounts of scapolite, pyroxene, biotite, and pink feldspar.
- 2 — Brownish to greenish andesitic volcanic breccia, in part probably pyroclastic.
- 2a — Massive brownish to greenish andesite with occasional thinly laminated layers.
- 1 — Dark brownish-grey, massive pyroxene andesite.

- 45 — Trachytoid foliation in intrusive rocks — showing measured angle with core axis
- 45 — Bedding — showing measured angle with core axis
- F — Intense pink feldspathization
- Fault

Figure 26

INGERBELLE MINES LTD.

DIAMOND-DRILL HOLE SECTION 14,660N

SCALE 0 100 200 300 400 FEET

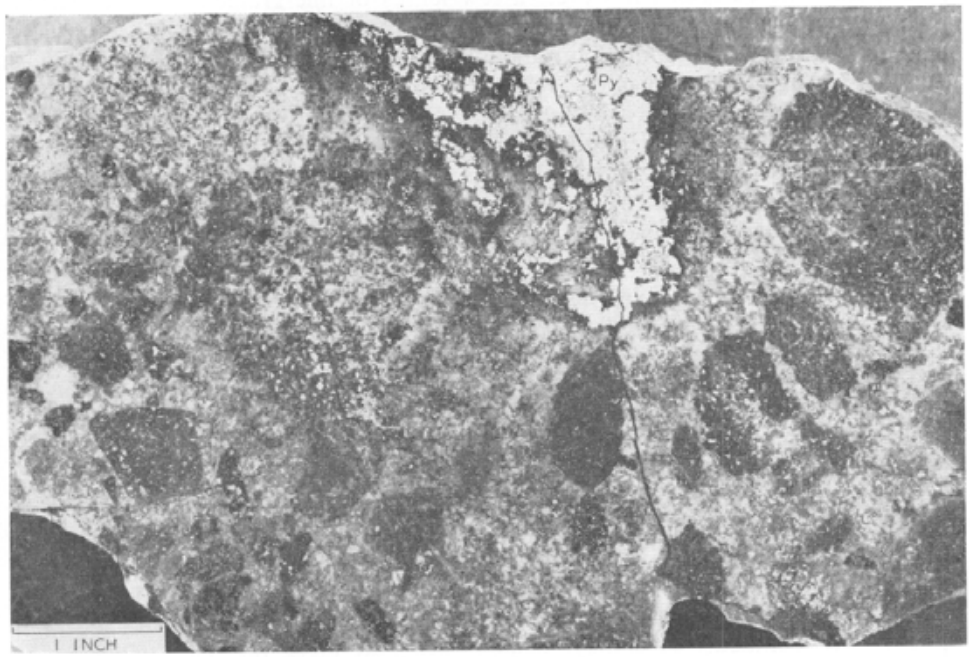


Plate IIIA. Pyritized brownish-green andesitic volcanic breccia, typical of the least altered parts of unit 2 (py is pyrite).

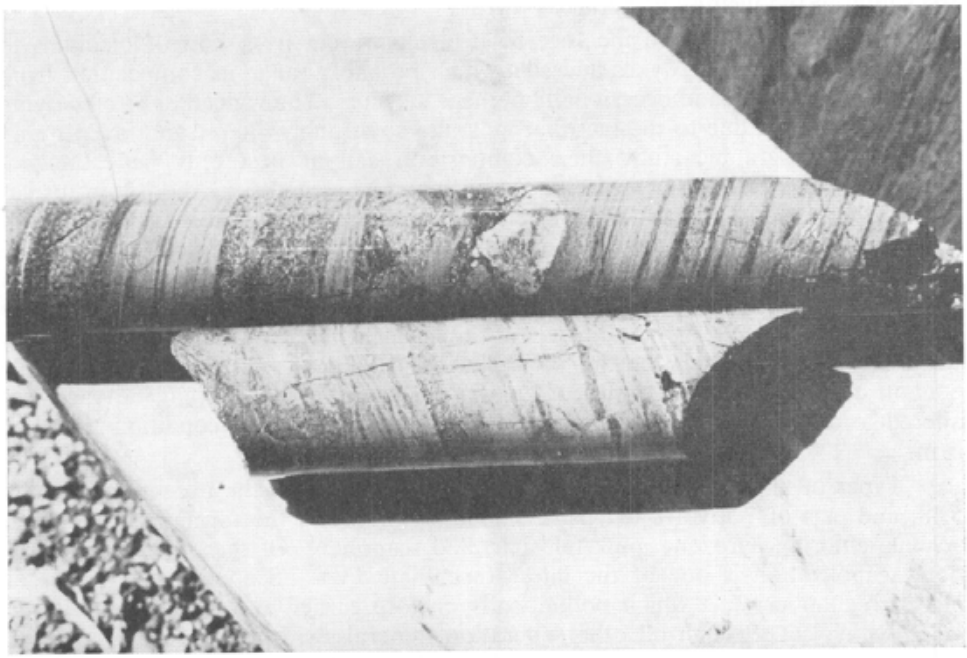


Plate IIIB. Unit 3, laminated and graded bedded metasiltstone and (or) tuff with thin conglomerate layer. Graded bedding indicates right side is up. Core diameter is 1.5 inches.

these highly altered rocks, however, a few lenses of fine-grained bedded material indicate gentle northeasterly dips.

To the south of the Gully Fault the volcanic rocks consist of a pile of brownish to greenish massive and fragmental andesite (*see* Fig. 24) at least 800 feet thick. On Figures 25 and 26 these rocks are designated as unit 2 and are characterized in their upper part by an excellent marker horizon of delicately laminated metasiltstone and (or) tuff which is designated as unit 3 (*see* Plate III). In sections 14,660 N and 13,800 E it ranges from 70 to 100 feet in thickness and has been intersected by virtually every hole drilled south of the Gully Fault and west of Highway No. 3. The thickness of the unit is greatest to the southwest and decreases gradually to the northeast. The locus of unit 3 in each drill-hole and the core-bedding angles both indicate that the layer dips gently to the northeast. Thinly laminated tuffaceous layers and (or) lenses found at several other places within the andesitic rocks above and below unit 3 also indicate the same general attitude. The deepest drill-holes of sections 14,660 N and 13,800 E indicate that some 600 feet below unit 3 the fragmental andesite of unit 2 changes rather sharply into massive finely porphyritic dark brownish-grey andesite.

Gentle northeasterly dips of the Nicola rocks in the Ingerbelle block are found within a very short distance of the Copper Mountain stock contact, immediately east of Highway No. 3. To the east of the Honeysuckle break, however, the lithology changes abruptly and the strata trend northwesterly and dip vertically or steeply to the northeast for a distance of more than 1,200 feet directly away from the intrusive contact. This may mean either that there has been considerable movement of the strata along the Honeysuckle break or that the Nicola rocks were folded along northwesterly trending axes and then faulted in a northeasterly direction prior to the intrusion of the stock. The second alternative is presently favoured because of other indications of pre-intrusion folding of Nicola rocks to the south, in the vicinity of Saturday Creek.

The volcanic rocks in the Ingerbelle block are cut by a host of medium- to fine-grained porphyritic dykes and sills which probably range in composition from diorite to monzonite and occasionally perhaps syenite. The vagueness in classifying these intrusives is due to the fact that most are so strongly altered that even by an extensive petrographic study their composition can at best only be estimated. Moreover, the alteration of andesite of unit 2 and of some of the dioritic intrusives is such that in some cases it cannot be said with any degree of certainty what rock one is dealing with. It seems, however, that one of the characteristics of the intrusive rocks of units 6 and 7 is the presence of generally well-formed crystals of clear apatite ranging from less than 1 to 3 millimetres in diameter. These crystals are very obvious in thin-section and can generally be easily identified in the hand specimen with the aid of a pocket magnifier. All the intrusives also contain conspicuous phenocrysts of augitic pyroxene, but these may be variously altered to amphibole, epidote, and chlorite, depending on the condition the rock is in.

Types of alteration which have affected all rocks with the exception of units 5, 8, and part of 7 involve extensive saussuritization and the formation of biotite, sphene, chlorite, pyroxene, pink feldspar, and scapolite. Of these types of alteration, scapolization is one of the latest (*see* Plate IV). Scapolite may occur as large irregular crystals which poikilitically enclose earlier minerals, or as distinct veins which cut through all other alteration minerals with the exception of pink potash feldspar veinlets and late carbonate veinlets. The relative age of scapolitization and sulphide mineralization is as yet not well understood. In some instances the scapolite appears to be later than the bulk of the sulphides, but in others dis-

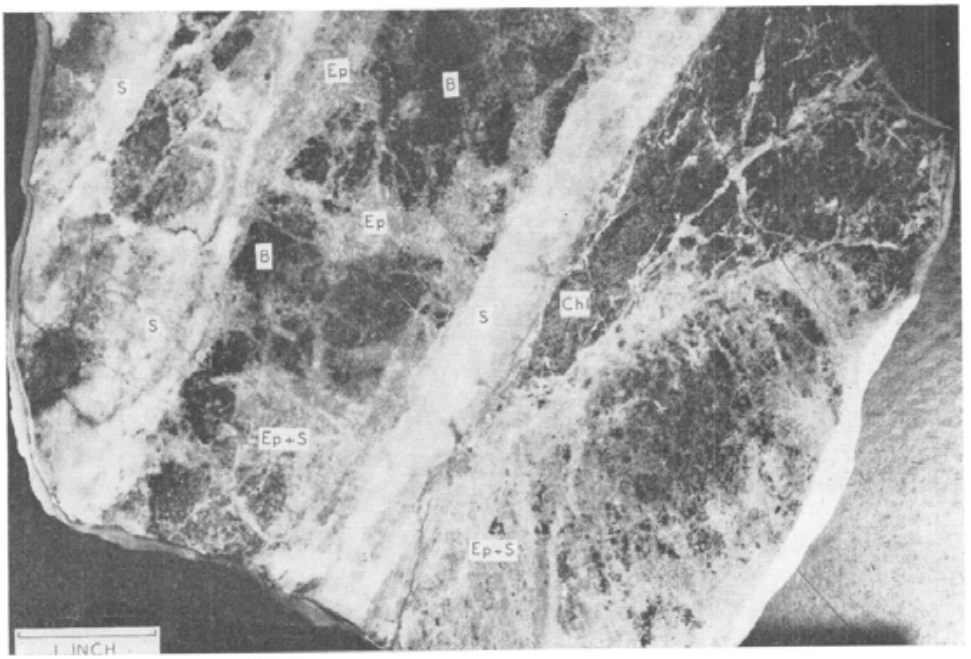


Plate IVA. Intensely altered pale-green rock, probably derived from breccias of unit 2. B=biotite; Ep=mostly epidote and pyroxene; Chl=mostly chlorite; S=scapolite.

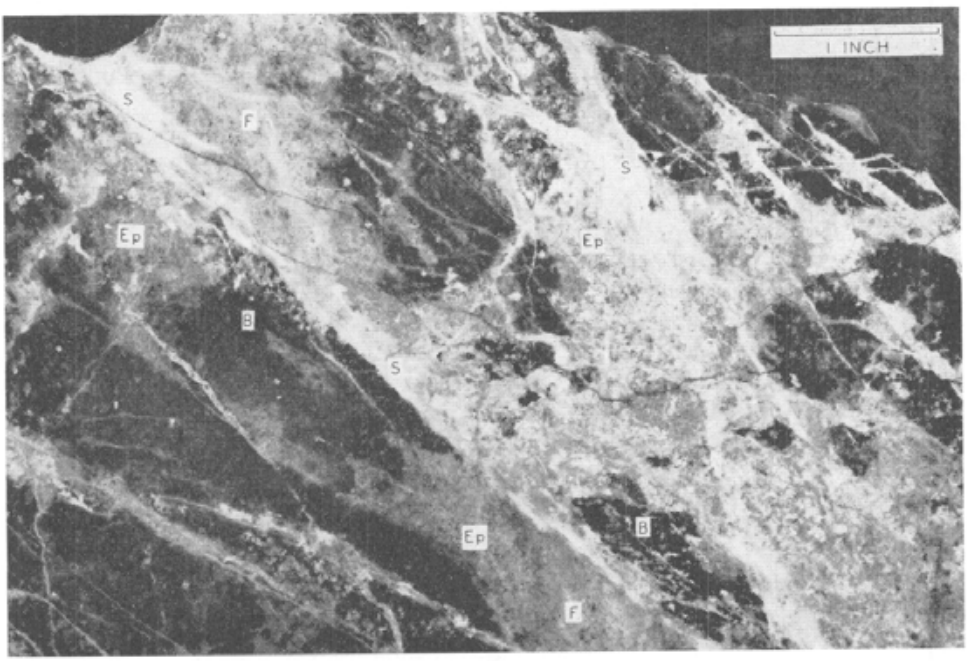


Plate IVB. Intensely altered pink and brown rock, probably derived from breccia of unit 2. B=brown biotite; Ep=mostly epidote and pyroxene; S=scapolite; F=strongly altered pink sodic plagioclase partly replaced by slightly darker-pink potash feldspar. Pink potash feldspar is the latest alteration in this picture.

continuous chalcopyrite and pyrite veinlets and patches appear to cut through scapolite veinlets. Alteration by pink feldspar occurred in two distinct stages. In the first there was wholesale replacement of the rock by salmon pink sodic plagioclase, which in turn was strongly sericitized, veined by scapolite, and finally veined and partly replaced by pink potash feldspar (*see* Plate IV). Veinlets and disseminations of fine-grained pyrite, chalcopyrite, and molybdenite are in turn cut by later veins of coarsely crystalline pyrite and bright-green epidote.

Apart from the main faults which have been briefly mentioned earlier, all rock units of the Ingerbelle block are cut by innumerable generally steeply dipping fractures, a large part of which trend in northwesterly and northeasterly directions.

Sulphide mineralization may be found in any of units 1, 2, 3, 4, 6, 7, or 8, and on a small scale its distribution is controlled by steeply dipping fractures and alteration zones. On a larger scale, however, most sulphides are found in the lower and central portions of unit 2, below unit 3. Within this area, rocks of unit 6 are also generally better mineralized than elsewhere. Very strongly pink feldspathized or intensely scapolitized rocks generally are not a good host to mineralization, most of which is found in less intensely altered rocks.

T

LOCATION: (49° 120° S.W.) Two miles southwest of Kennedy Mountain, on the southeast side of Whipsaw Creek adjoining the property of Ingerbelle Mines Limited.

CLAIMS: T 1 to 22.

ACCESS: Fifteen miles by road south from Princeton.

OWNER: Anchor Mines Ltd., 1111, 409 Granville Street, Vancouver 2; A. P. Fawley, consultant.

METAL: Copper.

WORK DONE: An induced polarization survey was made of the 22-claim group.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 178; Assessment Report No. 1774.

Whip, Saw

By V. A. G. Preto

LOCATION: (49° 120° S.W.) On the north side of Whipsaw Creek, approximately 8 miles upstream from the bridge on Highway No. 3.

CLAIMS: Twenty-eight recorded claims comprising the Whip, Saw, Axe, and Pick groups.

ACCESS: Twenty-one miles south from Princeton via Highway No. 3 and the Whipsaw Creek road.

OWNER: Texas Gulf Sulphur Company.

OPERATOR: Amax Exploration, Inc., 601, 535 Thurlow Street, Vancouver 5.

METALS: Copper, molybdenum.

WORK DONE: Over the whole claim block. Eight men were employed by the company and two by contractor for a period of two months. Work was supervised by D. K. Mustard, geologist for Amax Exploration, Inc. A geological survey and a soil and silt geochemical survey for copper and molybdenum were carried out over the whole claim block. Eight trenches totalling 4,200 feet were bulldozed and some access roads built.

REFERENCES: Assessment Reports Nos. 314, 362, 409, and 561.

DESCRIPTION:

The property is located along, and immediately east of, the contact between Eagle granodiorite and rocks of the Nicola Group. In this region the contact

trends north-northwesterly and dips at moderate angles to the west. Nicola rocks in the area have been metamorphosed to amphibolite schist. Minor folds in the metamorphic rocks are concentric or nearly concentric in style and strongly asymmetric. Conjugate minor folds are also found, but not as commonly as individual folds. All these structures plunge at moderate angles to the northwest, commonly have weakly curvilinear axes, and indicate a relative sense of movement of southwest over northeast.

Generally poorly developed b-lineation in the amphibolite schist and hornblende growing at random in the plane of the foliation indicate a thermal event which post-dated the main period of deformation.

The Eagle granodiorite in the area is strongly gneissic and inhomogeneous, and its appearance suggests that it is not intrusive but rather that it is a gneiss formed by granitization of pre-existing rocks. The contact between Eagle granodiorite and Nicola rocks is gradational and is marked by an increase of gneissic sills and dykes in the amphibolite schist over an area approximately 150 yards wide until only gneiss is found. Sills related to the Eagle granodiorite are, near the contact, folded with the amphibolite schist, but other sill-like bodies apparently of similar composition and origin cut through both folds and older sills.

Work done by the company indicates the presence of a body of biotite-quartz-feldspar porphyry situated mostly east of the Eagle-Nicola contact, within an area of Nicola rocks. In the same area there are also various types of feldspar porphyry dykes which trend north-northwesterly and may be associated with the body of biotite-quartz-feldspar porphyry mentioned above. Sulphide mineralization appears to be associated with the dykes and consists of abundant pyrite and minor chalcopyrite, bornite, magnetite, and molybdenite. The sulphides are found disseminated and in quartz veins or fractures in porphyry dykes, Nicola rocks, or Eagle granodiorite. Loci favourable to sulphide mineralization appear to be the porphyry dykes and the periphery and contact of the biotite-quartz-feldspar porphyry intrusion with Nicola and Eagle rocks.

By David Smith

Silvertip

LOCATION: (49° 120° S.W.) At the head of Whipsaw Creek, 21 miles southwest of Princeton at elevations of 4,500 to 5,000 feet.

CLAIMS: Silvertip 1 and 2, OK 1, 2, and 3 to 5 Fractions, mineral lease M30 (Three Forks, Lot 172; Contact No. 3, Lot 1549; and seven other fractions).

ACCESS: Twelve miles by road from Highway No. 3.

OPERATOR: Silver Tip Explorations Ltd., P.O. Box 697, Princeton.

METALS: Copper, zinc, silver.

WORK DONE: The construction of a mill was completed, a tailings dam built, and a trial run made on 150 tons of ore. An adit was collared and driven 32 feet, and some ore stockpiled at the mill-site. Three men were employed for 1½ months under the direction of H. P. Huff. Power is produced by a 250-kva. diesel-driven generator. The connected load is as follows: Crushing plant, 55 horsepower; grinding equipment, 75 horsepower; concentrating, 70 horsepower; conveyors, 15 horsepower; pumps, 10 horsepower; total, 225 horsepower.

Axe

LOCATION: (49° 120° S.W.) Directly south of the south end of Kennedy Lake for a distance of 12,000 feet and over a belt approximately 3,000 feet wide.

CLAIMS: Axe 1 to 16.

ACCESS: Via Highway No. 3 for a distance of 13 miles south from Princeton and then via the Kennedy Lake road.

OWNER: Kalco Valley Mines Ltd.

OPERATOR: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5.

METAL: Copper.

WORK DONE: Ground magnetometer, 12.2 line miles, supervised by A. E. Soregaroli and J. Knauer.

REFERENCE: Assessment Report No. 1745.

DESCRIPTION: Chiefly sedimentary rocks of the Nicola Group.

Ilk, Elk, Fri, PR

By V. A. G. Preto

LOCATION: (49° 120° S.W.) On both sides of the Similkameen River between Friday and Saturday Creeks and in the vicinity of Combination Creek.

CLAIMS: Eighty-six claims comprising leases M48, M51, M56, M68, and M70, and the Elk, Ilk, Fri, Ni, Ski, and PR groups.

ACCESS: Via Highway No. 3, 16 miles south of Princeton and then east for 1 mile by bush road.

OWNER: Kalco Valley Mines Ltd.

OPERATOR: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5.

METAL: Copper.

WORK DONE: Ground magnetometer, induced polarization, and electromagnetic surveys and soil geochemical survey over various parts of the property. Thirteen bulldozer trenches totalling 4,800 feet, 25 rock pits totalling 100 feet, 13 BQ-size diamond-drill holes totalling 4,426 feet.

REFERENCES: Montgomery, J. H., 1967, Petrology, Structure and Origin of the Copper Mountain Intrusions near Princeton, British Columbia, unpublished Ph.D. thesis, *U.B.C.*

DESCRIPTION:

The claims straddle the Similkameen River and cover a portion of the southern contact of the Copper Mountain stock with volcanic and sedimentary rocks of the Nicola Group. Nicola rocks consist of generally massive andesitic volcanics, argillite, and fine-grained cherty, hornfelsed bedded tuff and (or) siltstone and sedimentary breccia. Low-grade metamorphism has produced widespread biotite, epidote, and chlorite. The extensive development of pink feldspar and scapolite which is so typical of some areas along the northern contact of the Copper Mountain stock is virtually absent here.

On the Reco mineral claim, in the vicinity of the stock, layered Nicola rocks dip steeply and trend parallel to the contact. To the west, however, in the gorge along the Similkameen River immediately south of Saturday Creek, a very distinctive bed of pillow lava several tens of feet thick outlines a tight synform which plunges to the south and trends nearly at right angles to the intrusive contact. Faulting and fracturing of all rocks are prominent and widespread along northwesterly and northeasterly trends.

Mineralization consists of chalcopyrite, pyrite, and bornite disseminated and in fractures in Nicola rocks and in Copper Mountain diorite along and near the intrusive contact. Pegmatitic pink feldspar veins which carry some bornite are found in intrusive rocks near the contact. Disseminated pyrite, pyrrhotite, and minor chalcopyrite are also found widespread in Nicola rocks away from the stock contact and particularly in one area approximately 1,200 feet wide and 2,000 feet long on the Reco mineral claim.

OSOYOOS MINING DIVISION

BRENDA LAKE

By David Smith and L. Wardman

Brenda Mine

LOCATION: (49° 120° N.E.) One mile east of Brenda Lake.

CLAIMS: One hundred and seventeen mineral claims and fractions including seven Crown-granted mineral claims and mineral leases Nos. 58 and 59.

ACCESS: The original camp established at MacDonald Lake is still used by employees of Brenda Mines Ltd. In 1968, with the aid of a grant from the British Columbia Department of Mines and Petroleum Resources, an additional 4 miles of road was improved to highway standards, and the mine is now serviced by 17 miles of excellent secondary highway.

OWNER: Brenda Mines Ltd., 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.

METALS: Copper, molybdenum.

WORK DONE:

In 1968, construction of the concentrator and crushing units was commenced, and work has been continuous throughout the year except for minor delays caused by work stoppage due to a labour dispute. As well as construction of the mill units, a fully equipped heavy maintenance and equipment shop has been completed. The main office building and a service building housing a dry and offices for mine personnel have been completed. Construction crews have been housed in a camp on site, adequately equipped to handle 500 men. Some of the crew commute from Peachland, Kelowna, and Penticton.

In 1968, overburden and waste rock has been continuously removed and trucked a distance of 4 miles, where it is used as part of the fill material in a tailings dam and a reclaim dam.

Equipment consists of twelve 100-ton electrohaul trucks, two 11-cubic-yard electric shovels, and two 60-R rotary drills.

A 4,160-volt power-line was built from the plant substation to the pit. A 1,200-horsepower electric shovel and a 600-horsepower drill were put into service.

It is expected that the mine and mill will be in operation by the autumn of 1969. The plant is designed for production at the rate of 24,000 tons per day. Copper concentrates are to be shipped to Japan as well as part of the molybdenum concentrates.

Maximum construction crews have at times numbered more than 450 men. The Brenda mine crew is 75 and is expected to increase to 300 when all units are in operation.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept, 1967, pp. 183–211.

North Brenda

LOCATION: (49° 120° N.E.) At elevation of 5,000 to 6,000 feet adjoining Brenda Mines property on the north.

CLAIMS: Total of 130 claims including the Jef, Coulee, etc., groups.

ACCESS: By logging-road from Peachland, a distance of 28 miles.

OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; R. C. Heim, geologist.

METALS: Copper, molybdenum.

Plate VA. Brenda mine, looking south across proposed open pit.

Plate VB. Brenda mine, looking southeast to plant-site from south limit of proposed open pit.

WORK DONE: Two men worked for two weeks. Some bedrock cuts were blasted.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 211.
DESCRIPTION: Molybdenite and chalcopyrite occur as breccia zones and fracture fillings in granodiorite (Brenda stock).

PEACHLAND

Decano

LOCATION: (49° 120° N.W. and N.E.) Eight miles southwest of Peachland.
CLAIMS: Total of 79 claims known as Decano 17 to 36, 104 Fraction, Stag 1 to 13, Fire 1 to 8, Candle 7 to 10, Eagle 7 to 18, Glen 1 to 8.
ACCESS: By road from Peachland, a distance of 12 miles.
OWNER: Juniper Mines Ltd., 201, 714 West Hastings Street, Vancouver 1; R. Philp, geologist.
METAL: Molybdenum.
WORK DONE: Work consisted of 2,575 feet of percussion drilling in 15 holes. Previous work had been done in 1967 by Juniper Mines Ltd. and in 1965 by Maverick Mines and Oils.
DESCRIPTION: Molybdenite and ferrimolybdite occur in granodiorite and feldspar porphyry.

SUMMERLAND

Wendy

LOCATION: (49° 119° N.W.) One mile south of Kirton station, 12 miles west of Summerland.
CLAIMS: Wendy 1 to 24.
ACCESS: Sixteen miles via Fish Lake road from Summerland.
OWNER: Polaris Mines Limited, 501, 535 Thurlow Street, Vancouver 5.
METAL: Copper.
WORK DONE: Magnetometer survey and geochemical soil-sampling over the 24 claims.
REFERENCE: Assessment Report No. 1567.

OKANAGAN FALLS

J Gus, JG, Joe

LOCATION: (49° 119° S.W.) One mile south of south end of Skaha Lake.
CLAIMS: One hundred and thirty-four claims including J Gus 1 to 7, JG 1 to 14, Gus 1 to 10, Joe 1 to 5, Dusty 1 to 16, Mac 1 to 13, and others.
ACCESS: By paved highway passing through Okanagan Falls.
OWNER: Dusty Mac Mines Ltd., 404, 510 West Hastings Street, Vancouver 2; Marcel Guiget, project manager.
METALS: Gold, silver.
WORK DONE: Ten men worked two months on the property mapping surface and underground workings. Four rock cuts, total length 140 feet, were blasted, and an incline drift 126 feet long was driven.

Lynx, Late

LOCATION: (49° 119° S.E.) At elevations between 5,100 and 6,000 feet just west of Allendale Lake.
CLAIMS: Lynx 1 to 27, Late 1 to 6.
ACCESS: By road from Okanagan Falls, a distance of 15 miles.
OWNERS: K. G. Ewers and R. W. McLean.

OPERATOR: Gunnex Limited, 1019, 409 Granville Street, Vancouver 2.
METAL: Copper.
WORK DONE: Three men worked one month under the direction of Allan McGain, geologist. Reconnaissance geological mapping was done and magnetometer, electromagnetic, and geochemical surveys were made.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 190; Assessment Report No. 1741.

HEDLEY

Flint (Mission)

By N. D. McKechnie

LOCATION: (49° 120° S.E.) On west side of Jamieson Creek and southwest of Hedley between elevations 4,500 and 5,300 feet; adjoins Indian Reserve No. 2c on the northwest.
CLAIMS: Flint 1 to 6, Rock 1 to 6, Stone 1 to 4, Hank 1 to 4, Newt 1 to 8, grouped as Mission group, the original name.
ACCESS: By logging-road which leaves Princeton highway about one-quarter mile west of Similkameen River bridge, follows Whistle Creek to about 3,000 feet elevation, then eastward to the working area for a total distance of 16 miles.
OWNER: Austro-Can Explorations Ltd., c/o Herman Plank, president, P.O. Box 413, Vancouver.
METAL: Silver.
WORK DONE: Bulldozer trenching.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1936, p. D 11; *Geol. Surv., Canada,* Mem. 243, p. 78.

DESCRIPTION:

The mineral showings are near the junction of claims Flint 1 to 4 and are the same as those described in 1936.

The rock underlying the working area is biotite granodiorite or quartz monzonite well jointed in the direction north 15 degrees west. The monzonite is cut by a number of small shears and fractures striking in two dominant directions, north 30 degrees east and north 60 degrees east. Three of the better-developed shears are described in the 1936 Report as the Barnes zone (strike north 30 degrees east, dip 70 degrees southeastward) and the Walker and Winkler zones (strike north 60 degrees east, dip 80 degrees northwestward to 85 degrees southeastward). The Barnes zone contains subsidiary fractures paralleling the Walker and Winkler zones as well as an eastward-striking set dipping 45 degrees north and a set striking north 50 degrees west and dipping 65 degrees southwestward.

All the shears and fractures described are mineralized with sulphides and quartz. In the specimens taken by the writer, only pyrite and arsenopyrite were recognized; the 1936 Report mentions sphalerite, tetrahedrite, and chalcopyrite also. At no place, including the extant exposures of the Barnes zone, did the mineralized breaks form an appreciable proportion of the exposure.

A strongly developed alteration of the quartz monzonite accompanies all of the mineralized stringers and fades out away from them. The altered rock is a mosaic of quartz, orthoclase, and green mica (altered biotite) veined by sericite. The sulphides occur with the sericite and the green mica. Northward and eastward from the Barnes-Walker-Winkler area limited rock outcrops showed this alteration to be more widespread than the original working area. As the alteration appears to be directly related to mineralization, bulldozer trenching was begun on Flint No. 4 mineral claim to test the possibility that a large mineable zone of low-grade ore might exist.

OPERATOR: Gunnex Limited, 1019, 409 Granville Street, Vancouver 2.
METAL: Copper.
WORK DONE: Three men worked one month under the direction of Allan McGain, geologist. Reconnaissance geological mapping was done and magnetometer, electromagnetic, and geochemical surveys were made.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 190; Assessment Report No. 1741.

HEDLEY

Flint (Mission)

By N. D. McKechnie

LOCATION: (49° 120° S.E.) On west side of Jamieson Creek and southwest of Hedley between elevations 4,500 and 5,300 feet; adjoins Indian Reserve No. 2c on the northwest.
CLAIMS: Flint 1 to 6, Rock 1 to 6, Stone 1 to 4, Hank 1 to 4, Newt 1 to 8, grouped as Mission group, the original name.
ACCESS: By logging-road which leaves Princeton highway about one-quarter mile west of Similkameen River bridge, follows Whistle Creek to about 3,000 feet elevation, then eastward to the working area for a total distance of 16 miles.
OWNER: Austro-Can Explorations Ltd., c/o Herman Plank, president, P.O. Box 413, Vancouver.
METAL: Silver.
WORK DONE: Bulldozer trenching.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1936, p. D 11; *Geol. Surv., Canada,* Mem. 243, p. 78.

DESCRIPTION:

The mineral showings are near the junction of claims Flint 1 to 4 and are the same as those described in 1936.

The rock underlying the working area is biotite granodiorite or quartz monzonite well jointed in the direction north 15 degrees west. The monzonite is cut by a number of small shears and fractures striking in two dominant directions, north 30 degrees east and north 60 degrees east. Three of the better-developed shears are described in the 1936 Report as the Barnes zone (strike north 30 degrees east, dip 70 degrees southeastward) and the Walker and Winkler zones (strike north 60 degrees east, dip 80 degrees northwestward to 85 degrees southeastward). The Barnes zone contains subsidiary fractures paralleling the Walker and Winkler zones as well as an eastward-striking set dipping 45 degrees north and a set striking north 50 degrees west and dipping 65 degrees southwestward.

All the shears and fractures described are mineralized with sulphides and quartz. In the specimens taken by the writer, only pyrite and arsenopyrite were recognized; the 1936 Report mentions sphalerite, tetrahedrite, and chalcopyrite also. At no place, including the extant exposures of the Barnes zone, did the mineralized breaks form an appreciable proportion of the exposure.

A strongly developed alteration of the quartz monzonite accompanies all of the mineralized stringers and fades out away from them. The altered rock is a mosaic of quartz, orthoclase, and green mica (altered biotite) veined by sericite. The sulphides occur with the sericite and the green mica. Northward and eastward from the Barnes-Walker-Winkler area limited rock outcrops showed this alteration to be more widespread than the original working area. As the alteration appears to be directly related to mineralization, bulldozer trenching was begun on Flint No. 4 mineral claim to test the possibility that a large mineable zone of low-grade ore might exist.

Although arsenopyrite is the most prominent sulphide, the sulphide minerals contain only a negligible amount of gold. Geological Survey of Canada Memoir No. 2, " Geology and Ore Deposits of the Hedley District," notes on page 140 that although gold is associated with arsenopyrite, not all of the arsenopyrite in the district contains appreciable gold. Assays given in the 1936 Report show silver ranging from 0.2 ounce per ton to 20 ounces per ton, the latter from a picked specimen high in sphalerite. A picked sample of arsenopyrite and pyrite taken by the writer contained 3.1 ounces silver per ton and trace gold.

JM

LOCATION: (49° 120° S.E.) On McNulty Creek, 5 miles north of Hedley.
CLAIMS: About 45 JM recorded claims.
ACCESS: By road from Hedley, a distance of 5 miles.
OWNER: Anacanda American Brass Limited, Britannia Beach.
METALS: Molybdenum, copper.
WORK DONE: Five men were employed for two months under the direction of J. M. McAndrew, geologist, making an induced polarization survey of the property.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 216; Assessment Reports Nos. 1225, 1615, and 1617.
DESCRIPTION: Molybdenite along fractures and associated with pyrite and malachite occurs in fine-grained andesite.

Nickel Plate Mine

By David Smith

LOCATION: (49° 120° S.E.) At Hedley.
CLAIMS: Total of 83 claims, of which the key claims are the Kingston, Warhorse, and Bulldog.
ACCESS: By road from Highway No. 3, a distance of 10 miles.
OWNER: Burden Investors Services, Inc.
OPERATOR: G.M. Explorations Limited, 1825, 355 Burrard Street, Vancouver 1; A. M. Gerun and C. Stanford, geologists.
METALS: Copper, gold.
WORK DONE: Detailed geological mapping was done on the Kingston, Warhorse, Rollo, and Princeton claims, electromagnetic and magnetometer surveys were made, soil samples were taken for geochemical analysis, and 2,000 square feet of bedrock was stripped by bulldozer.

ASHNOLA RIVER

Ash, Nola, Etc.

By V. A. G. Preto

LOCATION: (49° 120° S.E.) Immediately west of the Ashnola River, at its junction with McBride Creek.
CLAIMS: One hundred and sixty-six claims comprising the Ash, Nola, A, Car, Jam, and McBride groups.
ACCESS: From Keremeos via the Ashnola River road for a distance of 25 miles.
OPERATOR: Quintana Minerals Corporation, 2160 One Bental Centre, Vancouver 1.
METALS: Molybdenum, copper.
WORK DONE: On Nola No. 7 and No. 9 claims. Two men were employed by the company and five by contractor, under the supervision of J. H. Montgomery, consulting geologist. A geological map of the property was made and six NQ-size diamond-drill holes totalling 2,957 feet were completed.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1960, p. 55; 1966, p. 187.

DESCRIPTION: A sequence of acid volcanic rocks of probable Kingsvale age is intruded by quartz porphyry and by a plug of biotite quartz monzonite. Fracturing and pyritization are strong and extensive. Quartz vein stockwork and (or) pervasive silicification are locally strong. Sericitization and kaolinization are also present. Mineralization consists of abundant and widespread pyrite with minor chalcopyrite, molybdenite, and possibly chalcocite. Malachite and ferrimolybdite are alteration products of chalcopyrite and molybdenite. A brief examination of the property indicated that fracturing and wallrock alteration crudely conform to a circular pattern centred on a small body of quartz monzonite.

KEREMEOS

Urp

LOCATION: (49° 119° S.W.) At the International Boundary 10 miles west of the Similkameen River.

CLAIMS: Urp 1 to 11.

ACCESS: By helicopter from Keremeos, a distance of 15 miles.

OWNER: Phelps Dodge Corporation of Canada, Limited, 404, 1112 West Pender Street, Vancouver 1.

METALS: Molybdenum, copper.

WORK DONE: Five men worked for two weeks under G. A. Whiton, project geologist. The claims were geologically mapped; soils and rocks were sampled for geochemical analysis.

DESCRIPTION: Molybdenite with minor chalcopyrite and pyrite occurs in quartz veins and disseminations in fractured quartz monzonite.

Goats, Mons

LOCATION: (49° 119° S.W.) At elevation 3,500 feet, 7 miles northwest of Keremeos.

CLAIMS: Goats 1 to 6, Mons 5 to 18.

OWNER: Monarch Metal Mines Limited, 214, 475 Howe Street, Vancouver 1.

METALS: Silver, gold, lead.

WORK DONE: Fault and shear zones trenched and stripped by bulldozer; 1,700 cubic yards of overburden removed.

DESCRIPTION: Galena-bearing quartz veins in shear zones in cherts, tuffs, and greenstones.

Mag

LOCATION: (49° 119° S.W.) Two miles west of Keremeos.

CLAIMS: Mag 1 to 6, formerly Louis.

ACCESS: By road from Keremeos, a distance of 2 miles.

OWNER: Union Carbide Exploration Corporation, 601, 1112 West Pender Street, Vancouver 1.

METAL: Manganese.

WORK DONE: Work was carried out over a two-month period under the direction of R. A. M. Wilson, resident geologist. The geology of the Mag 2 and 3 claims was mapped, and 50 trench samples were taken. The assay results indicate that the primary manganese silicate is of sub-ore grade; there is some surface enrichment by manganese oxides.

By David Smith and L. Wardman

Horn Silver Mine

LOCATION: (49° 119° S.W.) On the western slope of Richter Mountain, 16 miles south and east of Keremeos and 4 miles north of the International Boundary.
CLAIMS: Property comprises two Crown-granted and 41 recorded mineral claims.
ACCESS: 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 Richter Mountain.
OWNER: Utica Mines Ltd., 904, 510 West Hastings Street, Vancouver 2; mine address, P.O. Box 47, Keremeos.
METALS: Silver, gold (*see* Table 12 for production).

WORK DONE:

Development in the mine was as follows: Drifting, 4,758 feet; raising, 1,051 feet. In 1968, 128,000 tons was milled.

A new office block was built and wired, and a 2,200-volt line was built to it. The voltage is stepped down to 220/110 volts at the service. Several feeders were rerouted. A 25-kva. transformer was installed to replace the two 10-kva. for the assay laboratory.

In the mine at the west end of 2600 level a substation and battery-charging unit were installed. A 550-volt cable was installed to feed slushers on 2400 level.

A pump for pumping reclaim water was installed on 2400 level. On 2200 level ore drift a fan compressor and light were installed.

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; 1967, pp. 219–221.

OSOYOOS

Chukar, Quail, Etc.

LOCATION: (49° 119° S.E.) Two miles southwest of Osoyoos.
CLAIMS: Chukar 2 to 16, Quail 2 and 3, Moly 1 to 4 recorded claims and Gem, Whistler, Molka, Rohne, and other Crown-granted claims.
ACCESS: By road from Osoyoos, a distance of 2 miles.
OWNER: K. A. Butler, Osoyoos.
OPERATOR: The Granby Mining Company Limited, 507, 1111 West Georgia Street, Vancouver 5; K. C. Fahrni, chief geologist.
METAL: Copper.
WORK DONE: Three men worked for two months. An area of 20,000 square feet was stripped by bulldozer, and 14 percussion-drill holes totalling 2,040 feet were drilled.
DESCRIPTION: Chalcopyrite in a quartz carbonate gangue occurs in shears, veins, and stringers in andesites and diorites.

VERNON MINING DIVISION

MABEL LAKE

D.C.K.

LOCATION: (50° 118° N.W.) Head of Kingfisher Creek, northwest of Mabel Lake, adjoining the Bright Star Trio (Kingfisher).
CLAIMS: D.C.K. 7 to 9, 44 to 48.

ACCESS: Approximately 30 miles from Enderby.
OWNER: D. C. King, P.O. Box 904, Vernon.
OPERATOR: King Graybarr Mines Ltd., 2815—31st Street, Vernon.
METALS: Tungsten, gold, silver.
WORK DONE: Two men worked under the direction of W. C. Rotar; 100 feet of diamond drilling was done.

Bright Star

LOCATION: (50° 118° N.W.) On Kingfisher Creek at the head of Mabel Lake.
CLAIMS: Total of 127 claims including the BST, Star, Len, and Deer claims, comprising the Star, Bright Star, and Golden West groups.
ACCESS: Via Mabel Lake road from Enderby, a distance of 27 miles.
OWNER: Bright Star Trio Mining Ltd., 3302—17th Street, Vernon; J. Butula, president.
METALS: Lead, zinc.
WORK DONE: Work was carried out over a four-month period by two men. Fourteen trenches and pits were excavated and a 24-foot diamond-drill hole put down.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1964, p. 105; Assessment Reports Nos. 578 and 579.

LUMBY

Val

LOCATION: (50° 118° S.W.) On Vidler Creek near Lumby.
CLAIMS: Total of 14 claims known as Val.
ACCESS: By road from Lumby, a distance of 14 miles.
OWNER: Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2; W. St. C. Dunn, superintendent of exploration.
METAL: Uranium.
WORK DONE: Four men were employed for one month. The geology of the claims was mapped by R. H. Seraphim on a scale of 1 inch equals 500 feet, a spectrometer survey was made of an area underlain by sandstone, conglomerate, and tuffaceous arkose of Tertiary age, and three percussion-drill holes totalling 898 feet were drilled.

Chaput

By David Smith

LOCATION: (50° 118° S.W.) On the east bank of Bessette Creek, 2 miles northeast of Lumby.
CLAIMS: Chaput 1 to 24.
ACCESS: By 1½ miles of good road from Highway No. 6 at Lumby.
OWNERS: W. and E. Chaput.
OPERATOR: F.K. Explorations Ltd., 10647 King George Highway, North Surrey; field address, P.O. Box 399, Lumby.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Half a mile of road was constructed to the property. Two adits totalling 240 feet were driven; the upper one, 200 feet long, was driven on a quartz vein for 125 feet. Ore was cobbed and shipments totalling 327 tons were trucked to the Trail smelter. A bin is being constructed to facilitate handling of shipping ore. A crew of nine was employed under the direction of A. Panpu.

OKANAGAN LAKE

Pat

LOCATION: (50° 119° S.W.) Between elevations of 2,500 and 4,500 feet near the head of Whiteman Creek, 6 miles west of Okanagan Lake.
CLAIMS: Pat 10, 12, 27.
ACCESS: Six miles by helicopter from Whiteman.
OWNER: Noranda Exploration Company, Limited, 1050 Davie Street, Vancouver 5; A. Soregaroli, geologist.
METAL: Copper.
WORK DONE: Two men spent one month on the property. Six holes totalling 246 feet were diamond drilled.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 223; Assessment Report No. 1039.

WHITEROCKS MOUNTAIN

Night Owl

LOCATION: (50° 119° S.W.) On the west slopes of Whiterocks Mountain.
CLAIMS: Night Owl 1 to 70, formerly Bard.
ACCESS: By road from Westbank, a distance of 25 miles.
OWNER: Texas Gulf Sulphur Company, 701, 1281 West Georgia Street, Vancouver 5; J. R. Loudon, district geologist.
WORK DONE: Geological mapping and soil-sampling by four men for one month.

VERNON

By David Smith

Dakota, Silver Streak, Anne

LOCATION: (50° 119° S.E.) On Vernon Hill 5 miles east of Vernon.
CLAIMS: The Anne 1 to 7, D.C.K. 1 to 6, 24 to 43, 49 to 51, 54 to 61, WCR 1 to 5, and the Silver Streak, Copper, Denyse, Gold, and Dakota groups held by Vernon Copper Limited.
ACCESS: Five miles east of the city of Vernon by the east Vernon road.
OWNERS: D. C. King, W. C. Rotar, and Vernon Copper Limited.
OPERATOR: King Graybarr Mines Ltd., 2815—31st Street, Vernon.
METALS: Silver, lead, molybdenum, copper.
WORK DONE: Five miles of access road was built, and 400 feet of trenches was bulldozed. Some sampling was done.

JUBILEE MOUNTAIN

B.S., Pane, Fern

LOCATION: (49° 118° N.W.) On the west and south slopes of Jubilee Mountain, 2 miles southeast of Graystoke Lake.
CLAIMS: A total of 71 claims comprising the B.S. 1 to 36, Pane 1 to 27, and Fern 1 to 8.
ACCESS: By road from Kelowna, a distance of 35 miles.
OWNER: Dewain M. Cox.
OPERATOR: Copper Hill Mining and Exploration Co. Ltd., P.O. Box 506, Grand Forks; Dewain M. Cox, exploration manager.
METALS: Copper, molybdenum, tungsten, nickel.
WORK DONE: The claims were geologically mapped, magnetometer and geochemical surveys were made, and 12 miles of road was built. Six men worked for three months.
DESCRIPTION: Chalcopyrite, molybdenite, and scheelite occur as disseminations and in veins in quartz monzonite.

LIGHTNING PEAK

Waterloo No. 3

LOCATION: (49° 118° N.E. and N.W.) At the head of Rendell Creek on the north side of Lightning Peak, about 18 miles south of Monashee Pass.
CLAIMS: Waterloo No. 3 (Lot 4815) Crown-granted mineral claim, Peak 1 to 200.
ACCESS: Via 18 miles of fair road which leaves Highway No. 6 near Monashee Pass.
OWNER: Great Horn Mining Syndicate Inc.
OPERATOR: International Mine Services Limited, 1601, 8 King Street East, Toronto; W. J. Stephen, project manager.
METALS: Silver, lead, zinc.
WORK DONE: A topographic map was prepared and surface and underground workings were surveyed. The regional geology was mapped and detailed geology was done in Waterloo, Payday, and Lightning Peak areas. A self-potential survey was made in the vicinity of the Payday adit. Soil samples for geochemical analysis were taken from the entire area, and detailed sampling was done in a small area in the vicinity of the Payday adit. Twenty-two men spent three months on the property.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, p. 191; 1967, p. 223.

GREENWOOD MINING DIVISION

BEAVERDELL

Highland Bell Mine

By P. E. Olson and L. Wardman

LOCATION: (49° 119° S.E.) The property is on the west slope of Wallace Mountain, about 1 mile east of Beaverdell.
CLAIMS: Fourteen recorded mineral claims and 32 Crown-granted mineral claims.
ACCESS: The property is serviced by several roads from Beaverdell.
OWNER: Mastodon-Highland Bell Mines Limited, 300, 999 West Pender Street, Vancouver 1; mine office, Beaverdell; B. Goetting, mine manager.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Drifts and crosscuts, 3,426 feet; raises, 908 feet; winzes, 230 feet; diamond drilling, 28,800 feet. The lighting circuits in the mill were improved. In the crushing plant the cone crusher and cone belts were relocated. Circuit-breakers and headlights were installed on the trammers.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 223–224.
DESCRIPTION: Main production was obtained from 2800E, 2850, 2900, 3000, and 3100 levels, with minor production coming from the Lass No. 2 level and the Bell No. 4 level. An active exploration and development programme was carried out in the old Bell mine, with a new ore-pass being driven from the Lass No. 4 level and a 380-foot drift being driven under the Beaver workings. About 1,100 tons of dump rock was milled in addition to mine production.

Rambler

By P. E. Olson

LOCATION: (49° 119° S.E.) On the west slope of Wallace Mountain, immediately south of the Mastodon-Highland Bell holdings.
CLAIMS: Nine recorded and Crown-granted mineral claims, including the Rambler (Lot 2861).
ACCESS: Via the Wallace Mountain mining-road from Beaverdell.
OWNER: Highland Silver Mines, Ltd.

OPERATOR: Ajax Mercury Mines Limited, 115, 815 West Hastings Street, Vancouver 1.

METAL: Silver.

WORK DONE: Stripping and diamond drilling, mainly on the Rambler claim.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1935, p. D 14.

ROCK CREEK

RC

LOCATION: (49° 119° S.E.) On Johnstone Creek 3 miles north of Johnstone Creek park.

CLAIMS: RC 60 to 64, 95 to 102, 116 to 123.

ACCESS: By road from Rock Creek, a distance of 8 miles.

OWNER: Anaconda American Brass Limited, Britannia Beach.

METAL: Nickel.

WORK DONE: Six men worked for two weeks under B. Goddard, geologist. Some gelogical mapping was done, an induced polarization survey was made, and an 80-foot diamond-drill hole was put down.

REFERENCE: Assessment Report No. 1230.

Old Nick

By G. E. P. Eastwood

LOCATION: (49° 119° S.E.) South of Rock Creek and southeast of the Southern Trans-Canada highway bridge.

CLAIMS: Old Nick Nos. 1, 2, and 20.

ACCESS: From the Southern Trans-Canada highway on private road through Mr. Pendergraff's farm, thence east along an abandoned grade of the Great Northern Railway.

OWNER: Nickel Ridge Mines Ltd., 904, 510 West Hastings Street, Vancouver 2. (Controlling interest in company held jointly by Copper Ridge Mines Ltd. and Utica Mines Ltd.)

OPERATOR: Newmont Mining Corporation of Canada Limited, 604, 744 West Hastings Street, Vancouver 1.

METAL: Nickel.

WORK DONE: Geologic mapping, sampling of stream sediments and soils, airborne and ground magnetometer surveys, bulldozer trenching, and rock-sampling.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, pp. 192–193; 1967, p. 224.

DESCRIPTION:

The nickel occurs in pyrrhotite that is disseminated through (1) a large area of altered rock and (2) a large dyke of dunite. The altered area lies between Rock Creek and the old railway grade, and extends for half a mile east from a shallow shaft and short adit that are due south of the confluence of Baker Creek with Rock Creek. The dyke extends eastward from this altered area for a further 2,200 feet and is as much as 250 feet wide.

The altered rock passes eastward and southward to schists, phyllites, and metagreywackes assigned by Little (*Geol. Surv., Canada,* Map 15-1961) to the Anarchist Group. Metagreywacke is displayed in rock cuts of the old railway grade to the south of the approximate eastern end of the altered area. It is more or less calcareous and hornblendic. It passes westward to meta-argillite that is

conspicuously banded with calcite. These bands show crenulated dragfolds indicative of up-dip overriding, and probably represent thin limestone beds. This banded rock is underlain by less calcareous meta-argillite containing some gritty greywacke. To the north, carbonaceous quartz-mica schist is interspersed with altered rock in a trench along the east edge of exposure. Within the area of altered rock are small patches of chlorite-mica phyllite, mica hornfels, and a wispy hornblende-plagioclase schist. The original rock in the area of alteration was probably largely sedimentary, with possibly some interbedded or admixed volcanic material.

The typical altered rock is fine grained, hard, and vitreous, white to light grey in colour, and contains closely spaced, narrow dark bands about 1 millimetre thick. It resembles sheared or sheeted quartzite, and has been so identified in one report. Thin-sections disclose, however, that the rock consists largely of tremolite, with some remnant pyroxene and minor quartz and micas replacing the tremolite, and that the dark bands are wisps of epidote, zoisite, and clinozoisite, with sporadic remnants of feldspar. The micas are both white and green. The green mica is deduced from its maximum refractive index and from a spectrochemical analysis to be a chromian phengite containing more chromium than the type mariposite. It is confined to a few northeast-striking bands or lenses, less than 60 feet wide, within which it forms indistinct veinlets along the contacts of the wisps with the tremolite rock. The white mica is sparse but widespread. Quartz is both sparingly disseminated and present as small lenses and veinlets in the tremolite rock. Carbonate is generally negligible in amount, but in one exposure it has largely replaced the tremolite rock.

The ultramafic dyke is a dense black rock containing seams of white to green serpentine. No entirely fresh rock was found, but in some places distant from contacts and shear zones substantial olivine has survived. Pyroxene was not found, and the rock is altered dunite. The alteration minerals include magnetite, brown chrysotile (both of which contribute to the dark colour), antigorite, serpophite, chlorite, tremolite, locally anthophyllite, and minor carbonate.

Probable bedding was identified in only one place, in the exposure of banded rock beside the old railway grade mentioned above. Overall, the calcite bands strike north 20 degrees east and dip 40 degrees east. These bands have been thrown into fairly open dragfolds with a wave-length of 1 to 2 feet, on which are superposed crenulations about 2 inches across. The form of the dragfolds indicates up-dip overriding, and the beds are probably right side up.

The metagreywacke overlying the calcite-banded rock shows scattered schistosity and gneissosity striking north 60 degrees east and dipping vertically. To the north, in a trench along the east end of exposures of altered rock, tongues of black schist have roughly similar schistosity attitudes. The dark wisps in the tremolite rock are subparallel to this schistosity, and may have inherited their structure from it.

The rocks are traversed by several shear zones striking between 10 and 15 degrees east of north. The tremolite rock is extensively rubbled adjacent to them, and dunite is altered to a mass of light-green serpentine 15 to 20 feet wide. Displacement on the shear zones was probably slight.

Pyrrhotite can be found in at least trace amounts in virtually all the rocks of the area, but it is more abundant in the tremolite rock and the altered dunite. In the tremolite rock it occurs preferentially in and near the wisps. A small amount occurs along grain boundaries in quartz lenses that transect the tremolite, but most of the pyrrhotite appears to be older than the quartz. Pyrite and locally chalcopyrite accompany the pyrrhotite in the tremolite rock. In the altered dunite, pyrrhotite is rather closely associated with magnetite. A composite sample, comprising chips from seven points within the altered area, assayed 0.23 per cent nickel.

KETTLE RIVER

Crown Point, Lucky, Zamora

LOCATION: (49° 118° S.W.) Two miles west of Kettle River, about 2½ miles south of Westbridge.

CLAIMS: Crown Point (Lot 2448) and Lucky 1 to 5, Zamora 6 to 10 recorded mineral claims adjoining the Crown Point.

ACCESS: By truck-road which leaves the Rock Creek–Westbridge road immediately south of Ed James Creek.

OWNER: G. E. White, of Oliver.

OPERATOR: Tonto Explorations Ltd., 242 Lawrence Avenue, Kelowna; J. E. Nott, in charge of exploration.

METALS: Silver, lead, zinc.

WORK DONE: Bulldozer trenching.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1905, p. 181; 1921, p. 184.

Lou

LOCATION: (49° 118° S.W.) East side of Kettle River, 1½ miles north of the junction of Lost Horse Creek and Kettle River.

CLAIMS: Lou 1 to 41.

ACCESS: Twenty-five miles by road from Rock Creek.

OWNER: Rip Van Mining Ltd., 020, 640 Seventh Avenue Southwest, Calgary, Alta.; S. J. Hunter, consulting engineer.

METALS: Copper, zinc.

WORK DONE: Two men worked for a month and a half on the property. Surface workings were mapped, soil samples for geochemical analysis were taken, and 17 trenches totalling 7,060 feet were bulldozed.

REFERENCE: Assessment Report No. 1722.

MIDWAY

Lois, Bruce

By P. E. Olson

LOCATION: (49° 118° S.W.) About 2 miles northwest of Midway.

CLAIMS: Lois 1 to 26 and one Crown-granted mineral claim, Bruce (Lot 918).

ACCESS: The property lies immediately north of the Midway–Rock Creek highway.

OWNER: Lois group is owned by The Granby Mining Company Limited, P.O. Box 490, Grand Forks, the Bruce is held under option.

METAL: Copper.

WORK DONE: One thousand seven hundred feet of diamond drilling.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 225; Assessment Report No. 809.

GREENWOOD

Buckhorn

LOCATION: (49° 119° S.W.) Deadwood camp, on Buckhorn Creek 2 miles west of Greenwood.

CLAIMS: Buckhorn (Lot 1107), Moreen Fraction (Lot 1709), mineral leases M226 (Tintic, Lot 1461, and Red Metal Fraction, Lot 1568), and M227 (Little Ruth, Lot 881), and others.

ACCESS: Two miles by road from Greenwood.

OWNER: San Jacinto Explorations Limited, 2, 515 Granville Street, Vancouver 2.

METALS: Copper, molybdenum.

WORK DONE: Ten men worked for two months under J. MacLean, foreman. Three trenches totalling 550 feet were bulldozed on the Buckhorn and Moreen Fraction. Four holes totalling 1,827 feet were diamond drilled.

Croesus

By P. E. Olson

LOCATION: (49° 118° S.W.) Two miles south of Greenwood and east of Boundary Creek.

CLAIMS: Croesus (Lot 866) and four other Crown-granted mineral claims; OR 1 to 26 and CU 1 to 6 recorded claims.

ACCESS: Via road from Greenwood.

OWNER: P. Gouthro and associates, of Greenwood.

OPERATOR: Ortega Minerals Ltd., 615, 850 West Hastings Street, Vancouver 1; F. J. Hemsworth, consultant.

METAL: Copper.

WORK DONE: During 1967 P. Gouthro put in several large bulldozer cuts adjacent to old workings on the Croesus. In 1968 Ortega Minerals Ltd. ran a soil-sample survey over the entire claims and established picket lines preparatory to making an induced polarization survey in 1969.

REFERENCE: Assessment Report No. 1648.

Richmond

By P. E. Olson

LOCATION: (49° 118° S.W.) On the International Boundary, about 10 miles southeast of Greenwood.

CLAIMS: Eighteen mineral claims, including the Richmond (Lot 2918) Crown-granted mineral claim.

ACCESS: From Greenwood via 10 miles of truck-road.

OWNER: R. F. Sandner, of Greenwood.

OPERATOR: Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2.

METAL: Copper.

WORK DONE: Nine hundred and forty-seven feet of diamond drilling on the Richmond.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 226.

Mother Lode

By P. E. Olson and A. Sutherland Brown

LOCATION: (49° 118° S.W.) North of Deadwood Creek, about 3 miles west of Greenwood.

CLAIMS: Forty-five mineral claims, including the Mother Lode (Lot 704), Anaconda (Lot 1931), and Plutonia (Lot 884) Crown grants.

ACCESS: Via good road from Greenwood along Deadwood Creek.

OWNER: Aabro Mining & Oils Ltd., 204, 569 Howe Street, Vancouver 1.

METALS: Copper, gold, silver.

WORK DONE: Geochemical sampling, bulldozer stripping, and re-erection of the Woodgreen mill at its original site at the Mother Lode pit.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1961, p. 64; 1962, p. 68; *Geol. Surv., Canada,* Mem. 19; Paper 65-1, pp. 56–60.

DESCRIPTION:

The Mother Lode orebody was discovered around 1891 and was subsequently developed by the B.C. Copper Co. Ltd. in 1898. The mine operated continuously for 21 years, during which time it supplied ore for the Greenwood smelter owned by the same company. The property was reopened by Consolidated Woodgreen Mines Ltd., and from 1957 to 1962 produced 643,985 tons of ore, mainly by mining the old shaft pillar. This ore was milled at the Mother Lode pit. Upon being shut down in 1962, the company moved the mill to Mount Washington.

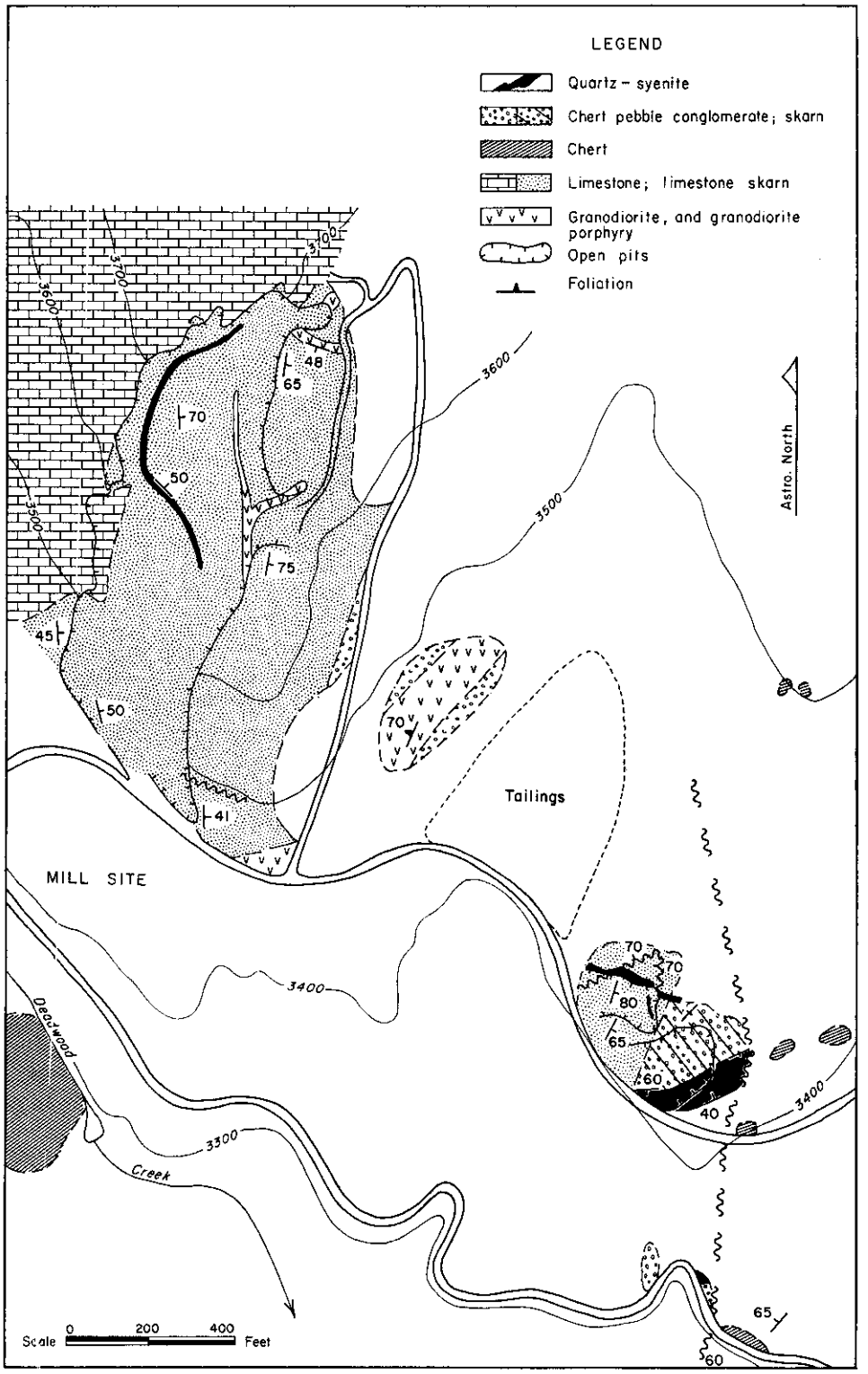


Figure 27. Aabro Mining & Oils Ltd., geologic sketch-map of the Mother Lode and Sunset.

Preparation of the mill-site started in September, 1968. The company intends to clean up any ore in the Mother Lode and Sunset pits and truck ore from a pit to be developed on the Greyhound at Deadwood, 1 mile to the east.

The geology of the Mother Lode and Sunset is shown on the accompanying Figure 27. The oldest rocks are cherts and cherty greenstones of the Permian Knob Hill Formation. These appear to be only in fault contact with chert pebble conglomerates of Middle Triassic age which normally unconformably overlie the Knob Hill Formation. Limestone, also of Middle Triassic age, normally overlies the chert pebble conglomerate and is conformable with it on the east slope of the Mother Lode hill. These stratified rocks are cut by intrusive rocks of two types. The older are granodiorite, or in small dykes, granodiorite porphyries. These are composed of about 60 per cent oscillatory zoned plagioclase (An_{40-50}), 15 per cent perthite, 15 per cent hornblende, 10 per cent quartz, and minor pyrite and sphene. Most specimens are strongly altered with hornblende crystals converted to a felted mass of fine amphibole, some perthite replaced by epidote, and plagioclase partly sericitized. A second group of dykes consists of light-brown porphyries with salmon-coloured feldspar phenocrysts. These rocks, locally called pulaskites, are quartz syenites composed of about 15 per cent perthite phenocrysts in a matrix of radial to plumose fine perthite (70 per cent) with 7 per cent interstitial quartz, 6 per cent chlorite after amphibole, and minor calcite and opaque minerals.

Skarn alteration of limestone and chert pebble conglomerate is fairly extensive, as shown on Figure 27. The limestone is mostly converted to a garnet skarn, but banded garnet-epidote-actinolite skarns are also fairly common. The skarn developed from chert pebble conglomerate differs in a number of aspects although superficially similar. Many of the original pebbles were chert and are now variably recrystallized stained quartz. Original volcanic fragments have been altered to feldspar-muscovite-calcite aggregates. Some of the matrix was calcite. This and some of the meta-volcanic pebbles are replaced by epidote, garnet, magnetite, and minor sulphides. The source of the skarn-forming fluids is not as clear as at Oro Denoro. Only one large dyke of granodiorite (about 100 feet wide) is evident on the surface, although another was apparently mapped underground. The granodiorite of the dyke itself is slightly skarnified. Presumably the granodiorite or another plutonic rock occurs in greater quantity at shallow depth.

The structure indicated in the area of the sketch is relatively simple, but complexities are evident on study. The limestone and chert pebble conglomerate both strike northward and dip steeply eastward. Two sequences of limestone with conglomerate to the east occur so that they appear to be duplicated. They also appear to be overturned. One northerly trending steep fault occurs that presumably drops the limestone-chert pebble sequence down in the west block. Another important fault, presumably a thrust dipping west at a low angle, must underlie the area because the steep attitudes indicated throughout show no indication of altered orientation as they approach what seems to be an underlying plate of Knob Hill chert. Such chert occurs only a short distance under the floor of the Sunset pit and at a slightly greater depth under the Mother Lode.

Sulphide mineralization and magnetite are erratically distributed in the pit walls presently available for examination. Chalcopyrite is most abundant in the Sunset pit, but the tonnage of ore is small. The old pillar in the east central part of the Mother Lode pit presumably is one of the production targets, but most of the ore for the mill probably will have to come from the Greyhound property, which has been drilled by several companies and is reported to have three-quarters of a million tons of ore grading about 0.9 per cent copper.

Top

By P. E. Olson

LOCATION: (49° 118° S.W.) About one-half mile north of the Mother Lode mine on Deadwood Creek.
CLAIMS: Twenty-six recorded mineral claims, including the Top 1 to 10, Lost 1 to 10.
ACCESS: Via road along Deadwood Creek.
OWNER: D. M. Cox.
OPERATOR: Copper Hill Mining and Exploration Ltd., P.O. Box 506, Grand Forks.
METALS: Copper, gold, silver.
WORK DONE: The geology was mapped, magnetometer and induced polarization surveys were made, and samples were taken for geochemical analysis. Three miles of access road was built to drilling-sites.

Amandy, Roderick Dhu

LOCATION: (49° 118° S.W.) Between elevations of 3,000 and 5,000 feet on the northwest side of Jewel Lake.
CLAIMS: Amandy (Lot 2795), Roderick Dhu (Lot 598), Alice (Lot 698), Lady of the Lake (Lot 1171), and Skipper 1 to 8 recorded claims held under mineral lease.
ACCESS: By the Jewel Lake road from the Greenwood–Grand Forks highway.
OWNER: J. A. Millican, of Grand Forks.
METALS: Gold, silver.
WORK DONE: The surface workings were surveyed, some random magnetometer readings were taken, and stripping was done on the Skipper claims. About 1 mile of new road was built up the southeast side of Mount Roderick Dhu.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1935, p. D 2; 1967, p. 227.

Phoenix Mine

By P. E. Olson

LOCATION: (49° 118° S.W.) About 5 miles due east of Greenwood, covering the old town of Phoenix.
CLAIMS: The company owns 230 recorded and Crown-granted mineral claims. Main workings are on the Old Ironsides Crown grant (Lot 589).
ACCESS: Good roads provide access from Greenwood and from the Grand Forks–Greenwood highway.
OWNER: The Granby Mining Company Limited, Phoenix Copper Division, P.O. Box 490, Grand Forks.
METALS: Copper, gold, silver (*see* Table 12 for production).
WORK DONE: The mine operated continuously throughout the year, treating about 1,900 tons of ore daily. New switchgear was installed for the gyratory-crusher motor. The N.C.N. factory was wired. A transformer-station was built for the submersible mine pump, and a portable transformer-station was built for the tailings-pond pumps.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 227–228.

DESCRIPTION:

All production came from the Old Ironsides pit. Ore removed from the pit amounted to 650,050 tons, and waste removal amounted to 4,239,751 tons. Included in the waste figure is 502,971 tons of marginal material which grades between 0.3 and 0.5 per cent copper.

The mill treated 698,796 tons of ore grading 0.744 per cent copper, 0.029 ounce per ton gold, and 0.25 ounce per ton silver.

Most of the drilling was done with a 9-inch electric rotary drill, and most of the loading was done with a 5-yard electric shovel. Both of these machines operated satisfactorily during the year, permitting the removal of about 400,000 tons of ore and waste per month. A small diesel-powered shovel was converted to a drop-ball machine for secondary breaking to eliminate blasting.

Pit expansion incorporated the Victoria inclined shaft during the year and necessitated the removal of pumps which supplied water from the old workings to the mill. A 9-inch hole was put down 125 feet to intersect the old levels, following which the hole was lined, and then a submersible pump was lowered into the hole to provide 250 gallons per minute of water for the mill.

The company continued to explore for more ore in the general area of the pits.

At the mill a dust-collection system was installed, utilizing a bag-house with collected dust being returned to the mill circuit through a special rotary valve.

Marshall

By P. E. Olson

LOCATION: (49° 118° S.W.) At the head of Providence Creek north of Providence Lake, 3½ miles east and north of Greenwood.

CLAIMS: The claims include mineral leases 138 (Marshall, Lot 2388; Little Annie, Lot 2389; Custer Fraction, Lot 160, and others), 229, and 269, together with eight Crown-granted mineral claims and the Tio Buracho 1 to 6 and 4 Fraction grouped as the Tio Buracho group and the Tia 1 to 12 recorded mineral claims.

ACCESS: The Greenwood–Phoenix road crosses the property and various other roads provide access from it.

OWNER: San Jacinto Explorations Limited, 2, 515 Granville Street, Vancouver 2.

METALS: Copper, gold.

WORK DONE: Four men worked for two months under the supervision of J. MacLean, foreman; 1,827 feet of BQ and AQ diamond drilling and some bulldozer trenching were done.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 228–230; Assessment Report No. 882.

DESCRIPTION: The property, adjacent to Phoenix, has received a considerable amount of attention since the early days of the Phoenix camp, but very little production has resulted. With the use of modern geophysical prospecting techniques, various companies have investigated the Marshall property, but no significant mineralized zones have been found thus far, although there are indications of copper mineralization.

Winnipeg

By P. E. Olson

LOCATION: (49° 118° S.W.) Two and one-half miles southeast of Phoenix, between Skeff and Snowshoe Creeks, at an elevation of 4,400 feet.

CLAIMS: Twenty-two recorded and Crown-granted mineral claims, including the Winnipeg (Lot 599).

ACCESS: By truck-road which follows the abandoned C. & W. railway grade to Hartford Junction.

OWNER: Sabina Mines Ltd. holds the property through option agreements.

OPERATOR: Sabina Mines Ltd. entered into agreement with Scurry-Rainbow Oil Limited, 539 Eighth Avenue South-west, Calgary, Alta.; J. Rowntree, in charge of exploration.

METAL: Copper.

WORK DONE: Geological mapping, electromagnetic and induced polarization surveys, soil-sampling, and diamond drilling.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 230–231.
DESCRIPTION: Several anomalous areas were found and were subsequently diamond drilled. Some massive pyrrhotite and disseminated pyrite were found.

Oro Denoro

By A. Sutherland Brown

LOCATION: (49° 118° S.W.) West of the Grand Forks–Greenwood highway, about 1½ miles north of the Phoenix turn-off, and 6 miles northwest of Greenwood.
CLAIMS: Oro Denoro (Lot 692) (incorrectly Oro Denero), Emma (Lot 591), Jumbo (Lot 592), Minnie Moore (Lot 593), Mary B (Lot 1568), and 29 other adjoining claims.
ACCESS: By mine roads from the Grand Forks–Greenwood highway.
OWNER: W. E. McArthur.
OPERATOR: West Coast Resources Ltd., 104, 569 Howe Street, Vancouver 1; W. E. McArthur, superintendent.
METAL: Copper.
WORK DONE: Geological mapping, an induced polarization survey, geochemical testing, 300 feet of underground work, 3,560 feet of diamond drilling, and 600 feet of percussion drilling. Mill-site clearing started.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1965, pp. 171, 172; 1967, pp. 232, 233; *Geol. Surv., Canada,* Maps 828, 6-1957.

DESCRIPTION:

The Oro Denoro is a skarn copper deposit which was mined between 1903 and 1917, producing 136,447 tons of ore containing 3,727,194 pounds of copper and some gold and silver. In the last two years a relatively large amount of drilling and 300 feet of underground exploration has outlined a digitated orebody which is being prepared for mining. D. D. Campbell, in a report to the company in August, 1968, stated reserves as 1,167,000 tons of ore of 0.95 per cent copper. A 1,000-ton mill has been purchased and is being installed.

The geology of the deposit was described in some detail in the Annual Report for 1967, pages 232 and 233, and is shown on a sketch-map (Fig. 28) prepared by the writer, by chain and compass, during a two-day visit. The host rocks are Middle Triassic limestones (*Geol. Surv., Canada,* Paper 65-1, pp. 56–60) that strike northward and dip steeply. Tight dragfolds indicate that though they mostly dip steeply westward, they probably face eastward. Intercalated with the limestone are minor beds of pebble conglomerate, one bed of which is shown on the map. The limestone is truncated by the easternmost tip of a tongue of granodiorite extending from a body of Nelson Intrusions centred on Boundary Creek. In hand specimen the granodiorite is a homogeneous rock characterized by pink quartz and thin hornblende prisms. Microscopically it is seen to be composed of about 44 per cent tabular zoned plagioclase, 20 per cent small anhedral perthite grains, 15 per cent large round quartz grains, 10 per cent prismatic hornblende, 5 per cent biotite altered partly to chlorite and epidote, and 1 per cent combined magnetite, pyrite, and sphene.

Dykes of an early dioritic phase of the intrusion are very similar to the granodiorite, except they lack quartz and contain about 27 per cent hornblende.

The limestone has been converted to skarn for 800 to 1,200 feet south of the contact. The skarn is composed of about 90 per cent zoned, green to brown garnet in a matrix of calcite with a variable but minor amount of magnetite, pyrite, or

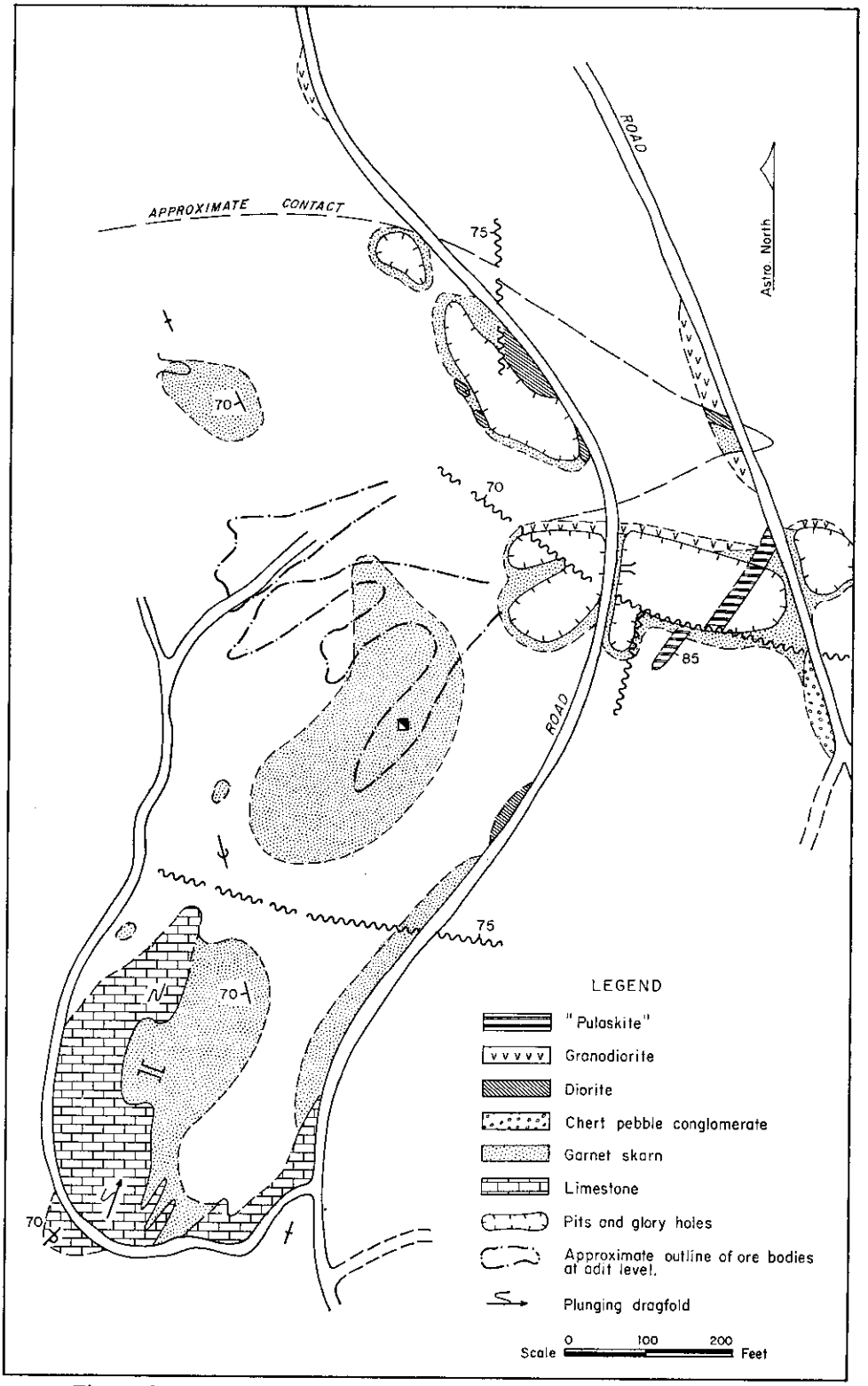


Figure 28. West Coast Resources Ltd., geologic sketch-map of the Oro Denoro.

chalcopyrite. The youngest rock, post-dating skarn formation is a grey-green dyke of a sort normally called pulaskite in the Phoenix area, but which appears to be a normal andesite, as no feldspathoids were identified.

On the surface not much mineralization is apparent in the skarn, except about the glory-holes, the southernmost open cut, and to a lesser degree about the shaft. The new underground workings along the palm-like base of the digitations of the orebody show a fairly intense mineralization of chalcopyrite in streaks, blobs, and blebs. The former bedding of the limestone is evident as a steep banding of the garnetite accentuated by discontinuous lines of calcite. As chalcopyrite replaces the calcite, it also has a steeply oriented foliation. Other ore minerals include very minor magnetite and pyrite, which have a more random distribution than the chalcopyrite.

Cyclops

By P. E. Olson

LOCATION: (49° 118° S.W.) Immediately south of the Oro Denoro mine, which is south of the Grand Forks–Greenwood highway, about 1 mile north of the Phoenix turn-off.
CLAIMS: Cyclops (Lot 1244) and two recorded mineral claims.
ACCESS: Via the Oro Denoro mine roads and abandoned railway grades which cross the Phoenix mine road.
OWNER: W. J. Cudworth.
OPERATOR: Giant Explorations Limited, 1825, 355 Burrard Street, Vancouver 1.
METAL: Copper.
WORK DONE: Geological mapping, magnetometer surveying, and soil-sampling.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 233; Assessment Report No. 1580.

Pac

LOCATION: (49° 118° S.W.) Two miles east of Phoenix.
CLAIMS: Pac 1 to 56.
ACCESS: The Grand Forks–Greenwood highway crosses the claims about 10 miles from Grand Forks.
OWNER: The Granby Mining Company Limited, P.O. Box 490, Grand Forks.
METAL: Copper.
WORK DONE: Three thousand feet of diamond drilling.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 233.

GRAND FORKS

B.V.P.K., Tex

LOCATION: (49° 118° S.W.) North of Skeff Creek, a tributary of July Creek from the west.
CLAIMS: B.V.P.K. 1 to 9, Tex 1 to 6.
ACCESS: Via truck-road along Skeff Creek from the Grand Forks–Greenwood highway.
OWNERS: D. M. Cox and W. W. Berigin.
OPERATOR: Occatilla Exploration Co. Ltd., P.O. Box 506, Grand Forks.
METALS: Copper, molybdenum, gold, silver.
WORK DONE: Geological, magnetometer, and induced polarization surveys were made, samples were taken for geochemical analysis, and about 3 miles of access road was built.

CHRISTINA LAKE

Mastodon

By P. E. Olson

LOCATION: (49° 118° S.E.) Immediately north of the United States border and 2 miles southeast of Cascade.

CLAIMS: Mastodon (Lot 2384) and other Crown-granted mineral claims and the Ann 1 to 107.

ACCESS: Via the Cascade highway, which cuts across the property.

OWNER: Hunter Point Exploration Ltd., 826, 470 Granville Street, Vancouver 2; M. Hretchka, managing director; R. Steiner, geologist.

METALS: Chromium, nickel.

WORK DONE: Eleven holes totalling 4,300 feet were diamond drilled, mainly on the Mastodon. Several holes were drilled to depths exceeding 500 feet.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 234.

DESCRIPTION: A large body of low-grade nickel mineralization has been disclosed by recent diamond drilling, although no specific nickel minerals have been identified. The grade reported is 0.25 per cent nickel. This order of value occurs at some depth below the surface and is mainly in serpentinized rocks.

Ajax, Burnt Basin

By P. E. Olson

LOCATION: (49° 118° S.E.) About 1 mile southwest of the Paulson bridge, on the Christina Lake–Kinnaird highway, near the heads of Josh and Mollie Creeks.

CLAIMS: Mineral leases Nos. 52, 118, 119, 131, 183, 196, 197, 205; B.P. 1 to 3 Fractions, Shirley 1 to 8, Christina 1 to 6.

ACCESS: Access is by truck-road 2½ miles long which leaves the Christina Lake–Kinnaird highway immediately south of the Paulson bridge.

OWNER: Dalex Mines Ltd., 8, 515 Granville Street, Vancouver 2; M. H. Currie, manager.

METALS: Gold, lead, zinc.

WORK DONE: Principal workings are on the Ajax (Lot 1509) and Burnt Basin (Lot 1136) Crown grants. An induced polarization survey was made, and a considerable amount of bulldozer stripping and trenching in rock were done.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 198.

TRAIL CREEK MINING DIVISION

ROSSLAND

Midnight

By P. E. Olson

LOCATION: (49° 117° S.W.) West of the Rossland–Paterson highway, 2 miles from Rossland.

CLAIMS: The Midnight Crown-granted mineral claim (Lot 1186) and 12 recorded mineral claims adjoining the Midnight.

ACCESS: Via 1½ miles of good road which leaves the Cascade highway one-half mile from the Rossland junction.

OWNER: Tull Mines Ltd., Rossland.

OPERATOR: Cinola Mines Ltd., 1322, 510 West Hastings Street, Vancouver 2; E. A. Edwards, manager.

METALS: Gold, silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Drifting, raising, and stoping on the 3,100-foot level. Shipments to the Trail smelter amounted to 789 tons. During the year a crew of five men was employed by the company.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 235.
DESCRIPTION: The company reports that there are sufficient reserves of ore on the Midnight to justify the installation of a 100-tons-per-day mill. Construction of a mill is under way.

Mayflower, Bluebird, Homestake

By P. E. Olson

LOCATION: (49° 117° S.W.) Immediately south of Rossland.
CLAIMS: Fifty-six recorded and Crown-granted mineral claims, including the Mayflower (Lot 1274), Bluebird (Lot 1053), and Homestake (Lot 936).
ACCESS: Several roads cross the property—these roads originate in the city of Rossland.
OWNER: Rossland Mining Co. Ltd., 1403, 1030 West Georgia Street, Vancouver 5.
METALS: Gold, silver, lead, zinc.
WORK DONE: Five hundred feet of diamond drilling on the Bluebird.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1949, pp. 157–163; 1967, p. 236.

Coxey Mine

By P. E. Olson

LOCATION: (49° 117° S.W.) On the west slope of Red Mountain, about 2 miles west of Rossland.
CLAIMS: Eighteen mineral claims and two mineral leases. Production during 1968 came from the Coxey Crown-granted mineral claim (Lot 1221).
ACCESS: Via a good road which leaves the Cascade highway about 1 mile west of Rossland.
OWNER: Red Mountain Mines Limited, P.O. Box 849, Rossland; B. C. Fillingham, manager.
METAL: Molybdenum (*see* Table 12 for production).
WORK DONE: The mine worked continuously throughout the year.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 239.
DESCRIPTION: Total ore milled amounted to 196,396 tons. From the " B " zone 95,870 tons of waste was mined. The waste was used to construct a tailings-disposal area on Jumbo Creek.

Giant, Novelty, Golden Queen, St. Elmo

LOCATION: (49° 117° S.W.) On Red Mountain, immediately north of the Rossland–Paterson highway.
CLAIMS: Giant (Lot 997), Novelty (Lot 958), Golden Queen (Lot 994), St. Elmo (Lot 923), Gertrude (Lot 690), Surprise (Lot 693), Cliff (Lot 921), Consolidated St. Elmo (Lot 924).
ACCESS: Via jeep-road which leaves the Rossland–Paterson highway near the Cascade highway turn-off.
OWNER: Continental McKinney Mines Limited.
OPERATOR: Scurry-Rainbow Oil Limited, 539 Eighth Avenue Southwest, Calgary, Alta.; J. Rowntree, in charge of exploration.
METAL: Molybdenum.
WORK DONE: Diamond drilling and geological mapping.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1966, p. 208; 1967, p. 239.
DESCRIPTION: Several bodies of molybdenum ore have been blocked out by diamond drilling during recent years.

Plate VIA. Open pit at Tasu mine, Moresby Island.

Plate VIB. Open pit at Coxey mine on the west slope of Red Mountain, Rossland. The "A" orebody is in the upper left and the " B " orebody is below the trees in the centre of the cleared area.

CHINA CREEK

Mota

By James T. Fyles

LOCATION: (49° 117° S.W.) On the ridge southwest of China Creek four-fifths of a mile up the creek from the Trail–Castlegar highway.

CLAIMS: Mota 1 to 18, located in December, 1967.

ACCESS: By " Cat " road from a point on the highway just west of China Creek.

OWNER: Murray Swetz, 1620 Burnaby Street, Vancouver.

OPERATOR: Norex Uranium Ltd., 605, 535 Thurlow Street, Vancouver 5.

METAL: Uranium.

WORK DONE: About 1½ miles of drill road; seven diamond-drill holes, the deepest of which was 500 feet on the Mota 12 and Mota 14 claims.

DESCRIPTION: The uranium showings consist of local concentrations of uraninite in pegmatite. The uraninite occurs as subhedral crystals up to one-sixteenth of an inch across in coarse-grained granitic pegmatite. The terrane is dominantly pegmatite, which occurs in irregular sheets up to a few tens of feet thick in gently dipping biotite, schist, and gneiss. The wallrocks have an east-west lineation, and the pegmatites terminate in rounded and bulbous shapes with long axes parallel to this lineation. The area in general is reported to give scintillometer readings which are three times background, with local areas in which uraninite is visible giving readings much higher than this. No systematic distribution of uraninite is apparent, and the drilling failed to intersect any of the small surface showings.

NELSON MINING DIVISION

NELSON

Kok

By James T. Fyles

LOCATION: (49° 117° N.E.) East side of Kokanee Creek straddling Busk Creek 1½ to 2 miles from Highway No. 3, between elevations of 3,000 and 4,500 feet.

CLAIMS: Kok 1 to 12.

ACCESS: By road from Highway No. 3.

OWNER: M. P. McDougall, R.R. 1, Nelson.

OPERATOR: Hogan Mines Ltd., 401, 550 Burrard Street, Vancouver 1.

METALS: Lead, zinc.

WORK DONE: Trenching, sampling, and geological mapping by owner and company.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 242.

DESCRIPTION:

The property contains a number of small showings scattered over a wide area. They are in a group of schists, calc-silicate gneisses, and granitic rocks which on a regional scale form a metasedimentary remnant within the Nelson batholith. Foliation in most places dips to the west at moderate angles more or less parallel to the east slope of Kokanee Creek.

The main showing (M-1) north of Busk Creek, at an elevation of 4,200 feet, consists of irregular quartz veinlets carrying pyrrhotite, pyrite, sphalerite, and galena in a fine-grained to porphyritic granitic rock. Below M-1, at an elevation of 3,400 feet, is a mineralized fracture striking 95 degrees and dipping 70 degrees to the south. Other zones contain poorly defined masses of sulphides, including pyrite, pyrrhotite, sphalerite, galena, and minor chalcopyrite.

Showings south of Busk Creek include two cross-fractures containing massive pyrrhotite and sphalerite, one striking 70 degrees and dipping 75 degrees to the south and the other striking 110 degrees and dipping 75 degrees to the south. They are exposed on a logging-road at an elevation of 3,100 feet. Along the same road above these showings are a number of lenses of schist and gneiss containing disseminated sulphides. They are mainly pyrrhotite and pyrite with local sphalerite, galena, and minor chalcopyrite.

HALL CREEK

Mammoth

By P. E. Olson

LOCATION: (49° 117° S.E.) On the ridge between Hall and Barrett Creeks, at the head of Keno Creek.

CLAIMS: The Mammoth No. 2 (Lot 14694) and seven other claims are held under lease. There is also a block of recorded claims adjoining the lease which forms part of the property.

ACCESS: By jeep-road along Barrett Creek and thence by a very steep road to the Mammoth.

OWNER: Weland Mining Ltd., 1002, 549 Howe Street, Vancouver 2.

METALS: Molybdenum, copper, gold, silver.

WORK DONE: Fifteen holes totalling 5,000 feet, size AX, were diamond drilled. Ten trenches, each 4 by 6 feet, were blasted, and 4,000 square feet of surface was stripped by bulldozer.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1917, p. 171; 1967, p. 243.

DESCRIPTION: Nine diamond-drill holes were put down on the Mammoth No. 2 to test for an extension of molybdenum mineralization which was partially tested by drilling in 1967, and which was previously exposed by open cuts, a shaft, and a crosscut. On the A.T.S. recorded claims which lie to the east of the Mammoth No. 2, five 200-foot diamond-drill holes were put down to prospect copper mineralization noted in this area. Drilling results were not made available.

YMIR

Fresno, Fresnu

By P. E. Olson

LOCATION: (49° 117° S.E.) On Quartz Creek, immediately west of Ymir.

CLAIMS: Eighty-two recorded mineral claims named Fresno and Fresnu.

ACCESS: By truck-road from Ymir.

OWNER: Copper Horn Mining Ltd., P.O. Box 548, Penticton; R. Joy, president.

METAL: Molybdenum.

WORK DONE: Assessment work, consisting of bulldozer cuts and soil-sampling.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 243.

Yankee Girl

By P. E. Olson

LOCATION: (49° 117° S.E.) On a ridge between Ymir and Oscar Creeks, about 2 miles east of Ymir.

CLAIMS: Twenty-four Crown-granted mineral claims including the Yankee Girl (Lot 7712) and Lakeview (Lot 3245).

ACCESS: Via a truck-road which follows Ymir Creek from the village of Ymir.

OWNER: Burlington Mines Ltd., 510 West Hastings Street, Vancouver 1; Louis Masura, foreman.

METALS: Gold, silver, lead, zinc.

WORK DONE: The Wildhorse level adit was reopened and retimbered, and mine ventilation was restored.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 243–244.

Porcupine

By P. E. Olson

LOCATION: (49° 117° S.E.) On the south side of Porcupine Creek, about 2 miles east of the Salmo River.
CLAIMS: Eleven recorded mineral claims and eight Crown-granted mineral claims including the Porcupine (Lot 4634).
ACCESS: Via truck-road along Porcupine Creek.
OWNER: Duval Corporation, 506, 602 West Hastings Street, Vancouver 2.
METALS: Gold, silver, lead, zinc.
WORK DONE: Geological mapping and sampling of surface exposures.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1930, pp. 272–273.
DESCRIPTION: Northerly and north-northeasterly trending veins and silicified zones with disseminated sulphides are present in the Laib Formation.

Jack Pot

By P. E. Olson

LOCATION: (49° 117° S.E.) The claims extend northward from the summit between Hidden and Porcupine Creeks to the summit between Oscar and Ymir Creeks; main showings immediately west of Active Creek.
CLAIMS: Jack Pot, Ink Spot, and 48 other recorded mineral claims.
ACCESS: By a truck-road which leaves the Porcupine Creek road 2 miles from the Ymir–Salmo highway.
OWNER: New Jersey Zinc Exploration Company (Canada) Ltd., 905, 525 Seymour Street, Vancouver 2; R. C. MacDonald, regional geologist.
METAL: Zinc.
WORK DONE: Two diamond-drill holes totalling 873 feet were drilled on the Ink Spot claim.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 212.

Howard

By P. E. Olson

LOCATION: (49° 117° S.E.) On the east side of Active Creek, a tributary of Porcupine Creek, at elevations of 5,500 to 5,800 feet.
CLAIMS: Eight Crown-granted mineral claims, including the Howard (Lot 12540).
ACCESS: By road along Porcupine and Active Creeks, a distance of 7 miles from the Ymir–Salmo highway.
OWNER: Mrs. J. Craft, Nelson.
OPERATORS: John Stoochnoff and G. Windsor.
METALS: Gold, silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Roads in the vicinity of the mine were repaired and dumps were examined with a view to milling the dump material. A carload of dump rock was shipped to Trail in December.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1928, pp. 339–342; 1929, pp. 350–351; *Geol. Surv., Canada,* Mem. 172, 1934, pp. 70–73.
DESCRIPTION: The Howard mine has been idle for many years, during which time the portals have caved and the buildings have collapsed. The operators purchased mill equipment which was partly set up near the confluence of Porcupine Creek and Salmo River. It was proposed that dumps from the Howard mine be milled, and eventually underground ore was to be developed. The dumps at the Howard carry only marginal values.

Peanut

By P. E. Olson

LOCATION: (49° 116° S.W.) South of Cultus Creek and about 2 miles west of Mount Burnett; Cultus Creek flows into the south end of Kootenay Lake from the west.

CLAIMS: Four recorded mineral claims, including the Peanut No. 1 claim where the main showings are found.

ACCESS: During the summer the area can be reached via a jeep-road from Ymir via Porcupine and Cultus Creek roads.

OWNER: J. Robinson and partners, Salmo.

OPERATOR: Inland Ore Reduction Company, 8816 East Sprague Avenue, Spokane, Wash.; field office, 469 Richards Street, Nelson.

METALS: Copper, silver.

WORK DONE: A small portable flotation mill was set up, and a 25-foot incline shaft was sunk on the showing. A few tons of ore was treated. The mill was removed in August.

DESCRIPTION: A shear zone cutting altered granite is exposed on the Peanut No. 1 mineral claim, at an elevation of 5,500 feet. The shear strikes north 35 degrees west and dips 75 degrees southerly and contains a narrow lens of vein material which carries tetrahedrite. The vein, which is only several inches wide, has been traced for about 40 feet on the surface and to a depth of 25 feet in an inclined shaft.

Elsie, Ann By P. E. Olson

LOCATION: (49° 116° S.W.) Between Cultus and Next Creeks, which drain into Kootenay Lake from the west (next to the west of the Peanut property).

CLAIMS: Thirty-two recorded mineral claims located as the Ann, Elsie, Susiann, and Susi groups.

ACCESS: By jeep-road via Porcupine and Cultus Creeks from Ymir.

OWNER: A. Barker, of Creston.

OPERATOR: Rio Tinto Canadian Exploration Limited, 404, 1111 West Georgia Street, Vancouver 5.

METALS: Copper, silver.

WORK DONE: The geology of the claims was mapped, and silt and soil samples were taken for geochemical analysis. Six men, employed for six weeks, were supervised by E. W. Johnson.

SALMO

ERIE CREEK

New Arlington By P. E. Olson

LOCATION: (49° 117° S.E.) On Mineral Mountain, between Whisky and Rest Creeks, which flow into Erie Creek from the east.

CLAIMS: Ten Crown-granted mineral claims including the Arlington (Lot 3648), on which the main workings are situated.

ACCESS: Via the Erie Creek road, which leaves the Salmo–Trail highway immediately east of the Erie Creek bridge.

OPERATOR: G. D. Fox and associates.

METALS: Gold, silica (*see* Table 12 for production).

WORK DONE: Five thousand seven hundred and twenty-two tons of dump rock was shipped from the New Arlington mine dumps. Some bulldozer stripping was done in an attempt to find the surface traces of veins worked underground.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 244.

Silver Dollar

LOCATION: (49° 117° S.E.) Elevation 3,000 feet on a low ridge just west of Salmo.

CLAIMS: Silver Dollar (Lot 12599), Lucky Boy (Lot 12600), and eight other adjoining claims.

ACCESS: Via one-half mile of truck-road which leaves the Salmo–Trail highway 1 mile west of Salmo.

OWNER: D. Norcross, of Nelson.

OPERATOR: Silver Dollar Mines Ltd., 203, 415 Third Street Southwest, Calgary, Alta.; Eugene Myers, geologist.

METALS: Gold, silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Two hundred and fifty feet of drifting and raising was done. This was a continuation of work started in 1967. Ore mined and shipped to Trail amounted to 4,093 tons during 1968.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 244.

DESCRIPTION: A vein, which conforms with the formation, is exposed on the Silver Dollar by many open cuts and several drifts. The vein dip is variable and generally to the east at a very low angle. The vein structure is about 8 feet wide, but only narrow lenticular zones within the structure carry values in lead, gold, and silver.

IRON MOUNTAIN

By P. E. Olson

Jersey Mine

LOCATION: (49° 117° S.E.) On Iron Mountain between Lost and Sheep Creeks.

CLAIMS: Fifty-six Crown-granted mineral claims.

ACCESS: 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 road.

OWNER: Canadian Exploration Limited, 700 Burrard Building, Vancouver 5; mine office, Salmo; E. A. Lawrence, mine manager; J. W. Robinson, mine superintendent; A. Filyk, mill superintendent.

METALS: Lead, zinc (*see* Table 12 for production).

WORK DONE: Development work in the mine amounted to 9,600 feet of drifting and 759 feet of raising. Surface diamond drilling totalled 1,289 feet. Underground diamond drilling amounted to 14,553 feet. Probable reserves at the end of 1968 were 631,818 tons, an increase over the previous year. Three new areas were developed—the " J " zone, the east " F " zone, and the 33D area below the old track mine. Pillar extraction in the north "A" zone was started.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 245–246.

DESCRIPTION:

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 the 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 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 3-boom jumbo, which is used in large headings and large benches. A new 2-boom jumbo is being designed. Most blasting is done with ammonium nitrate-fuel oil mixtures. Muck is scraped to ore passes and chutes, or loaded with front-end loaders into Dumptors and Euclids and hauled to pockets over the crushing plant. Ore-pass muck is hauled with Euclids and DW-10's and semi-trailers to the crushing pockets.

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 a vertical drop from the crusher to the mill of approximately 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. During 1968 all production, amounting to 506,220 tons, came from the Jersey zone and was treated at the company concentrator. Lead concentrates were shipped to the Bunker Hill smelter at Kellog, Idaho, and the zinc concentrates were shipped to the Anaconda smelter at Black Eagle, Montana, and the Bunker Hill zinc plant at Kellogg, Idaho. Zinc concentrates amounting to 11,574 tons were smelted, and the resultant zinc metal was turned over to Canadian Exploration Limited, who then disposed of the metal on world markets. A strike at smelters in northwestern United States necessitated stockpiling of concentrates from January to April.

New equipment purchased and put into service during 1968 includes two RD-13 Euclid trucks, one D-6B bulldozer, one Land Rover supervisors' truck, several jacklegs, mufflers for all drill machines, and a seismitron for pillar-recovery control.

The company operates 31 pieces of diesel equipment underground. Ventilation is supplied for four 48-inch fans driven by 60-horsepower electric motors.

Invincible

By P. E. Olson

LOCATION: (49° 117° S.E.) On Iron Mountain between Lost and Sheep Creeks.
CLAIMS: Invincible (Lot 12084) and other adjoining Crown-granted mineral claims.
ACCESS: By road which leaves the Salmo–Nelway highway 4 miles south of Salmo.
OWNER: Canadian Exploration Limited, 700 Burrard Building, Vancouver 5; mine office, Salmo; O. E. Bradley, chief engineer.
METAL: Tungsten.
WORK DONE: Nine thousand four hundred and thirty-two feet of surface BQ wire line diamond drilling.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 246.
DESCRIPTION: Scheelite is present in a skarn zone in limestone; 300,000 tons grading 0.7 per cent tungstic oxide has been outlined by diamond drilling.

SHEEP CREEK

Double B

By P. E. Olson

LOCATION: (49° 117° S.E.) On Hedgehog Creek, a tributary of Sheep Creek from the north.
CLAIMS: Twelve mineral claims including the Double B group.
ACCESS: Via the Sheep Creek road and thence by jeep-road to the claims.
OWNER: F. W. Cartwright, of Nelson.
METALS: Lead, zinc, tungsten.
WORK DONE: Prospecting, stripping, diamond drilling, and road construction.
DESCRIPTION: The property is underlain by silicified argillites which contain beds or lenses of dolomitic limestone. A large body of dolomite on the eastern edge of the property terminates along a contact with granitic rocks. F. W. Cartwright and son have prospected the claims for several years, using a small diamond-drilling machine and a portable gasoline-powered rock drill. A scintillometer survey carried out in 1967 disclosed several zones where counts reached several times normal background. Ultraviolet-lamp surveys have

shown the presence of scheelite at several places on the property. Several cuts in dolomite show scattered grains of sphalerite and galena. A jeep-road was constructed from the main Sheep Creek road to the main showings during the spring of 1968.

REMAC

Bar

LOCATION: (49° 117° S.E.) South of the Pend d'Oreille River near the heads of Harcourt and Red Bird Creeks and 3 miles southwest of Remac.

CLAIMS: Bar 1 to 14 recorded mineral claims.

ACCESS: Via logging-roads from Waneta a distance of 15 miles.

OWNER: Cominco Ltd., 1199 West Pender Street, Vancouver 1; D. W. Heddle, senior geologist.

METALS: Lead, zinc.

WORK DONE: Three and one-fifth miles of road was built to provide access to the property.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1962, p. 77 (Red Bird).

DESCRIPTION: The property covers an outcrop of Reeves limestone lying to the west of the Red Bird Crown-granted mineral claim (Lot 13467), which has been actively explored by Cominco Ltd.

Reeves MacDonald Mine

By P. E. Olson

LOCATION: (49° 117° S.E.) On the Pend d'Oreille River, 4 miles west of Nelway.

CLAIMS: Recorded and Crown-granted mineral claims covering several square miles at Remac.

ACCESS: The mine is on the Nelway–Waneta road 4 miles west of Nelway.

OWNER: Reeves MacDonald Mines Limited, Remac; L. M. Kinney, general manager; F. R. Thompson, superintendent; M. D. Wiwchar, chief engineer; J. M. McDearmid, mill superintendent.

METALS: Lead, zinc (*see* Table 12 for production).

WORK DONE: Drifting and crosscutting, 7,595 feet; raising, 4,465 feet; percussion test-hole drilling, 3,201 feet; sinking, 117 feet; blast-hole drilling, 63,250 feet; production from stopes, 309,311 tons. In the Annex hoistroom a 100-horsepower 2,300-volt G.E. hoist motor (Serial No. 1466578) and controls were installed, also three 25-kva. transformers to supply pumps, fans, and lighting. Two thousand two hundred feet of 3-conductor, No. 2 A.W.G. steel-wire armoured cable was installed from the portal to the hoistroom. A motor-generator set was installed at the main haulage portal for battery charging.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 247.

DESCRIPTION:

Mineralization is in dolomite in the Reeves limestone of the Laib Formation. Values are primarily in lead and zinc with minor values in cadmium and silver. In the vicinity of the mine, the formation strikes to the west with a dip of 55 to 60 degrees to the south. The ore zone plunges to the west.

The grade of ore mined has dropped slightly each year for the past three years. Main production during 1968 came from the lower Reeves zone.

Exploration was continued at the Annex mine, which is on the south side of the Pend d'Oreille River. Diamond drilling from the 1750 level was completed in April, and preparation for shift-sinking started shortly thereafter. Preliminary work done included 450 feet of crosscutting from the end of 1750 level, excavation of a hoistroom and ropeway raises, and raising of the shaft to the head-pulley site.

Actual sinking was started in December. Depth of the finished shaft will be about 1,000 feet. Upon completion of sinking, the company intends to explore the Annex ore zone with diamond-drill holes and crosscuts.

PRIEST RIVER

Giant, Midget

By P. E. Olson

LOCATION: (49° 116° S.W.) The property is about a mile north of the United States border along the west side of Priest River.

CLAIMS: Nineteen recorded mineral claims in the Midget and Giant groups.

ACCESS: Via 9 miles of private logging-road which leaves the Salmo–Creston highway at Summit Lake.

OWNER: E. C. Shunter, of Creston.

METALS: Copper, silver.

WORK DONE: Bulldozer stripping, erection of a semi-portable flotation mill, and some rock removal from exposed vein.

DESCRIPTION:

A vein has been exposed on the Midget claim immediately north of Nun Creek and at the west edge of the Priest River canyon, at an elevation of 4,000 feet. This vein strikes northerly and dips very steeply to the west. The vein is composed chiefly of white quartz and is about 10 feet wide where exposed. Scattered grains and masses of sulphides were noted in the vein. Pyrite is the most abundant sulphide, but tetrahedrite and galena are also present. Wallrocks are schists conformable in attitude to the vein.

The mill which was set up at the property has a capacity of about 50 tons per day. Production was limited to trial runs, and no results are available. The vein appeared to contain about 1 per cent each of copper and lead where mining was done.

WYNNDEL

Liz B

By P. E. Olson

LOCATION: (49° 116° S.W.) On Wilds Creek about 2 miles north of Wynndel.

CLAIMS: Liz B 1 to 4, Tag 1 to 5, Bid 1 to 18.

ACCESS: Two miles via mining-roads north from Wynndel.

OWNER: Aspen Grove Mines Ltd., 826, 510 West Hastings Street, Vancouver 2; George Mill, consultant.

METALS: Silver, lead, zinc.

WORK DONE: An electromagnetic survey was made over the Tag 1 and 2, Liz B 1 and 2, and Bid 1 and 2 Fractions.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 198; Assessment Report No. 1695.

DESCRIPTION: A vein which is exposed along the south bank of Wilds Creek contains scattered values in silver, lead, and zinc across widths of several feet and for a length of several hundred feet. Diamond drilling for extensions of this vein has failed to disclose anything of significant value.

PROCTER

Panarama

By James T. Fyles

LOCATION: (49° 116° N.W.) Showings at elevations between 6,700 and 7,400 feet on ridges between the headwaters of Narrows, Procter, and Irvine Creeks south of the west arm of Kootenay Lake.

CLAIMS: Panarama 1 to 6, probably relocations of the Parkland claim of 1893 and the Merry Hope group of 1928.

ACCESS: From Procter via a logging-road to an elevation of 5,400 feet on the west side of the ridge between Irvine and Procter Creeks, thence by a trail south along the ridge.

OWNER: Eric Denny, R.R. 1, Nelson.

METALS: Silver, lead.

WORK DONE: Trail-cutting and cleaning out old open cuts on the Panarama No. 1 and Panarama No. 3 claims.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1928, p. 326.

DESCRIPTION:

Two principal groups of quartz veins in metasedimentary rocks have been explored by old trenches and short adits. The rocks in the area include mica schist, calc-silicate gneiss, white quartzite, and marble, which in general strike north and dip at moderate angles to the west. Locally the dip is vertical or steeply to the east. The uppermost showings are exposed at the portals of three caved adits between elevations of 7,200 and 7,400 feet, half a mile northwest of Mount Irvine. A lenticular quartz vein up to 2 feet thick lies between a layer of schist and marble and a layer of white quartzite striking north 10 degrees east and dipping steeply to the west. The vein follows the formations, and the best mineralization, which is at the upper adit, is at a point where the formations dip steeply and form an open fold concave to the east. The vein contains vuggy quartz, minor calcite, and botryoidal chalcedony, and locally clusters of medium-grained galena reported to be rich in silver.

The second group of veins is about three-quarters of a mile to the northwest on the ridge between Procter and Narrows Creeks at an elevation of about 6,700 feet. The veins in siliceous dark-grey mica schist strike north 20 degrees east and dip 50 to 60 degrees to the west with the schistosity. Several veins are exposed in three trenches over a strike length of 200 feet and a width of 50 feet. Selected material from dumps assayed: Silver, 0.08 ounce per ton; lead, 4.10 per cent; and silver, 10.8 ounces per ton; lead, 52.72 per cent. Spectrochemical analyses of two chip samples across one of the veins showed less than 1 per cent lead and traces of silver.

Big Pay Off

By P. E. Olson

LOCATION: (49° 116° N.W.) One mile east of Procter.

CLAIMS: Forty-three claims, comprising Big Pay Off 1 to 6, DOC 3 to 14, and others.

ACCESS: By truck-road from Procter.

OWNER: Citation Silver Mines Ltd., 522, 837 West Hastings Street, Vancouver 1.

METALS: Lead, zinc.

WORK DONE: A 1,200-foot diamond-drill hole was put down on the Big Pay Off No. 2 claim. A second hole was started, but extremely cold weather forced a halt to work in December.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 217.

SLOCAN MINING DIVISION

NAKUSP

NePe

By P. E. Olson

LOCATION: (50° 117° S.W.) At an elevation of 2,400 feet on a tributary of Slewiskin Creek from the south, 2 miles from Upper Arrow Lake.

CLAIMS: Eighteen recorded mineral claims known as the NePe group.
ACCESS: Two miles by road from the Nakusp–Burton highway; the mining-road leaves the highway one-half mile south of Slewiskin Creek.
OWNER: F. Jordan and associates, of Nakusp.
OPERATOR: Jason Explorers Ltd., 1170, 505 Burrard Street, Vancouver 1.
METAL: Silver.
WORK DONE: The lower level was driven about 200 feet southerly following quartz veins.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 249.
DESCRIPTION: The veins drifted on were mainly barren of sulphides. Upon completion of the drift, the company dropped its option on the property.

BURTON

Millie Mack

LOCATION: (50° 117° S.W.) On the north side of Caribou Creek, 15 miles from Burton.
CLAIMS: Forty-four recorded and Crown-granted mineral claims, including the Millie Mack (Lot 1831).
ACCESS: By truck-road which follows Caribou Creek from Burton to the property.
OWNER: Richwood Silver Mines Ltd., P.O. Box 230, Osoyoos.
METALS: Gold, silver, lead, zinc.
WORK DONE: Bulldozer stripping was done on the lower Millie Mack zone at about the 6,000-foot elevation.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 249.

Cris

LOCATION: (50° 117° S.W.) On the north side of Caribou Creek, about 14 miles from Burton, adjoining the Millie Mack property.
CLAIMS: Thirty-six claims known as the Cris group.
ACCESS: Via the Millie Mack truck-road from Burton.
OWNER: Leonard Root and associates.
OPERATOR: Moly-Win Mining Ltd., 827, 510 West Hastings Street, Vancouver 2.
METALS: Silver, lead, zinc.
WORK DONE: Brief investigation by H. D. Forman.
DESCRIPTION: The Cris group of mineral claims is underlain by rocks of the Slocan Series.

SPRINGER CREEK

Ottawa Mine

By P. E. Olson

LOCATION: (49° 117° N.E.) On the north side of Springer Creek 5 miles from Slocan.
CLAIMS: Ottawa Crown-granted mineral claim (Lot 4968) and 10 other claims.
ACCESS: Via the Springer Creek road, which leaves the Slocan–Nelson highway one-half mile south of Slocan.
OWNER: Slocan Ottawa Mines Ltd.
OPERATOR: Brimont Mining Limited, P.O. Box 56, Slocan; A. Ditto, managing director.
METAL: Silver (*see* Table 12 for production).
WORK DONE: Brimont Mining Limited stoped mainly between Nos. 8 and 6 levels and did some raising and stoping above No. 9 level. No work which could

be classified as exploration was done by the company. Brimont dropped its lease about mid-year after shipping 4,415 tons of ore to the Trail smelter. The property was idle during the second half of the year.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 250.

Arlington

By P. E. Olson

LOCATION: (49° 117° N.E.) The property is on the north side of Springer Creek, about 7 miles from Slocan.

CLAIMS: Sixteen mineral claims, including the Arlington Crown-granted mineral claim (Lot 2416).

ACCESS: Via the Springer Creek road, which leaves the Slocan–Nelson highway immediately south of Slocan.

OWNER: Arlington Silver Mines Ltd., 809, 525 Seymour Street, Vancouver 2; mine office, Slocan; S. Walsh, mine manager.

METALS: Silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Several raises were driven from A level to B level, and several old stopes were intersected between the levels. About 836 tons of ore was stoped from two areas below B level, and was shipped to the Trail smelter.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 250–251.

Little Tim

By P. E. Olson

LOCATION: (49° 117° N.E.) Near the head of Little Tim Creek, which flows into Springer Creek from the north.

CLAIMS: The Bee and Cee recorded mineral claims cover the Little Tim mine.

ACCESS: By 4 miles of jeep-road from the Ottawa mine.

OWNER: B. E. O'Neail, of Slocan.

OPERATORS: M. Nebor and N. Bjerg, of Slocan.

METALS: Silver, lead (*see* Table 12 for production).

WORK DONE: Old mine portals were cleaned out, the mine workings were examined, and about 21 tons of hand-sorted ore was shipped to the Trail smelter.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1919, p. 126; *Geol. Surv., Canada,* Mem. 184, p. 178.

Homestake

By P. E. Olson

LOCATION: (49° 117° N.E.) On the north side of Memphis Creek, about 1 mile east of the Slocan–Silverton highway, and at an elevation of 4,000 feet.

CLAIMS: Homestake Crown-granted mineral claim (Lot 15283) held as mineral lease M230.

ACCESS: Via 2 miles of jeep-road from the Slocan–Silverton highway.

OWNER: M. L. Craig.

OPERATOR: C. Thickett during the early part of the year and later by Smigaj and Grove, of Spokane, Wash.

METALS: Gold, silver (*see* Table 12 for production).

WORK DONE: C. Thickett, of Slocan, had an agreement with S. Reid, the owner of the Joyce No. 3 recorded mineral claim, which was thought by these men to cover the Homestake workings. During this time Thickett shipped 76 tons of ore to the Trail smelter. M. L. Craig acquired mineral lease M230, which covers the Homestake, and requested C. Thickett to leave. Subsequently M. L. Craig subleased to two Spokane men, who mined 45 tons of ore from the workings and shipped this ore to the Trail smelter.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1948, p. 148; 1950, p. 150; 1967, p. 249 (Joyce).

DESCRIPTION: The Homestake mine is developed by a 75-foot level, several short raises, and a short winze below the level. The adit, at an elevation of about 4,000 feet, is on a steep, rocky hillside which forms the immediate valley of Memphis Creek. The Homestake vein strikes northwesterly and dips steeply to the northeast. The principal structure is a shear about 10 feet wide which cuts granitic rocks of the Nelson batholithic complex. Within the shear there is a narrow vein of quartz which carried abundant pyrite and minor tetrahedrite, arsenopyrite, and possibly argentite. Native silver has been reported from this vein.

ENTERPRISE CREEK

Enterprise

By P. E. Olson

LOCATION: (49° 117° N.E.) On Enterprise Creek about 4 miles from the Slocan–New Denver highway.

CLAIMS: The Enterprise Crown-granted mineral claim (Lot 1014) and several adjoining claims.

ACCESS: Via 4 miles of fair road along Enterprise Creek. This road was washed out in several places in June, 1968. A new road was partly built from the Slocan–New Denver highway along the north side of Enterprise Creek.

OWNER: Enterprise Silver Mines Ltd. purchased the Enterprise mine from Western Exploration Company Limited early in 1968.

OPERATOR: Enterprise Silver Mines Ltd. (operating on behalf of the company were A. Mazur and partner, of Revelstoke).

METALS: Silver, lead, zinc (*see* Table 12 for production).

WORK DONE: A few tons of shipping ore and some milling-grade ore were shipped to the Trail smelter. The material shipped by the operators actually was mined by Dick Avison and partners late in 1967.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 251.

Westmont

By P. E. Olson

LOCATION: (49° 117° N.E.) On the north side of Enterprise Creek about 4 miles from the Slocan–Silverton highway.

CLAIMS: Westmont (Lot 8929), Eastmont (Lot 8924), White Cloud (Lot 8925), and six other adjoining Crown-granted mineral claims and fractions.

ACCESS: Via road along Enterprise and Westmont Creeks.

OWNER: Ellis Syndicate (optioned to Eastmont Silver Mines Ltd., 506, 905 West Pender Street, Vancouver 1).

OPERATOR: Brimont Mining Limited under management agreement with Eastmont Silver Mines Ltd.

METALS: Silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Three hundred and fifty-four feet of drifting was done, mainly on No. 5 level of the old Westmont mine. About 24 tons of development ore was shipped to the Trail smelter in October.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1963, p. 78; *Geol. Surv., Canada,* Mem. 184, 1935, p. 189.

DESCRIPTION: Galena, sphalerite, tetrahedrite, and ruby silver in quartz occur as fissure fillings in porphyritic Nelson granite.

SILVERTON

Standard

By P. E. Olson

LOCATION: (49° 117° N.E.). On the north side of Silverton Creek about 2 miles east of Silverton.

CLAIMS: The property consists of a large block of mineral claims including the Standard Crown-granted mineral claim (Lot 564).

ACCESS: The mine is serviced by a good mining-road which leaves Silverton on the north side of Silverton Creek.

OWNER: Western Exploration Company Limited.

OPERATOR: Panoil Canadian Minerals Associates; mine office, Silverton.

METALS: Silver, lead, zinc, gold (*see* Table 12 for production).

WORK DONE: Drifting, 610 feet; raising, 540 feet; sinking, 110 feet. Three 5-horsepower axial ventilation fans were installed for mine ventilation.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 251.

DESCRIPTION: A shaft was sunk and drifts were driven from the bottom of the shaft in both directions along the vein. The easterly drift was in ore for about 350 feet, and the westerly drift was in ore for about 100 feet. Raising and stoping showed the ore to continue only a few feet above the easterly drift, except near the shaft, where ore continued between levels.

Hewitt, Lorna Doone

By P. E. Olson

LOCATION: (49° 117° N.E.) The Hewitt mine is on the south side of Silverton Creek about 3 miles east of Silverton.

CLAIMS: Hewitt (Lot 4440) and Lorna Doone (Lot 1401) Crown-granted mineral claims.

ACCESS: Via 3 miles of fair road which leaves the New Denver–Slocan highway at Silverton.

OWNER: A. K. Lotze.

OERATOR: Panoil Canadian Minerals Associates, 717, 630 Eighth Avenue Southwest, Calgary, Alta.

METALS: Silver, lead, zinc.

WORK DONE: The Panoil company had the lower levels pumped out to enable the workings to be examined.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 251.

Freddy

By P. E. Olson

LOCATION: (49° 117° N.E.) The Freddy mine is 1 mile south of Silverton at an elevation of about 2,300 feet.

CLAIMS: The Freddy Crown-granted mineral claim (Lot 4025).

ACCESS: The Freddy mine is 2 miles by truck-road from Silverton.

OWNER: V. Hansen, New Denver.

METALS: Silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Drifting and stoping from the lowest level. About 63 tons of ore was shipped to the Trail smelter.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 252.

DESCRIPTION: The property is developed by a short winze and a level. The portal of the winze is beside Hasty Creek, which floods the workings each spring.

NEW DENVER

Panama

By P. E. Olson

LOCATION: (50° 117° S.E.) On London Ridge, about 1½ miles northwest of Zincton.

CLAIMS: Panama Crown-granted mineral claim (Lot 3152) and surrounding claims.

ACCESS: By 3½ miles of very steep road from Fish Lake on the Kaslo–New Denver highway.

OWNER: Vimy Explorations Ltd., 702, 850 West Hastings Street, Vancouver 1; H. Waller, manager.

METAL: Silver.

WORK DONE: A crosscut, started in 1965, was driven about 45 feet, at which point the Panama vein was intersected; 365 feet of drifting and crosscutting was done; and three holes totalling 212 feet were diamond drilled.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1965, p. 189.

DESCRIPTION: The Panama vein strikes easterly, dips at about 55 degrees to the south, and ranges from several inches to 2 feet in width. The vein is mainly white quartz sparsely mineralized with tetrahedrite. The entire length of the exposed vein was sampled.

SANDON

Mercury

By P. E. Olson

LOCATION: (49° 117° N.E.) On the southwest slope of Payne Mountain about 2 miles north of Sandon.

CLAIMS: Mercury (Lot 3531) and Redress (Lot 3209) Crown-granted mineral claims constitute mineral lease No. 21.

ACCESS: The property is below the Payne mine road, 2 miles from Sandon.

OWNER: Pat McCrory, New Denver.

METALS: Silver, lead, zinc.

WORK DONE: Several short diamond-drill holes were drilled from the Mercury level with a view to finding extensions of the vein. No mineralization was found.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 252.

Payne

By P. E. Olson

LOCATION: (50° 117° S.E.) On the southwest slope of Payne Mountain at an elevation of 5,000 feet.

CLAIMS: Several Crown-granted mineral claims, including the Payne (Lot 499).

ACCESS: Via the Payne mine road from Sandon, a distance of 2½ miles.

OWNER: R. A. Grimes, Nelson.

OPERATOR: Toby Creek Mines Limited, 204, 569 Howe Street, Vancouver 1.

METALS: Silver, lead, zinc.

WORK DONE: Clearing of the Payne No. 5 level continued, and a start was made on clearing the Payne No. 15 level (elevation 4,850 feet). This level is caved in several sections some distance from the portal, but some ventilation was passing through these caved sections.

REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 252; *Geol. Surv., Canada,* Mem. 184, pp. 98–100.

Madison

By P. E. Olson

LOCATION: (49° 117° N.E.) On the north side of Carpenter Creek valley about 1 mile northeast of Sandon.

CLAIMS: Ten mineral claims, including the Madison (Lot 1411), Madison Extension (Lot 5192), and Argenta (Lot 1412) Crown-granted mineral claims.

ACCESS: Via 1½ miles of mining-road which starts in Sandon on the abandoned K. & S. railway grade.

OWNER: Lorenzo Blondeau.
OPERATOR: Black Cricket Mines Limited, under option agreement; Leroy Shaw was in charge of exploration from an exploration office in New Denver.
METALS: Silver, lead, zinc.
WORK DONE: Two miles of road was built. Nine hundred feet of diamond drilling in three holes and trenching and stripping were done, mainly on the Madison Crown-granted mineral claim.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1898, p. 1074; 1899, p. 688; *Geol. Surv., Canada,* Mem. 184, p. 74.
DESCRIPTION: During 1898 and 1899 several levels, raises, and stopes were mined and a few tons of high-grade ore was shipped. This early work was discouraging since no continuity of mineralization was found. The company reports that 2 feet of core from hole No. 3 assayed: Gold, 0.04 ounce per ton; silver, 42.15 ounces per ton; lead, 0.6 per cent; zinc, 0.6 per cent.

Mountain Con

LOCATION: (49° 117° N.E.) At the extreme head of Carpenter Creek, on the western slope of Mount Carlyle, at elevations of 7,500 to 8,000 feet.
CLAIMS: Costick (Lot 9840) and Mountain Con (Lot 9841) Crown-granted mineral claims.
ACCESS: By helicopter.
OWNER: K. A. Thomas, Kaslo.
OPERATOR: Inland Ore Reduction, East 8816 Sprague Avenue, Spokane, Wash.; W. Geist, manager.
METALS: Silver, lead, zinc.
WORK DONE: Old workings were cleaned out and a small portable flotation mill was transported to the property by helicopter. Mining equipment and personnel were also transported by helicopter. No significant work was done in the mine.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1930, p. 250; *Geol. Surv., Canada,* Mem. 184, pp. 89–90.
DESCRIPTION: The mining and milling plants were set up just prior to the onset of winter, and were left at the property with a view to operating in 1969.

Silmonac (Minniehaha)

By P. E. Olson and L. Wardman

LOCATION: (49° 117° N.E.) One mile southwest of Sandon.
CLAIMS: Sixty-two Crown-granted mineral claims and three mineral leases.
ACCESS: By truck-road from Sandon.
OWNER: Silmonac Mines Limited.
OPERATOR: The Kambur Syndicate, of New Denver, is financed by Kam-Kotia Mines Limited and Burkam Mines Ltd.; J. C. Black, manager.
METALS: Silver, lead, zinc.
WORK DONE:

Roads were built and a portal was collared on the Minniehaha Crown-granted mineral claim (Lot 3170) at an elevation of 4,625 feet.

The following equipment was installed: One 56.6-kva. 440/220-volt 3-phase diesel-driven generator; one motor-generator set and one Hertner panel; two 440–220-volt dry-core lighting transformers; three grinders; and one diesel-driven air compressor.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 252.

DESCRIPTION:

During 1966 and 1967 Silmonac Mines Limited intersected promising structures and values in diamond-drill holes collared at the extremity of the Ruth-Hope No. 5 level. Kambur Syndicate was organized to explore the Silmonac discovery.

A road was constructed to the northern edge of the Minniehaha Crown-granted mineral claim (Lot 3170) from the Idaho Mountain road, and a mining plant was established at this point. The 4625 level was collared near the mining plant and advanced about 400 feet in a southerly direction, mainly in fractured argillite. This level is to provide a site from which diamond drilling can be done to explore the Silmonac discovery. The 4625 level is to be advanced about 3,000 feet and should explore several potential lode strands before reaching its objective.

RETALLACK-THREE FORKS

Victor

By P. E. Olson

LOCATION: (49° 117° N.E.) Immediately south of Three Forks.

CLAIMS: The Victor Crown-granted mineral claim (Lot 4565) and a large block of adjoining claims.

ACCESS: By 2 miles of good road that leaves Sandon at the Carnegie mill.

OWNER: Kam-Kotia Mines Limited, 416, 25 Adelaide Street West, Toronto, Ont.

OPERATORS: E. H. Petersen and E. Perepolkin, of Sandon.

METALS: Silver, lead, zinc (*see* Table 12 for production).

WORK DONE: Leasing, mainly on No. 5 level. About 38 tons of hand-sorted ore was shipped to the Trail smelter.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 252.

McAllister

By P. E. Olson

LOCATION: (50° 117° S.E.) On the northwest slope of London Ridge, about 3 miles northeast of Three Forks. Mine workings are at elevations of 5,500 to 5,900 feet.

CLAIMS: Ridgeway (Lot 11898), Silver Queen (Lot 11899), Silver King (Lot 11900), and Rowse Fractional (Lot 11901) Crown-granted mineral claims, and other adjoining claims.

ACCESS: By 4 miles of road along Kane Creek from Three Forks.

OWNER: Liberty Mines Ltd., 201, 535 Howe Street, Vancouver 1; mine office, Kaslo; H. L. Miller, project manager.

METAL: Silver.

WORK DONE: No. 3 level of the McAllister mine was cleaned out and examined. No. 6 level was badly caved at the portal so the entire portal area was bulldozed away and a new portal was started. A break-through into the old workings was not completed. Seven men were employed from July to November.

REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1950, p. 143; 1966, p. 223; *Geol. Surv., Canada,* Mem. 184, pp. 79–81.

Antoine

By P. E. Olson and L. Wardman

LOCATION: (50° 117° S.E.) Near the head of McGuigan Creek, a tributary of Seaton Creek from the south.

CLAIMS: About 16 mineral claims, including the Antoine (Lot 516) Crown grant.

ACCESS: By 9 miles of good mining-road which leaves the Kaslo–New Denver highway 3 miles east of Three Forks.

OWNER: Antoine Silver Mines Ltd., 506, 905 West Pender Street, Vancouver 1; mine office, New Denver; W. Wingert, manager.

METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Diamond drilling, 1,500 feet; development, 500 feet; ore mined, 6,670 tons. Ore trucked to the Red Deer Valley Coal Company Limited mill near Silverton produced 241 tons of lead concentrates and 359 tons of zinc concentrates, which were shipped to the Bunker Hill smelter. The mine worked continuously until November 30th and employed an average crew of 15 men. A small diesel-driven electric plant is in use for lighting.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 253.

Washington

By P. E. Olson

LOCATION: (50° 117° S.E.) On the south side of McGuigan Creek at an elevation of 5,800 to 6,400 feet.
CLAIMS: Thirteen mineral claims, including the Washington (Lot 541) and Slocan Boy (Lot 626) Crown-granted mineral claims.
ACCESS: Via the Antoine mine road, which follows the north side of McGuigan Creek.
OWNER: Larch Mining Limited, Silverton.
OPERATOR: W. H. McLeod.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Several large bulldozer cuts were made in an attempt to find the source of float found near the Washington mine. No veins were found. About 171 tons of hand-sorted lead ore was shipped to the Trail smelter.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 253; *Geol. Surv., Canada,* Mem. 184, p. 154.

Slocan Sovereign

By P. E. Olson

LOCATION: (49° 117° N.E.) On Reco Mountain about 1 mile northeast of Cody.
CLAIMS: Slocan Sovereign Crown-granted mineral claim (Lot 1927).
ACCESS: Via the Cody-Reco mine road.
OWNER: Wayne Turley, of Kaslo.
OPERATOR: Wayne Turley until October, at which time the property was taken over by Liberty Mines Ltd., of Kaslo.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Two short diamond-drill holes were put in to test the continuity of the lode. Some stoping was done, and 30 tons of ore was shipped to the Bunker Hill smelter.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1965, p. 192; 1966, p. 221.
DESCRIPTION: Liberty Mines Ltd. took over the property too late in the year to do any useful work. In 1969 this company plans to do further exploration and to mine known ore.

Reco, Bluebird

By P. E. Olson

LOCATION: (49° 117° N.E.) On Reco Mountain about 1 mile northeast of Cody at elevations of 4,000 to 7,000 feet.
CLAIMS: Forty-seven Crown-granted mineral claims, including the Ruecau (Lot 624), Noble Five (Lot 467), Bluebird, Chambers, New Denver, Goodenough, etc.
ACCESS: By road from Sandon via Cody.
OWNER: Mrs. J. M. Harris, of Sandon.
OPERATOR: Reco Silver Mines Limited, 201, 535 Howe Street, Vancouver 1.

METALS: Silver, lead, zinc.
WORK DONE: Geochemical surveys and 3,000 lineal feet of stripping by bulldozer.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 192.

Iron Crown

By P. E. Olson

LOCATION: (50° 117° S.E.) On the southeast flank of Eureka Mountain, overlooking Rossiter Creek, at an elevation of 7,000 feet.
CLAIMS: Iron Crown (Lot 2152), Kenneth (Lot 2153), and Mount Royal (Lot 2154) Crown-granted mineral claims.
ACCESS: Via the Eureka Mountain road from Retallack; this road crosses Whitewater and Lyle Creeks.
OWNER: Henry Zukowski, of Creston.
METALS: Silver, lead, zinc.
WORK DONE: Road-building was done to provide access to the Eureka mine, and a start was made toward extending this road to the Iron Crown.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1898, p. 1080 (*see* Iron Hand).
DESCRIPTION: The workings are in a particularly steep and mountainous area overlooking Rossiter Creek. Building a road to the workings will be difficult and expensive. The Iron Crown drift is open and some ore is piled nearby. This drift follows a vein of massive galena exposed in widths up to 6 inches.

Dublin Queen

By P. E. Olson

LOCATION: (50° 117° S.E.) 2½ miles south of Retallack near the head of Stenson Creek.
CLAIMS: Nine contiguous Crown-granted mineral claims, including the Dublin Queen (Lot 1167).
ACCESS: By mining-road, south from Retallack, along Stenson Creek.
OPERATOR: Iskut Silver Mines Ltd., 534 Burrard Street, Vancouver 1; R. D. Weseman, president.
METALS: Silver, lead, zinc.
WORK DONE: Detailed geological mapping of the Dublin Queen, 170 feet of bulldozer trenching, 30,000 square feet of bulldozer stripping, 40 feet of drifting, and eight diamond-drill holes totalling 1,830 feet.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 254.

Lucky Boy

By P. E. Olson

LOCATION: (49° 117° N.E.) Near the divide between Robb and Stenson Creeks at an elevation of about 7,000 feet.
CLAIM: Lucky Boy Crown-granted mineral claim (Lot 632).
ACCESS: By road from Retallack along Stenson Creek.
OWNER: L. N. Garland, Kaslo.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: The Jackson Basin road was extended to the property, and a start was made to clear out adits.
REFERENCE: *Geol. Surv., Canada,* Mem. 184, p. 230.
DESCRIPTION: The Lucky Boy has not been worked since the early 1900's. At that time a narrow high-grade vein of argentiferous galena was developed by two adits and several cuts, and about 40 tons of hand-sorted ore was shipped.

Utica By P. E. Olson

LOCATION: (49° 117° N.E.) Near the head of Twelve Mile Creek, about 15 miles west of Kaslo, between elevations of 6,150 and 7,500 feet.
CLAIMS: Fourteen Crown-granted mineral claims, including the key claim, Utica (Lot 4566).
ACCESS: By road along Twelve Mile Creek, which flows into Kaslo Creek from the south. This road is suitable for jeep-type vehicles only.
OWNER: Silver Peak Mines Ltd., 848 West Hastings Street, Vancouver 1.
OPERATOR: R. Golac, Nelson.
METALS: Silver, lead, zinc.
WORK DONE: A considerable amount of sampling was done throughout the mine; some diamond drilling was done below the 6150 level.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1965, p. 189; *Geol. Surv., Canada,* Mem. 184, pp. 252–256.
DESCRIPTION: The Utica mine has a long history of production, with important years being between 1909 and 1922. Since 1922 the mine has operated intermittently, but production of silver, lead, and zinc has been considerable during that time. At present there is a 50-ton mill on the property.

KEEN CREEK

Montezuma

LOCATION: (49° 117° N.E.) On the east side of Montezuma Creek, a tributary of Keen Creek from the north. Old workings range from 5,500 to 5,900 feet in elevation.
CLAIMS: Thirty-two mineral claims, including the Montezuma (Lot 2041) and Mexico (Lot 2042) Crown-granted mineral claims.
ACCESS: Via road along Keen Creek and jeep-road along Montezuma Creek.
OWNER: H. M. Geigerich.
OPERATOR: Hilroy Mines Ltd., 410, 470 Granville Street, Vancouver 2; R. Ingleby, director.
METALS: Silver, lead, zinc.
WORK DONE: Road-building and stripping of caved portals to old workings on the Montezuma mine.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 255.

WINLAW

Anne By P. E. Olson

LOCATION: (49° 117° N.W.) Immediately east of Winlaw.
CLAIMS: Anne 1 to 9.
ACCESS: On Highway No. 6, 3 miles from Winlaw.
OWNERS: Harold Avis and George Swanson, of Slocan.
OPERATOR: Giant Explorations Limited, 1825, 355 Burrard Street, Vancouver 1; A. M. Gerun, geologist.
METAL: Copper.
WORK DONE: Geological, electromagnetic, and magnetometer surveys were made, and soil samples were taken for geochemical analysis.

AINSWORTH

Greenacres By P. E. Olson

LOCATION: (49° 116° N.W.) The property lies 1 mile north of Ainsworth at an elevation of 2,000 feet.

CLAIMS: The Greenacres recorded mineral claim and the Jewel Crown-granted mineral claim (Lot 10785); main workings are on the Greenacres.
ACCESS: By road from Ainsworth, a distance of 1 mile.
OWNER: Multiple Mining Ltd., 569 Howe Street, Vancouver 1.
OPERATORS: Watch Mining & Development Ltd. and Multiple Mining Ltd.
METALS: Silver, lead, zinc.
WORK DONE: Surface stripping, road-building, and 310 feet of crosscutting. A few short diamond-drill holes were drilled near the end of the crosscut.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 256; *B.C. Dept. of Mines,* Bull. No. 53, p. 95 (*see* Jewel).
DESCRIPTION: The Greenacres showings lie in limestone of the lower Ainsworth Formation. Cross-fractures in the limestone are mineralized and are associated with local replacement of limestone with sphalerite, galena, and pyrite. Mineralization is rather discontinuous. The 310 feet of crosscut crosses the limestone obliquely but intersected no mineralization. Diamond-drill holes from the end of this working intersected no mineralization, although these drill-holes and workings were down-dip from the surface exposures of mineralization.

Silver Hoard

By P. E. Olson

LOCATION: (49° 116° N.W.) The Silver Hoard mine is at an elevation of 4,300 feet on the south side of Cedar Creek 1 mile north of Ainsworth.
CLAIMS: Silver Hoard Crown-granted mineral claim (Lot 10712).
ACCESS: Via 4 miles of truck-road which leaves the Ainsworth–Kaslo highway 1 mile south of Woodbury Creek.
OWNER: S. L. McLellan, Ainsworth.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: About 99 tons of dump rock was shipped from surface dumps on the Silver Hoard.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 256.
DESCRIPTION: About 500 tons of dump rock remain to be shipped from the Silver Hoard. The 1968 shipments were largely on a trial basis, which, according to reports, turned out satisfactorily.

Crown

By P. E. Olson

LOCATION: (49° 116° N.W.) The property straddles a ridge between Cedar and Lendrum Creeks about 2 miles west of Kootenay Lake.
CLAIM: The Crown (Lot 12847) Crown-granted mineral claim.
ACCESS: Via 4 miles of truck-road which leaves the Ainsworth–Kaslo highway about 1 mile south of Woodbury Creek.
OWNER: D. H. Norcross, of Nelson.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Thirty tons of ore was mined from a surface exposure of vein material about 300 feet south of the No. 2 adit. This ore was shipped to the Trail smelter.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1963, p. 73; *B.C. Dept. of Mines,* Bull. No. 53, p. 77.

Scranton

By P. E. Olson

LOCATION: (49° 117° N.E.) One mile south of Woodbury Creek and one-half mile within the eastern boundary of Kokanee Glacier Park, near the head of Pontiac Creek.

CLAIMS: Scranton (Lot 7452) and Grandview (Lot 6279) Crown-granted mineral claims.

ACCESS: Via 11 miles of fair road along Woodbury Creek from the Ainsworth–Kaslo highway.

OWNER: Blue Star Mines Limited, 400, 837 West Hastings Street, Vancouver 2.

OPERATOR: Silver Star Mines Ltd., 606, 626 West Pender Street, Vancouver 2; W. M. Sharp, consultant.

METALS: Gold, silver, lead, zinc.

WORK DONE: About 1,300 feet of underground work was done on the 5900 and 5700 levels. Some road-building and reconstruction of roads were done during the summer. Ten men were employed most of the year.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 256–257.

DESCRIPTION: Drifting on the 5900 level disclosed several long, narrow lenses of mineralization reported to assay about 14 ounces of silver per ton and about 14 per cent combined lead and zinc. Some isolated high assays in gold were also reported. The mineralized zones are in quartz, chiefly with minor pyrite. Muck from about 150 feet of the drifting on 5900 level was stockpiled for eventual treatment at the company mill at Ainsworth. The 5700 level was started to explore the downward extension of the ore showing on 5900 level.

Krao, Lead Coin

By P. E. Olson

LOCATION: (49° 116° N.W.) On Krao Creek about 1 mile southwest of Ainsworth.

CLAIMS: Krao (Lot 93), Nobel 3 (Lot 1435), Union (Lot 186), and 46 other Crown-granted and recorded mineral claims.

ACCESS: Via truck-road from Ainsworth.

OWNER: Coin Explorations Ltd., P.O. Box 230, Osoyoos, owns the property, except the Krao, which is optioned from O. K. Simmons, of Nelson.

METALS: Silver, lead, zinc.

WORK DONE: Bulldozer stripping was done on the structure which passes through the Krao mine.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 257.

DESCRIPTION: Sphalerite and galena occur in quartz veins and replacement zones in limestones, quartzites, and mica schists.

Skyline

By P. E. Olson

LOCATION: (49° 116° N.W.) On the south side of Krao Creek 2½ miles west of Kootenay Lake at an elevation of 5,600 feet.

CLAIMS: Skyline Crown-granted mineral claim (Lot 137).

ACCESS: Via the Cody Caves road which leaves the Ainsworth–Kaslo highway about 1 mile south of Woodbury Creek.

OWNER: W. E. Lane and associates, of Ainsworth.

METAL: Silver.

WORK DONE: Dumps were sampled.

REFERENCE: *B.C. Dept. of Mines,* Bull. No. 53, pp. 109–110.

DESCRIPTION: W. E. Lane and partners purchased the property late in 1968 and sampled the upper dumps, where it is estimated that there is 5,000 tons which can be profitably shipped directly to the Trail smelter.

Belle Aire By P. E. Olson

LOCATION: (49° 116° N.W.) North of Coffee Creek where the Balfour–Ainsworth highway crosses the creek.
CLAIMS: Margaret Nos. 1 to 4 recorded mineral claims.
ACCESS: The principal showings are within 250 feet of the Coffee Creek bridge.
OWNER: Grenmac Silver Mines Limited, 448 Seymour Street, Vancouver 2; mine office, Galloway; J. Thompson, manager.
METAL: Silver, lead, zinc.
WORK DONE: Several short diamond-drill holes were put down on the vein structure on the north bank of Coffee Creek where recent flooding had swept overburden from the vein.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1958, p. 43; *B.C. Dept. of Mines,* Bull. No. 53, pp. 74–75.

KASLO

HI-LO By P. E. Olson

LOCATION: (50° 116° S.W.) The property lies along Kootenay Lake between Schroeder and Lost Ledge Creeks.
CLAIMS: Thirty-six recorded mineral claims.
ACCESS: The claims were located along the Kaslo–Lardeau highway 10 miles north of Kaslo.
OWNER: Copper Horn Mining Ltd., P.O. Box 548, Penticton; R. Joy, president.
METALS: Silver, lead, zinc.
WORK DONE: Several short diamond-drill holes were drilled adjacent to the highway during 1967, and several bulldozer cuts were made during 1968.
REFERENCE: Assessment Report No. 1126.
DESCRIPTION: Sphalerite, with minor amounts of galena, was discovered along the Kaslo–Lardeau highway during construction of this road in 1952, but has received very little attention. The host rock, dolomitic limestone, outcrops for several miles along the highway north of Schroeder Creek.

LARDEAU

Moonshine By P. E. Olson

LOCATION: (50° 116° S.W.) The property is west of the Kaslo–Lardeau highway about 1 mile south of Lardeau.
CLAIMS: Moonshine (Lot 1881) and Right Bower (Lot 1882) Crown-granted mineral claims.
ACCESS: Via truck-road from the Kaslo–Lardeau highway.
OWNER: Willett Mines Ltd.
OPERATOR: J. Grant, Nelson, under lease arrangement with the owner.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Stoping was done above the main level, and 169 tons of ore was shipped to the Trail smelter.
REFERENCES: *Minister of Mines, B.C.,* Ann. Repts., 1951, p. 180; 1952, pp. 194–195; 1957, p. 60.

LEMON CREEK

Gold Reef By P. E. Olson

LOCATION: (49° 117° N.E.) About 1 mile northwest of the confluence of Crusader and Lemon Creeks at an elevation of 4,500 feet.
CLAIMS: Gold Reef and Gold Reef No. 2.

ACCESS: Via trail from a logging-road on Crusader Creek.
OWNERS: H. Avis and W. Dyson, of Winlaw.
METALS: Gold, silver, lead, zinc.
WORK DONE: A vein along a creek bottom has been exposed by several large cuts.
DESCRIPTION: The Gold Reef vein strikes easterly and dips steeply to the north and is about 12 feet wide where exposed. Wallrock is altered Nelson granite. Small lenses and masses of galena and sphalerite occur in the vein.

Dry Ridge

By P. E. Olson

LOCATION: (49° 117° N.E.) At the head of Mineral Creek and immediately west of Mount Ruppel at an elevation of 7,300 feet.
CLAIMS: Dry Ridge Nos. 1 and 2 (formerly Alexandria).
ACCESS: Via blazed trail from a logging-road on Crusader Creek, a tributary of Lemon Creek from the north.
OWNER: Norman Block, of Nelson.
METALS: Silver, lead.
WORK DONE: The claims were carefully prospected, and several narrow veins were stripped with hand-tools.
REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1898, p. 1077; 1899, p. 689 (*see* Alexandria).
DESCRIPTION: The owner reported that samples taken across 6 inches and 8 inches on two separate veins assayed about 50 per cent lead, with silver assaying around 2 ounces per unit of lead. Several old cuts and a shallow shaft which were found identify the property as the old Alexandria.

RIONDEL

Bluebell Mine

By P. E. Olson and L. Wardman

LOCATION: (49° 116° N.W.) The mine is 6 miles north of Kootenay Bay on the east side of Kootenay Lake.
CLAIMS: The Bluebell claims cover an area of 15 square miles centred around Riondel.
ACCESS: Six miles by road from Kootenay Bay. The mining property is also accessible to boats and barges on Kootenay Lake.
OWNER: Cominco Ltd.; company office, Trail; mine office, Riondel.
METALS: Silver, lead, zinc (*see* Table 12 for production).
WORK DONE: Stoping, 251,497 tons (all milled); development, 15,191 feet; raise borer advance, 1,934 feet (48-inch diameter); ventilation total, 250,000 cubic feet per minute; pumping (No. 8 level), 4,083 gallons per minute; pumping (Nos. 5 and 6 levels), 400 gallons per minute. A 50-horsepower 30-inch fan was installed at North Bay Point; one 300-horsepower, four 150-horsepower, one 50-horsepower, one 40-horsepower, and one 15-horsepower pumps were installed.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 259–260.
DESCRIPTION: The mine and mill operated continuously. Considerable advance northward was made on No. 8 level in spite of heavy flows of water and carbon dioxide, which increased while the level advanced. Ventilation to No. 8 level has been provided by 48-inch-diameter bore-holes driven from No. 5 level. Without these bore-holes, advance on No. 8 level would have been very hazardous, if not impossible. The increased flows of water on No. 8 level are followed by diminished flows on upper levels, thus demonstrating a general lowering of the ground-water table in the strata embracing the mine workings. The

character of the influent mine water clearly shows that lake water is not penetrating the workings, although the mine is several hundred feet below the lake surface.

CRAWFORD CREEK

Humbolt

By P. E. Olson

LOCATION: (49° 116° N.W.) West of Rose Pass near the head of Crawford Creek.

CLAIMS: About 100 recorded claims and several Crown grants, including the Humbolt (Lot 2015).

ACCESS: Via 15 miles of public and logging roads from Crawford Bay on Kootenay Lake.

OWNER: Rose Pass Mines Ltd., 630A—17th Avenue Southwest, Calgary 3, Alta.; Glen Champion, field manager.

METALS: Silver, lead, zinc.

WORK DONE: Twelve holes totalling 1,756 feet were diamond drilled, mainly to the southeast of the main showings on the Humbolt claim.

REFERENCES: *Minister of Mines, B.C.,* Ann Repts., 1966, p. 227; 1967, p. 260.

DESCRIPTION: The company prospected areas found to be anomalous by a 1966 induced polarization survey.

United Copper

LOCATION: (49° 116° N.W.) South of Sawyer Pass at elevations of 6,300 to 6,900 feet between the head of Sawyer Creek and a small creek tributary to Crawford Creek.

CLAIMS: United Copper 2 to 22; Limestone 1 to 8, 10 to 17, 22, and 23.

ACCESS: Four and one-half miles by four-wheel-drive vehicle up Crawford Creek from Crawford Bay.

OWNER: Cogle Copper Limited, 373 Baker Street, Nelson.

METALS: Silver, lead, zinc, copper, nickel.

WORK DONE: One and one-half miles of road was rebuilt, several rock cuts and open cuts were excavated, one hole 120 feet deep was diamond drilled.

REVELSTOKE MINING DIVISION

REVELSTOKE

Knox

By James T. Fyles and T. M. Waterland

LOCATION: (51° 118° S.E.) Exploration done in an area about 15 miles square immediately northwest of Revelstoke. Showings of molybdenite between 7,000 and 7,200 feet elevation on the north slope of the ridge 2 miles west of Mount Copeland explored by underground work.

CLAIMS: Several hundred claims located as the Knox, XX, etc., cover most of the area.

ACCESS: Logging and mining road from Highway No. 1, 2 miles west of Revelstoke, north along Jordan River and west up Hiren Creek. Most access by helicopter.

OWNER: King Resources Company, 1300 Elveden House, Calgary, Alta.

METAL: Molybdenum.

WORK DONE:

During 1968, 9 miles of road was built from the Jordan River up Hiren Creek to the south adit location at the 6,150-foot elevation. A trailer camp and workshop,

compressor-generator house, etc., were established and snowsheds constructed. Explosives magazines, dump trestle, etc., were constructed, and a 6,000-foot, 8- by 9-foot adit was driven from this location on the south side of Copeland Ridge. An access raise was collared and driven 165 feet, and an ore-pass raise, 69 feet. These raises are to be continued through to the workings on the 6500 level, which had be developed from an adit on the north side of Copeland Ridge.

The north camp was occupied for three months, and approximately 1,000 feet of drifting and crosscutting and 3,500 feet of underground diamond drilling was carried out from this camp. Access to the north camp was by helicopter from Revelstoke.

At year-end, plans were under way for the construction of a concentrator.

At the end of December, 1968, 35 men were employed at the operation. The operation was under the direction of B. T. Gallant, of King Resources Company, and the underground work and camp facilities were run under contract by Versatile Mining Services Limited with Ed R. Becker, of Vernon, in charge.

A 120-kva. diesel-driven generator supplies power for lighting and operating mine fans. The connected load is as follows: Mine fans, 83 horsepower; rectifiers, 4 horsepower; pumps, 2 horsepower; workshops, 3 horsepower; total, 92 horsepower.

An extensive prospecting programme was run by M.C.R. Exploration Ltd. for King Resources Company under the direction of M. C. Robinson. This included a systematic stream sediment and talus fines geochemical survey of all the drainage basin of the Jordan River and the headwaters of streams flowing west into the Perry River. Geological mapping on 1,000 feet to the inch was done between Hiren Creek and Highway No. 1 and along the ridge between the Jordan and Columbia Rivers. Samples were analysed for copper, lead, zinc, and molybdenum. Reconnaissance geochemistry was followed by more detailed geochemistry and prospecting. Several showings were found, which were sampled and trenched by hand.

REFERENCES: *Minister of Mines, B.C.,* Ann Rept., 1967, p. 261; Fyles, James T., 1969, Structure of the Shuswap Complex in the Jordan River Area Northwest of Revelstoke, *Geol. Assoc. Can.,* Spec. Vol., in press; *B.C. Dept. of Mines,* Bull. No. 57, Geology of the Jordan River Area, in press.

DESCRIPTION: Drilling and underground work on molybdenite showings on the north slope of Copeland Ridge outlined a body of high-grade molybdenite in syenite pegmatite. The pegmatite is along the northern contact of a large mass of syenite and nepheline synite gneiss which dips, in general, at moderate angles to the south. The pegmatite, which is up to 10 feet thick, is folded into tight structures plunging to the southeast. The size and limits of the mineralized zone have not yet been determined.

Stannite

LOCATION: (51° 117° S.W.) Clabon Creek.

CLAIMS: Seventy-five claims including the May, Helena, Alice, and other groups, formerly known as the Woolsey, Regal Silver, and Snowflake.

ACCESS: Via Trans-Canada Highway for 17 miles from Revelstoke, thence 7 miles up the Woolsey and Clabon Creek road.

OWNER: Stannex Minerals Ltd., 510, 850 West Hastings Street, Vancouver 1; J. B. C. Lang, manager.

METALS: Silver, lead, zinc.

WORK DONE: A total of 3,605 feet of underground exploration. Underground work was contracted to Canadian Mine Services Ltd. Nineteen men were employed for four months.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, pp. 263–264.
DESCRIPTION: Vein deposit in graphitic siliceous schist.

Wigwam By James T. Fyles

LOCATION: (50° 117° N.W.) North slope of Akolkolex River 14 miles southeast of Revelstoke.
CLAIMS: Big R 1 to 4, Big M 1 to 8, Buck 1 to 10, Big T 1 to 12, Big Valley 1 to 4, and Hianna 1 to 16.
ACCESS: By road via Akolkolex forest access road leaving Highway No. 23, 10½ miles south of Revelstoke.
OWNER: Mel Pardek, 3425 Napier Street, Vancouver 6.
METALS: Zinc, lead.
WORK DONE: Half a mile of steep "Cat" road, sampling of old showings by September, 1968, when the property was visited.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1961, p. 84; Muraro, T.W., Metamorphism of Zinc-Lead Deposits in Southeastern British Columbia, *C.I.M.M.,* Special Vol. No. 8, pp. 243–246.

TANGIER RIVER

George

LOCATION: (51° 117° S.W.) Near the head of Tangier River.
CLAIMS: Ten claims, George, Reggie, Roy, Arthur, *et al.,* known as the George group.
ACCESS: By 21 miles of road from Trans-Canada Highway.
OWNER: Ottamac Mines Ltd., 1451 Pandosy Street, Kelowna.
METALS: Copper, lead, zinc, silver, gold.
WORK DONE: Twenty-one miles of new road was built with Government assistance, 2,000 square feet of bedrock was hydraulically stripped, and 10 diamond-drill holes totalling about 500 feet were drilled. Work was supervised by R. A. Woolsey.

NORTH LARDEAU

True Fissure By P. E. Olson

LOCATION: (50° 117° N.E. and N.W.) On Great Northern Mountain about 2 miles north of Ferguson.
CLAIMS: True Fissure (Lot 1097), Hillside (Lot 1098), Great Northern (Lot 1099), Broadview (Lot 1550), and many other mineral claims.
ACCESS: The True Fissure mine is reached by 3 miles of fair road from Ferguson. A branch from this road services the Broadview mine.
OWNER: Columbia Metals Corporation, Limited, 1002, 80 Richmond Street West, Toronto, Ont.; mine office, Trout Lake.
METALS: Silver, lead, zinc.
WORK DONE: Stripping, road-building, diamond drilling, and drifting.
REFERENCES: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 264; *B.C. Dept of Mines,* Bull. No. 45, pp. 79–85.
DESCRIPTION: A road was built across swampy ground to the Broadview. Considerable diamond drilling was done from the Broadview No. 3 level in an attempt to find parallel veins or splits. Drifting and diamond drilling on the True Fissure No. 2 level are reported by the operators to have proven ore

reserves of 60,000 tons, grading about 6 ounces of silver, 6 per cent lead, and 4 per cent zinc. On No. 2 level the vein pinched out after 235 feet of drifting beyond the old face.

Eva, Oyster, Criterion

By P. E. Olson

LOCATION: (50° 117° N.W.) On the Incomappleux River in the vicinity of Camborne.
CLAIMS: Eva (Lot 5172), Oyster (Lot 5416), Criterion (Lot 5417), and 35 other Crown-granted claims totalling 855 acres.
ACCESS: Four miles by road from Beaton.
OWNER: Duval Corporation, 506, 602 West Hastings Street, Vancouver 2.
METALS: Gold, silver.
WORK DONE: Geological mapping and channel sampling in old workings. The work was supervised by J. R. Deighton, geologist.
REFERENCE: *Geol. Surv., Canada,* Mem. 161, pp. 35–39.
DESCRIPTION: Gold-bearing quartz-pyrite veins occur in isoclinally folded argillites and quartzites of the Windermere Group.

GOLDEN MINING DIVISION

SPILLIMACHEEN

ADR

LOCATION: (50° 116° N.W.) Head of Vowell Creek, 30 miles west of Spillimacheen Post Office.
CLAIMS: ADR 1 to 21.
ACCESS: By road west up Bobbie Burns Creek.
OWNER: Medesto Exploration Ltd., 215A Tenth Street Northwest, Calgary 41, Alta.; R. Renn, superintendent.
METALS: Silver, zinc.
WORK DONE: Ten trenches, total length 4,250 feet, were blasted and bulldozed. Two men were employed for two weeks.

HL, Bob, Liz

LOCATION: (50° 116° N.W.) At elevations of 6,000 to 7,000 feet at the headwaters of Warren Creek, 15 miles west of Spillimacheen.
CLAIMS: HL 1 to 8, 20 to 25; Bob 1 to 4; Liz 166 to 167.
ACCESS: From Parson by logging-road for 25 miles.
OPERATOR: Carolin Mines Ltd., P.O. Box 1269, Merritt; O. Gillespie, president.
METAL: Copper.
WORK DONE: An electromagnetic survey of the whole area was made, 2,600 feet of trenches was bulldozed, 800 feet of new road and 1½ miles of access road were built, and nine holes totalling 2,186 feet were diamond drilled.
REFERENCES: *Minister of Mines, B.C.,* Ann Repts., 1960, p. 85; 1961, p. 83.

LO

LOCATION: (50° 117° S.E.) At elevations of 5,000 to 8,000 feet on Bobbie Burns Creek 35 miles from Parson.
CLAIMS: LO 1 to 18.
ACCESS: Thirty-five miles from Parson by logging-road.
OWNER: Valnicla Copper Mine Ltd., P.O. Box 1269, Merritt.
OPERATOR: Norranco Mining & Refining Co. Ltd., 500, 736 Eighth Avenue Southwest, Calgary 2, Alta.; A. D. Tidsbury, consultant.

METAL: Copper.
WORK DONE: Access road to upper basin was completed and 300 feet of trench was cut by bulldozer. Base-line and grid system was started in preparation for mapping and geophysical surveying.
DESCRIPTION: Copper-bearing quartz vein in argillite and micaceous schist.

HORSETHIEF CREEK

Mag, Nimrod, Puzzler

LOCATION: (50° 116° N.E.) On Starbird Ridge on the north side of Horsethief Creek 13 miles west of Wilmer.
CLAIMS: Thirty-five claims comprising the Mag, Nimrod, Puzzler, Brown Bear, Discovery, and other groups.
ACCESS: From Windermere by logging-road, a distance of 19 miles.
OWNER: G. Larrabee.
OPERATOR: Cominco Ltd., 1199 West Pender Street, Vancouver 1; W. J. McMillan, exploration geologist.
METALS: Lead, zinc.
WORK DONE: Detailed geological mapping of the Mag 1 and 2 claims, soil samples taken on the Mag 1 and 2 for geochemical analysis, and nine trenches totalling 1,200 lineal feet bulldozed. Three men were employed for one month.

Great Northern, Copper King

LOCATION: (50° 116° S.E. and S.W.) On the northwest slope of Black Diamond Mountain at the head of Farnham Creek.
CLAIMS: Mineral lease 15, comprising the Great Northern (Lot 5358), Copper King (Lot 9988), and nine other Crown grants, is surrounded by about 75 located claims designated the Tatler group.
ACCESS: Thirty-two miles by road from Invermere.
OWNER: Jumbo Mines Ltd., 617, 402 West Pender Street, Vancouver 3; F. P. Sheppard and Associates, consultants.
METALS: Copper, silver, lead, zinc, gold.
WORK DONE: Ten miles of road was built and five holes totalling 1,456 feet were diamond drilled. Ten men were employed for five months.
REFERENCE: Assessment Report No. 1614.

DUTCH CREEK

Yornoc

LOCATION: (50° 116° S.E.) Near the head of Ben Abel Creek, 16 miles southwest of Invermere.
CLAIMS: Yornoc group of 31 mineral claims.
ACCESS: By logging-road west from Canal Flats.
OWNER: J. H. Conroy, of Invermere.
OPERATOR: Dresser Industries Inc., 415 Third Street Southwest, Calgary, Alta.
METALS: Lead, silver, barite.
WORK DONE: Electromagnetic, gravity, and geochemical surveys were made, and 300 feet of core drilling was done.

Dutchy

LOCATION: (50° 116° S.E.) In the vicinity of Copper Creek on the north side of Dutch Creek.
CLAIMS: Dutchy 1 to 10, formerly known as the Duchess.
ACCESS: By logging-road west from Canal Flats.

OWNER: J. H. Conroy, of Invermere.
OPERATOR: Yornoc Mining Co. Ltd., P.O. Box 606, Invermere.
METAL: Copper.
WORK DONE: Mapping and sampling by Cominco Ltd. and open trenching and soil-sampling by Yornoc Mining Co. Ltd.

TOBY CREEK

Rad

LOCATION: (50° 116° S.E.) Delphine Creek, on north side of Toby Creek.
CLAIMS: Fifty-claim Rad group.
ACCESS: Twenty-three miles from Windermere by road.
OWNER: Medesto Exploration Ltd., 215A Tenth Street Northwest, Calgary 41, Alta.
METALS: Silver, lead.
WORK DONE: Fifty feet of trenching; one pit, 6 feet deep.

Melody

By R. W. Lewis

LOCATION: (50° 116° S.E.) Four miles up Coppercrown Creek from its junction with Toby Creek.
CLAIMS: Melody 1 to 23.
ACCESS: Six miles by trail from the Toby Creek road.
OWNERS: Consolidated New Pacific Limited; H. W. Copper and J. Mosimann.
OPERATOR: North Canadian Oils Limited, 640 Seventh Avenue South, Calgary 2, Alta.; W. H. Myers, consultant.
METALS: Silver, lead, zinc.
WORK DONE: Detailed geological mapping was done on the Melody 1 and 2 claims in the vicinity of the old workings and current drilling. An induced polarization survey was made, 543 feet of trenches was blasted in bedrock, and eight holes totalling 2,891 feet were diamond drilled. Ten men were employed for four months.
REFERENCE: *Minister of Mines, B.C.*, Ann Rept., 1925, p. 224 (Silver Spray).

WINDERMERE

490

LOCATION: (50° 115° S.W.) On the southwest slope of Swansea Mountain 3 miles northeast of Windermere.
CLAIMS: 490 Nos. 1 to 40.
ACCESS: Four miles by road from Invermere.
OWNER: Alda Mines Ltd., 406, 402 West Pender Street, Vancouver 3; A. E. Morgan, president.
METALS: Copper, silver.
WORK DONE: The surface workings were mapped, two trenches totalling 400 feet in length were bulldozed, 5,000 square feet of bedrock was stripped by bulldozer, and some rock cuts were drilled and blasted. Five men were employed two months on the property.

FORT STEELE MINING DIVISION

SKOOKUMCHUCK CREEK

Pico

LOCATION: (49° 116° N.E.) At elevations of 4,500 and 8,700 feet on Greenland (Burnt) Creek, a tributary of Skookumchuck Creek.

CLAIMS: Pico 2, 7, 8, 9 to 12, 42 to 44; Star 1 to 5.
ACCESS: By highway 25 miles north from Kimberley, thence by gravel road for 30 miles west up Skookumchuck Creek.
OWNER: Cominco Ltd., 1199 West Pender Street, Vancouver 1.
METAL: Tungsten.
WORK DONE: Bedrock was stripped and trenched by bulldozer, and 3,000 cubic yards of overburden was removed. One hole 100 feet long was diamond drilled. Four men were employed for two weeks.
DESCRIPTION: Scheelite occurs in a skarn zone in siltstones and argillites.

KIMBERLEY

Sullivan Mine

By R. W. Lewis and L. Wardman

LOCATION: (49° 115° N.W.) The Sullivan mine is on Mark Creek, 2 miles north of Kimberley, and the concentrator is at Chapman Camp, 2 miles south of Kimberley.

CLAIMS: The holdings include 680 Crown-granted claims and fractions and 436 recorded claims.

ACCESS: Off main highway at Kimberley.

OWNER: Cominco Ltd., 1199 West Pender Street, Vancouver 1; Western Headquarters, Trail—J. H. Salter, vice-president, western region; S. M. Rothman, general manager; Western Operation, Kimberley—R. M. Porter, manager, Kimberley operations; O. E. Weightman, superintendent, Sullivan mine; R. M. Lauer, superintendent, Sullivan concentrator.

METALS: Silver, lead, zinc (*see* Table 12 for production).

WORK DONE:

During 1968 about 2,533,024 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 258 days during 1968.

Development driven totalled approximately 29,300 feet and core-hole diamond drilling about 9,000 feet. Backfill totalled 557,000 cubic yards of float rock, cave, and development waste.

The ventilation system handled approximately 865,000 cubic feet of air per minute. Installation of a 15 million B.T.U. per hour direct natural-gas fire heating plant for 270,000 cubic feet of air per minute in No. 24 shaft was started.

In the mine powerhouse a 150-horsepower pump was installed. At the concentrator, lighting was improved in the carpenter-shop, supervisors' dry, and warehouse. Control equipment was installed for the tin-recovery section. A 125-horsepower motor was installed for the bulk lime-handling section. Motors and starting equipment were installed for changes in the mineral-separation section.

Two 1,200-ampere Federal Pacific Electric Fusematic Breakers were installed in the mill substation. A motor and starting equipment were installed for the high-pressure water system.

DESCRIPTION:

The application of rock mechanics work to improve mining methods continued.

Technical development has been directed mainly toward improved mining methods, with extensive trials of pneumatic stowing equipment for backfilling of stopes; further testing of reaming relief holes up to 8 inches in diameter for improved blasting of longhole winzes, the application of a safe one-man transportation operation, the use of mortar rock bolting, and the improved use of explosives.

In 1968 the Sullivan mine had 19 lost-time accidents; there were three at the concentrator. No fatalities occurred at either operation. Accident frequency per 1,000,000 man-hours worked was 16.85 at the mine and 6.25 at the concentrator. The severity rate per 1,000,000 man-hours worked was 1,263.1 calendar days at the mine and 911.0 at the concentrator.

Eleven Sullivan mine and concentrator employees obtained or renewed their industrial first-aid certificates and 60 employees passed their St. John Ambulance first-aid examinations.

Twelve Sullivan mine employees obtained their mine-rescue certificates, making a total of 362 since training started in 1929.

Kim

LOCATION: (49° 115° N.W.) On the east side of Luke Creek 6 to 10 miles southeast of Kimberley and 5 to 8 miles north and northeast of Wycliffe.
CLAIMS: Kim 1 to 209.
ACCESS: Five miles by road from St. Mary Lake.
OWNER: Imperial Oil Limited, 500 Sixth Avenue Southwest, Calgary, Alta.; J. Hughson, geologist.
METALS: Lead, zinc.
WORK DONE: Topographic and surface maps were made. The geology of the claims was mapped, and magnetometer and gravity surveys were made. Five men spent four months on the property.
REFERENCE: Assessment Report No. 1715.

BULL RIVER

Big Bonanza, Bonanza

LOCATION: (49° 115° N.E.) On Burnt Bridge Creek 5 miles north of the abandoned town of Bull River, near Bull River hydro power plant.
CLAIMS: Big Bonanza 1 to 4, June 1 to 6, and 30 Bonanza claims.
ACCESS: From Wardner on Highway No. 3 by a paved highway for 8 miles.
OWNER: J. Van Koughnett.
OPERATOR: Placid Oil Company, 860 Guiness House, Calgary 2, Alta; R. A. Buckley, chief geologist.
METALS: Silver, lead, zinc, copper.
WORK DONE: Detailed geological mapping was done, and a magnetometer survey covering all the claims was made. Three hundred feet of trench was bulldozed, and 5,000 square feet of bedrock was stripped by bulldozer. A number of old pits were cleaned, and 1,500 feet of old adit was cleaned out. Twenty-three surface holes totalling 7,414 feet and five underground holes totalling 1,018 feet were diamond drilled. Nine men were employed for 10 months.

FORT STEELE

Midas, Big Chief

LOCATION: (49° 115° N.W.) Between elevations of 3,000 and 6,500 feet toward the head of Pebble (Boulder) Creek.
CLAIMS: Big Chief (Lot 4046), Midas (Lot 5456), Midas 2 to 9, and other recorded claims.
ACCESS: Five miles from Highway No. 95 at Fort Steele.
OWNER: Boulder Creek Mines Ltd., P.O. Box 372, Cranbrook.
METALS: Lead, silver, zinc (*see* Table 12 for production).

WORK DONE: Two open cuts were drilled and blasted, 1,200 feet of trenches were bulldozed, and 3,000 square feet of bedrock was stripped by bulldozer. One mile of access road was built, and three holes totalling 130 feet were diamond drilled. Two men were employed for eight months.

CRANBROOK

Jim, Cat, Nord, Etc.

LOCATION: (49° 115° S.W. and N.W.) One to four miles southwest of Cranbrook.

CLAIMS: Three hundred and eighty-one claims and fractions located as the Jim, Carol, Neil, Elk, Cat, Nord, and Jill groups.

ACCESS: From Highway No. 3 by logging-road for a distance of 2 miles.

OPERATOR: Placid Oil Company, 860 Guiness House, Calgary, Alta.; R. A. Buckley, chief geologist.

WORK DONE: A topographic map was made. An induced polarization survey was made of the entire property. Twenty-eight holes totalling 14,000 feet were diamond drilled. Twenty-seven men were employed for nine months.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 272; Assessment Reports Nos. 1174A, 1174B, 1178, 1207, 1244, and 1670.

DESCRIPTION: This is an extensive programme of exploration for strata-bound sulphides in the Aldridge Formation. To date no metallic minerals of importance have been found.

FLATHEAD VALLEY

Akamina

LOCATION: (49° 114° S.E.) In the Flathead Valley of southeastern British Columbia, adjacent to the Alberta and Montana borders, and extending southward from the head of Commerce Creek and encompassing the heads of Sage, Kishinena, and Akamina Creeks.

CLAIMS: Stang, Lin, Cum, Ruby, etc., groups, totalling approximately 1,900 recorded claims.

ACCESS: By road from Fernie to Sage Creek, a distance of 50 miles.

OWNER: Akamina Minerals Ltd., 702 Bank of Montreal Building, 101st Street and Jasper Avenue, Edmonton, Alta.; J. A. Rutherford, geologist and field manager.

METALS: Copper, silver.

WORK DONE: Visual prospecting, geological mapping, reconnaissance geochemistry, and some trenching by drilling and blasting.

DESCRIPTION:

The Precambrian Purcell Series of southeastern British Columbia and southwestern Alberta have been investigated for copper deposits during the past few years.

Chalcopyrite, bornite, and chalcocite mineralization is widespread and occurs mainly in quartz sandstones within the upper part of the Grinnell Formation and to a lesser extent in quartz sandstones of the Siyeh and Appekunny Formations. Copper minerals are disseminated between grains of quartz in sandstone, as clots commonly associated with shale fragments, and as small fracture fillings. Copper mineralization also occurs in quartz veins and as disseminations in some Purcell sills and dykes, where it is particularly conspicuous in the fine-grained margins.

CRAWFORD CREEK

Humbolt (Rose Pass Mines Ltd.)

(49° 116° N.W.) *See under* Slocan Mining Division, page 262.

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 examinations 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 as is 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, 1968

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	Line-cutting, Grid Survey, or Topographic Survey
48° 123°	N.W.	Mac, Max, Pansy, Ruby, John, Kerry, Judy, Ron (San Juan Property) Concorde Explorations Ltd. R. D. H. Philp. September 25, 1968.	1656	—	—	×	—
49° 115°	S.W.	Carol, Neil Placid Oil Company. R. A. Buckley. January 25, 1968.	1178	—	×	—	—
49° 115°	S.W.	Jill Placid Oil Company. Aime R. Brazeau. October 16, 1968.	1670	—	×	—	—
49° 115°	S.W.	Jim Placid Oil Company. J. T. Cook. January 29, 1968.	1207	—	×	—	—
49° 115°	S.W.	Jim, Cat, Carol, Nord, Neil, Elk, Jill Placid Oil Company. R. A. Buckley. December 20, 1967.	1174A	×	—	—	—
49° 115°	S.W.	Jim, Jim South, Carol, Cat Placid Oil Company. W. Schuur. January 19, 1968.	1174B	—	×	—	—
49° 115°	S.W.	Nord Placid Oil Company. R. A. Buckley. April 29, 1968.	1244	—	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
49° 115°	N.W.	Chan, Cherry, Char, Spike Utah Construction & Mining Co. G. A. Noel. February 26, 1968.	1223	....	×	×	—
49° 116°	N.W.	Ben Derby, UNF Kokanee Moly Mines Ltd. R. G. Jury. March 1, 1968.	1176	....	—	×	....
49° 116°	N.E.	Jac, Jill Fort Steele Mines Ltd. C. B. Selmser. July 5, 1968.	1583	....	×	....	—
49° 116°	S.E.	Kid H. E. Fors. Michael McCombe. August 7, 1968.	1642	....	×	....	....
49° 116°	S.E.	Kid H. E. Fors. R. G. Gifford. August 30, 1968.	1625	×	×	×	....
49° 116°	N.W.	Norm, Les-Ann Nelway Mines Ltd. C. J. Coveney. April 19, 1968.	1249	×	—	×	—
49° 116°	S.W.	Tag, Liz, Bid Aspen Grove Mines Ltd. D. L. Hings. October 31, 1968.	1695	....	×	....	....
49° 117°	S.E.	Hattie, Dal (Erie Group No. 2) McIntyre Porcupine Mines Ltd. J. W. MacLeod. July 30, 1968.	1603	....	—	×	....
49° 117°	N.E.	Rockland, Willa, Little Daisy Rockland Mining Ltd. D. K. Mustard. February 21, 1968.	1185	....	....	×	....
49° 118°	S.W.	Argo Rayore Mines Ltd. D. R. Cochrane. January 19, 1968.	1217	....	×	....	—
49° 118°	S.W.	Cyclops, Chief, Silver Chief Giant Explorations Ltd. D. M. Wilson. July 8, 1968.	1580	....	×	×	—
49° 118°	S.W.	Dee Rayore Mines Ltd. D. R. Cochrane. January 19, 1968.	1200	....	×	....	....
49° 118°	S.W.	Joe, Keno Extension, Hidden Treasure, Ike, Sam, Keno, Ophir, Rattler, Lookout, Fanny Joe, Sunnyside, Evening Star (Evening Star and Bombini Groups) Bomarc Mining Co. Ltd. J. Sullivan. March 29, 1968.	1232	....	×	....	....
49° 118°	S.W.	Joe, Wren, Keno, Keno Extension, Sibley, Evening Star, Colleen (Sibley and Wren Properties) Rayore Mines Ltd. A. B. L. Whittles. September 6, 1968.	1618	....	×	×	....
49° 118°	S.W.	Lex Lexington Mines Ltd. F. J. Hemsworth. December 2, 1968.	1707A	....	....	×	....

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
49° 118°	S.W.	Lex Lexington Mines Ltd. F. J. Hemsworth. December 2, 1968.	1707B	—	×	—	—
49° 118°	S.W.	Lex Lexington Mines Ltd. F. J. Hemsworth. December 2, 1968.	1707C	—	×	×	—
49° 118°	S.W.	OR, CU, Sovereign, Croesus, Eholt, Johnnesburg, Lexicon (OR Group) Ortega Minerals Ltd. F. J. Hemsworth. September 30, 1968.	1648	—	—	×	—
49° 118°	N.E.	Rio, Banner Lee R. McNair and C. N. W. Hutchinson. G. W. H. Norman. November 13, 1968.	1688	×	×	×	—
49° 118°	S.W.	Stan, KR, Rockland (Eholt and Eholt West Groups) King Resources Company. M. C. Robinson. November 16, 1967.	1162	—	—	×	—
49° 119°	N.W.	ARL, AC, CB (Trepanier Creek Groups) Braemar Mines Ltd. R. B. Stokes. January 15, 1968.	1173	×	×	×	—
49° 119°	S.W.	Budy W. Cannon. W. Cannon. June 27, 1967.	1210	—	×	—	—
49° 119°	S.W.	Copper Coin (Ethel Group) Coin Explorations Ltd. J. A. Mitchell. February 15, 1968.	1182	—	—	×	—
49° 119°	N.W.	Jo Lakeland Base Metals Ltd. A. C. Skerl. February 19, 1968.	1187	—	—	×	—
49° 119°	S.W.	Libra Libra Mines Ltd. D. Waugh and M. D. Kierans. December 15, 1967.	1154	×	—	×	—
49° 119°	S.W.	Libra Libra Mines Ltd. J. W. Prior. September 18, 1968.	1697	—	×	—	—
49° 119°	S.E.	Old Nick, Lola, Don, Holin, Three Sisters, Slow Poke, Nick, Jake, MB, Acme, Phoebe (Nickel Ridge Property) Nickel Ridge Mines Ltd. J. A. Coope, W. M. Dolan, and C. P. Costin. May 2, 1968.	1243	×	×	×	—
49° 119°	S.W.	Pen, Pal, Axe, Hen, Old Joe (Osoyoos Group) Multiple Mining Ltd. R. E. Renshaw. May 13, 1968.	1228	×	—	×	—
49° 119°	S.E.	RC (Rock Creek Group No. 1) Anaconda American Brass Ltd. T. A. Conto. May 7, 1968.	1230	—	×	—	—
49° 119°	S.W.	Silver Coin, Lone Pine (Ray Group) Coin Explorations Ltd. J. A. Mitchell. February 15, 1968.	1183	—	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
49° 119°	S.W.	Sup, Susap, Tom Noranda Exploration Company Ltd. J. D. Knauer. July 4, 1968.	1578	....	....	×	....
49° 119°	N.W.	Wendy Polaris Mines Ltd. F. L. C. Price. May 31, 1968.	1567	....	×	....	....
49° 119°	S.W.	White Knight, Lone Pine Anuk River Mines Ltd. H. S. Lazenby and W. S. Read. January 24, 1968.	1159	....	×	....	....
49° 120°	S.E.	Bob, Bon, Lou, Knob Hill G. R. Clark. G. R. Clark and P. Norgaard. January 26, 1968.	1224	....	×	....	....
49° 120°	N.E.	Chub, Myrtle, Pig (Kathleen Mountain Group) BrenMac Mines Ltd. and BrenColl Mines Ltd. A. C. Skerl. February 26, 1968.	1180	....	....	×	....
49° 120°	S.W.	... Hill, Ash, Eva, Tow	1601	....	×	....	....
50° 120°	S.W.	MM, Robb, Oro					
50° 120°	S.W.	CN, Price Oro Mines Ltd. R. K. Watson and W. A. Finney. March 11, 1968.					
49° 120°	S.E.	Don G. R. Clark. G. R. Clark. January 26, 1968.	1167	....	....	×	....
49° 120°	N.E.	Ellen Ellen Lake Mines Ltd. G. L. Oates. March 1, 1968.	1196	....	....	....	×
49° 120°	N.E.	Ellen, Post, Pen Ellen Lake Mines Ltd. G. L. Oates. January 19, 1968.	1151	....	....	....	×
49° 120°	N.E.	Pen (PN Group) Ellen Lake Mines Ltd. G. L. Oates. March 1, 1968.	1197	....	....	....	×
49° 120°	N.E.	ELN D. Smellie. D. Smellie. May 17, 1968.	1238	....	....	×	....
49° 120°	N.E.	ELN D. Smellie. D. Smellie. April 29, 1968.	1558	....	×	....	....
49° 120°	S.E.	JM Anaconda American Brass Ltd. P. E. Hirst. May 7, 1968.	1225	....	....	×	....
49° 120°	S.E.	JM Anaconda American Brass Ltd. T. A. Conto. August 30, 1968.	1615	....	×	....	....
49° 120°	S.E.	JM Anaconda American Brass Ltd. T. A. Conto. August 30, 1968.	1617	....	×	....	....
49° 120°	S.E.	JM Anaconda American Brass Ltd. T. A. Conto. August 30, 1968.	1619	....	×	....	....

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
49° 120°	S.E.	Lee G. R. Clark. G. R. Clark and P. Norgaard. January 26, 1968.	1177	....	×	×	—
49° 120°	N.W.	Lode Copper Mt. Consolidated Ltd. R. K. Watson. September 18, 1967.	1156	....	×	....	—
49° 120°	N.W.	Lode Copper Mt. Consolidated Ltd. W. A. Finney. August 6, 1968.	1651	....	×	....	....
49° 120°	N.W.	Mag Magnet Explorations Ltd. J. G. Baird. December 18, 1967.	1148	....	×	....	....
49° 120°	N.E.	Mat, Duke, Kent Kellex Mining Co. Ltd. J. G. Baird. August 5, 1968.	1658	....	×	....	....
49° 120°	S.E.	No. 2, Kathleen Fractional, Margaret Fractional (Mineral leases M62 and M63) Giant Explorations Ltd. D. M. Wilson. June 18, 1968.	1579	....	×	×	....
49° 120°	S.W.	Nut G. R. Clark. G. R. Clark. January 26, 1968.	1158	....	....	×	....
49° 120°	S.W.	Ox Steve Sersli. Ross Kidd. April 24, 1968.	1246	....	×	....	....
49° 120°	S.W.	RC Bethex Explorations Ltd. R. E. Anderson. June 21, 1968.	1566	....	×	....	....
49° 120°	N.E.	Toe Consolidated Skeena Mines Ltd. R. J. Caven. December 9, 1968.	1703	....	×	....	....
49° 120°	N.E.	Toe Consolidated Skeena Mines Ltd. D. R. Cochrane. July 26, 1968.	1589	....	×	....	....
49° 120°	N.E.	Toe Consolidated Skeena Mines Ltd. W. M. Sharp. July 26, 1968.	1586	×	×	×	....
49° 121°	S.E.	Bea Kelso Explorations Ltd. J. A. Mitchell. August 22, 1968.	1699	....	×	....	....
49° 121°	S.E.	Bea, Giant Kelso Explorations Ltd. D. R. Cochrane. June 7, 1968.	1251	....	×	....	....
49° 121°	S.E.	Bea, Giant Kelso Explorations Ltd. W. K. Lee. August 22, 1968.	1698B	....	×	×	....
49° 121°	S.E.	Bea, Giant, P, Mill Kelso Explorations Ltd. D. R. Cochrane. August 22, 1968.	1698A	....	×	....	....

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
49° 121°	S.E.	Mill Kelso Explorations Ltd. W. K. Lee. July 8, 1968.	1593	×	×	×	—
49° 121°	S.E.	CM Rayfield Mining Company Ltd. G. E. A. von Rosen. December 13, 1967.	1147	—	—	×	—
49° 121°	S.E.	Hope, Ann Bomarc Mining Company Ltd. J. Sullivan. February 12, 1968.	1195	×	×	×	—
49° 121°	S.E.	Jon J. Macandrew. K. C. Rose. August 21, 1968.	1604	—	—	×	—
49° 121°	S.E.	NIK Northair Mines Ltd. G. E. A. von Rosen. August 30, 1968.	1609	—	—	×	—
49° 121°	S.E.	Rainy Craigmont Mines Ltd. R. J. Young. July 4, 1968.	1560	×	×	×	—
49° 121°	S.E.	T, MA Mt. Agnes Mines Ltd. R. O. Crosby. May 1, 1968.	1226	—	×	—	—
49° 122°	N.W.	Expo, Add Consolidated Van-Tor Resources Ltd. W. G. Stevenson. February 6, 1968.	1186	×	×	—	—
49° 122°	N.W.	Max D. R. Cochrane. D. R. Cochrane. June 18, 1968.	1569	—	×	—	—
49° 123°	S.E.	A, B, Nancy, Linda, Lorraine, Sea, Dee Concorde Explorations Ltd. R. H. D. Philp. February 23, 1968.	1175	—	—	×	—
49° 123°	N.E.	Crest, Chicken, Deer, Jo-Ann, Potluck, Johnny Bullion Mountain Mining Ltd. R. Addison. March 8, 1968.	1214	—	—	×	—
49° 124°	S.E., N.E.	New Mid, New Strike, New Iron, Tie, Zone, Venus, St. Anthony, St. Joseph (Sherwin Group) Sweepstake Mines Ltd. D. R. Cochrane and W. K. Lee. April 26, 1968.	1241	—	×	—	—
49° 124°	S.W.	Rex Amax Exploration, Inc. P. E. Fox. July 26, 1968.	1591	×	×	×	—
49° 124°	N.E.	TR Rolling Hills Copper Mines Ltd. D. B. Sutherland and R. A. Bell. October 27, 1967.	1170	—	×	—	—
49° 125°	S.W., N.W.	Bear, Cream Cream Silver Mines Ltd. C. B. Selmser. March 27, 1968.	1563	×	—	—	—
49° 125°	S.W., N.W.	Bear, Cream Cream Silver Mines Ltd. C. B. Selmser. March 27, 1968.	1564	—	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
49° 125°	N.E.	Blue Jay, The Grouse, Grouse, The Bell, Charles (Litchie Group) Mt. Washington Copper Co. Ltd. W. G. Stevenson. September 5, 1968.	1655	—	×	—	—
49° 125°	N.E.	SJO, GEM, J.B. Mt. Washington Copper Co. Ltd. W. G. Stevenson. November 27, 1968.	1691	—	×	—	—
49° 125°	N.E.	SJO, SS, Me, Mag, MJ, GMB, J.L.G., T.S.M., Chuck, JGG, EM, GAM Mt. Washington Copper Co. Ltd. and Qualicum Mines Ltd. W. G. Stevenson. December 19, 1967.	1145	×	×	—	—
49° 126°	S.E.	Sydney Cominco Ltd. R. J. Nicholson. July 31, 1968.	1592	×	—	—	—
50° 116°	N.E.	Atlanta, Horseshoe, Fermanagh, London, Manchester, Cornwall, Mountain Daisy, Lancaster, Silver King, Hope, Jubilee Calix Mines Ltd. W. A. Finney. May 23, 1968.	1247	—	×	—	—
50° 116°	S.W.	Easy M No. 2 J. Maddison. O. E. Bradley. March 11, 1968.	1211	×	—	—	—
50° 116°	S.W.	Fog King Resources Company. G. A. Wilson. July 2, 1968.	1561	×	—	—	—
50° 116°	N.W.	Red Dresser Industries Inc. J. T. Cook. January 26, 1968.	1163	—	×	—	—
50° 116°	N.E.	Rocking Chair, A, Q, F, K, S, R, Cal, V, Pam, J (Starbird Ridge-Forster Creek Property) Kodiak Mines Ltd. R. H. D. Philp. June 5, 1968.	1254	×	—	—	—
50° 116°	S.E.	Worlds Fair, Great Northern, Wilderness, Iron Mask, Broken Hill, North Light, Imperial, Copper King, White Bear, Master, Butler (Tatler Group) Jumbo Mines Ltd. E. P. Sheppard. July 22, 1968.	1614	×	—	—	—
50° 117°	S.E.	Dee, Del, JJ Trophy Silver Mines Ltd. D. L. Hings. March 21, 1968.	1607A	—	×	—	—
50° 117°	S.E.	Dee, Del, JJ Trophy Silver Mines Ltd. D. L. Hings. March 21, 1968.	1607B	—	×	—	—
50° 117°	S.E.	Kat D. W. Smellie. D. W. Smellie. November 30, 1967.	1164	—	×	×	—
50° 117°	S.E.	Kat D. W. Smellie. D. W. Smellie. September 17, 1968.	1622	—	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
50° 117°	S.E.	TK T. Kingsberry. C. Jontz. June 20, 1967.	1190	—	×	—	—
50° 119°	N.E.	Bluenose N. Basaraba. N. B. Vollo. September 30, 1968.	1635	×	×	—	—
50° 119°	N.W.	Cahilty Kamad Silver Company Ltd. J. F. V. Millar. July 4, 1968.	1652	×	—	×	—
50° 119°	S.E.	Deer, Tick Agricola Mines Ltd. G. P. E. White. November 1, 1968.	1694A	—	×	—	—
50° 119°	S.E.	Deer, Tick Agricola Mines Ltd. G. P. E. White. November 1, 1968.	1694B	×	—	—	—
50° 119°	S.E.	Deer, Buck, Nova Agricola Mines Ltd. G. P. E. White. March 13, 1968.	1208	×	—	—	—
50° 119°	S.E.	Deer, Buck, Nova Agricola Mines Ltd. G. P. E. White. March 13, 1968.	1209	—	—	—	×
50° 119°	S.W.	EIN (Sweetsbridge Property) Noranda Exploration Company, Ltd. B. O. Brynelsen. June 24, 1968.	1572	—	×	—	—
50° 120°	N.W.	AB, Mike & Bill, JB, Tom North Pacific Mines Ltd. and Comet-Krain Mining Corp. Ltd. D. W. Pringle and D. R. Cochrane. June 24, 1968.	1585	—	×	—	—
50° 120°	N.W.	Afton Afton Mines Ltd. C. F. Millar. October 3, 1968.	1677	—	—	×	—
50° 120°	S.W.	Alta, Jeff, Lark, Scat, SKU, SPA (Northwest Syndicate Property) Mercury Explorations Ltd. R. E. Chaplin. July 17, 1968.	1594	—	×	—	—
50° 120°	N.E.	B Royal Canadian Ventures Ltd. N. B. Vollo. June 20, 1968.	1600	×	×	—	—
50° 120°	S.W.	Donny, Al, OK, Bob, Mad Arab Cambridge Mines Ltd. D. R. Cochrane. March 29, 1968.	1213	—	×	—	—
50° 120°	S.W.	H.C. Bethlehem Copper Corp. Ltd. B. R. Sharan and R. J. Savelieff. June 18, 1968.	1557	×	—	—	—
50° 120°	N.W.	HJ, DAB Alwin Mining Company Ltd. R. O. Crosby. January 26, 1968.	1166	—	×	—	—
50° 120°	N.W.	Joe, Cindy Liberty Mines Ltd. D. L. Hings. September 13, 1968.	1632	—	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
50° 120°	S.E.	L, M Bardale Mining and Development Ltd. T. D. Wilkinson and R. S. Adamson. March 18, 1968.	1206	....	....	×	....
50° 120°	S.W.	Shot, J.J.M. D. S. Patterson. W. A. Finney. September 10, 1968.	1686	....	×	....	....
50° 120°	S.W.	O.K., Etta, Paquet, Retan, String, Rope, Ern, Knot, Mic, MMM, Come, Peg, Salamander, Ner (Winney Creek Property) Noranda Exploration Company, Ltd. D. K. Fountain. November 8, 1968.	1684	....	×	....	....
50° 120°	S.W.	Porcupine Amalgamated Resources Ltd. S. F. Kelly. April 29, 1968.	1595	....	....	×	....
50° 120°	S.W.	Rob Laura Mines Ltd. M. P. Stadnyk. August 9, 1968.	1598	....	....	×	....
50° 120°	S.W.	Ron Polaris Mines Ltd. A. Labounsky and K. J. Christie. November 29, 1967.	1138	....	×	....	....
50° 120°	S.W.	Sahara, Lee, File (New Group) Highpoint Mines Ltd. H. C. Gunning. May 9, 1968.	1227	×	....	....	....
50° 121°	N.E., S.E.	A.L., I.C., HAL Arlington Silver Mines Ltd. D. B. Sutherland and R. A. Bell. November 29, 1967.	1155	....	×	....	....
50° 121°	S.E.	Bar, M.B. Northlode Exploration Ltd. W. A. Finney and R. K. Watson. November 17, 1967.	1199	....	×	....	....
50° 121°	N.E.	Den Adera Mining Ltd. W. A. Finney. May 2, 1968.	1575	....	×	....	....
50° 121°	N.E.	Dia, Pearl, T.E., Vera Kel-Glen Mines Ltd. R. W. Cannon. November 21, 1968.	1710	....	×	....	....
50° 121°	N.E.	Dia, Pearl, T.E., Vera Kel-Glen Mines Ltd. E. J. Lees. September 12, 1968.	1676	....	×	....	....
50° 121°	S.E.	JAC Cleveland Mining & Smelting Co. Ltd. J. G. Baird. September 3, 1968.	1638	....	×	....	....
50° 121°	S.E.	Lorex Northlode Exploration Ltd. A. A. Ablett. April 30, 1968.	1248	....	....	....	×
50° 121°	S.E.	Skeena Copper-Divide Copper (Victor) Consolidated Skeena Mines Ltd. F. D. Forgeron and W. M. Sharp. July 12, 1968.	1574	....	....	×	....
50° 123°	S.E.	Elk Mining Corporation of Canada (1964) Ltd. B. O. Brynelsen. June 17, 1968.	1562	....	×	....	....

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
50° 123°	S.E.	Tarn Barkley Valley Mines Ltd. C. B. Selmser. July 4, 1968.	1577	—	×	—	—
50° 124°	S.W.	OK American Smelting and Refining Co. of Canada Ltd. J. R. Irvine and W. Schuur. June 28, 1968.	1573	—	×	—	—
50° 127°	N.W.	Beta, Aero Western Canada Steel Ltd. I. R. Chisholm. July 4, 1968.	1582	—	—	×	—
50° 127°	N.W.	Bim, Tar, Ken, Bee, Car, Expo Dawn Mining Ltd. and Sahara Mining Ltd. R. H. D. Philp. September 20, 1968.	1693	—	—	×	—
50° 127°	S.E.	Blue Alpha Mines Ltd. A. P. Fawley. October 21, 1968.	1662	—	—	×	—
50° 127°	N.W.	Deb (No. 1) Utah Construction & Mining Co. E. S. Rugg. October 17, 1968.	1671A	—	—	×	—
50° 127°	N.W.	Deb (No. 2) Utah Construction & Mining Co. E. S. Rugg. October 17, 1968.	1671B	—	—	×	—
50° 127°	N.W.	Deb (No. 3) Utah Construction & Mining Co. E. S. Rugg. October 17, 1968.	1671C	—	—	×	—
50° 127°	N.W.	Gub, Tab Brett Explorations Ltd. R. H. D. Philp. October 1, 1968.	1692	—	—	×	—
50° 127°	N.E.	Har, Expo Riviera Mines Ltd. J. G. Baird. September 19, 1968.	1681	—	×	—	—
50° 127°	N.W.	Head Western Canada Steel Ltd. J. M. Black. January 5, 1968.	1152	×	×	—	—
50° 127°	N.W.	Hep (Group 1) Utah Construction & Mining Co. E. S. Rugg. September 18, 1968.	1621A	×	—	×	—
50° 127°	N.W.	Hep (Group 2) Utah Construction & Mining Co. E. S. Rugg. September 18, 1968.	1621B	×	—	×	—
50° 127°	N.E.	Ho, Kat, Dot Gyro Explorations Ltd. R. H. D. Philp. September 20, 1968.	1645	—	—	×	—
50° 127°	N.W.	J.R. Pine Lake Mining Co. Ltd. K. G. Sanders. October 25, 1968.	1666	—	—	×	—
50° 127°	N.W.	Mar Marshall Creek Copper Company, Ltd. H. Wober. October 7, 1968.	1708	×	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
50° 127°	N.W.	Lake, FTR, Jean, Ken, Hill, Frank (Nahwitti Lake Group) Kodiak Mines Ltd. W. G. Stevenson. July 12, 1968.	1610	×	×	×	—
50° 127°	N.E.	P.L. Pine Lake Mining Company Ltd. K. G. Sanders. October 25, 1968.	1687	—	—	×	—
50° 127°	N.W.	Ram Kennco Explorations, (Western) Ltd. P. T. Black. December 9, 1968.	1706	×	—	×	—
50° 127°	N.E.	Sauce I. Shulman. W. M. Dolan. October 31, 1968.	1685	—	×	×	—
50° 127°	N.E.	Tip, Top, Toe, Elk Emperor Mines Ltd. and Winco Mining and Explorations Ltd. J. P. Gerne. October 1,1968.	1709	—	×	—	—
50° 128°	N.E.	ORI Gordon Milbourne. M. J. Young. May 29, 1968.	1252	×	×	×	—
51° 119°	S.W.	Bex Barriere Explorations Ltd. W. S. Read. May 8, 1968.	1634	—	×	×	—
51° 119°	N.W.	FH Royal Canadian Ventures Ltd. N. B. Vollo. August 12, 1968.	1624	—	×	—	—
51° 119°	N.W.	FH Royal Canadian Ventures Ltd. N. B. Vollo. August 19, 1968.	1597	—	×	—	—
51° 119°	S.W.	H, M (Harper Creek Group) Royal Canadian Ventures Ltd. N. B. Vollo. October 23, 1968.	1669	—	—	×	—
51° 119°	N.W.	Hail, L, M, N, O Quebec Cartier Mining Company. J. W. Stollery. July 10, 1968.	1612	×	×	×	—
51° 119°	S.W.	Pete, Ranjo, Marty, Thor Aquarius Investments Ltd. D. R. Cochrane. September 12, 1968.	1629	—	×	—	—
51° 120°	N.W.	Ches, Les North Slave Exploration Ltd. P. A. Philipchuk. June 1, 1968.	1602	×	—	×	—
51° 120°	N.E., N.W.	CL Anaconda American Brass Ltd. P. Hirst. October 4, 1968.	1664	—	×	—	—
51° 120°	N.E., S.E.	EC (Eagle Creek Group) Royal Canadian Ventures Ltd. J. A. Woodard. October 3, 1968.	1639	—	×	—	—
51° 120°	N.E.	P.C. Anaconda American Brass Ltd. T. A. Conto. February 16, 1968.	1193	—	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
51° 120°	N.E.	Silver United Copper Corporation Ltd. A. D. K. Burton. December 22, 1967.	1169	—	×	×	—
51° 120°	N.E.	Silver, Mac, SP, Bill United Copper Corporation Ltd. R. G. Jury. September 12, 1968.	1690	—	×	—	—
51° 121°	S.E.	C-Soo Monarch Metal Mines Ltd. R. G. Jury. March 29, 1968.	1212	—	×	—	—
51° 121°	S.W.	Jo Riviera Mines Ltd. W. G. Stevenson. January 22, 1968.	1146	×	×	—	—
51° 121°	S.E.	Joe, CO, GI Rayfield Mining Company Ltd. R. O. Crosby. February 12, 1968.	1172	—	×	—	—
51° 121°	N.E.	Tim, Peach Coranex Ltd. W. Schuur. July 31, 1968.	1696	—	×	—	—
51° 121°	S.W.	VAN Kennco Explorations, (Western) Ltd. C. S. Ney. October 15, 1968.	1668	×	—	×	—
51° 123°	S.W.	Banner Bethex Exploration Ltd. R. E. Anderson. July 30, 1968.	1606	—	—	×	—
51° 124°	S.E.	Spokane, Isaac, Copper Dyke Rico Copper (1966) Ltd. R. W. Phendler. October 17, 1968.	1663	×	—	—	—
52° 119°	S.E.	IN (Paradise Group) A. Rich. A. Rich. September 16, 1968.	1630	×	—	—	—
52° 121°	N.W.	J.B. Burdos Mines Ltd. C. B. Selmser. March 7, 1968.	1222	—	×	—	—
52° 121°	N.W.	Placer-mining Leases 6606, 6608 (Joel, Scott) Abatis Exploration Ltd. W. Brown. March 25, 1968.	1205	×	—	—	—
52° 121°	N.W.	Placer-mining Leases 6610 to 6612 (Myles, Charlotte, Frank) Abatis Exploration Ltd. W. Brown. March 25, 1968.	1203	×	—	—	—
52° 121°	N.W.	Placer-mining Leases 6600 to 6604 (Queen, Lord, Lady, Knave, King) Abatis Exploration Ltd. W. Brown. March 25, 1968.	1204	×	—	—	—
52° 121°	S.E., N.W.	SS, Contact Monte Christo Mines Ltd. A. R. Allen. October 18, 1968.	1704	×	—	×	—
52° 121°	N.W.	W.P. Burdos Mines Ltd. C. B. Selmser. March 7, 1968.	1221	—	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
52° 122°	N.E.	A, J, H (Axel Group) Plateau Metals Limited. D. L. Hings. August 28, 1968.	1613	....	×	....	....
52° 122°	S.E.	BJ, PJ Midnight Consolidated Mines Ltd. D. L. Hings. February 8, 1968.	1179	....	×	....	....
52° 122°	N.E.	G Coast Silver Mines Ltd. R. O. Crosby. January 10, 1968.	1150	....	×	....	....
52° 122°	N.E.	GM Keevil Mining Group Ltd. E. G. Thompson. March 4, 1968.	1565	....	×	....	....
52° 122°	N.E.	GM Keevil Mining Group Ltd. C. M. Armstrong. March 4, 1968.	1596	×	....	....	....
52° 122°	N.E.	GM Keevil Mining Group Ltd. C. M. Armstrong. March 4, 1968.	1587	....	....	×	....
52° 122°	N.E.	HD, Bronc, FFE Gunn Mines Ltd. R. W. Cannon. September 23, 1968.	1641	×	....	....	....
52° 122°	N.E.	HD, FI Gunn Mines Ltd. R. W. Cannon. September 23, 1968.	1680A	....	×	....	....
52° 122°	N.E.	HD, FI Gunn Mines Ltd. R. W. Cannon. September 23, 1968.	1680B	....	×	....	....
52° 122°	N.E.	QB Northair Mines Ltd. G. E. A. von Rosen. September 30, 1968.	1636	....	....	×	....
52° 122°	N.E.	QB Northair Mines Ltd. J. G. Baird. December 1, 1967.	1135	....	×	....	....
52° 131°	S.E.	NB, BL Cariboo Gold Quartz Mining Co. Ltd. W. G. Stevenson. April 23, 1968.	1245	×	×	×	....
52° 132°	N.E.	Ruby, Garnet Canadian Superior Exploration Ltd. and Moresby Mines Ltd. R. A. Dujardin and A. P. Fawley. October 2, 1967.	1257	×	×	×	....
53° 122°	N.E.	Loon Noranda Exploration Company, Ltd. B. O. Brynelsen. September 5, 1968.	1633	....	....	×	....
53° 124°	N.W.	Owl, Bee Anaconda American Brass Ltd. P. E. Hirst. April 11, 1968.	1216	....	....	×	....
53° 124°	N.W.	Owl, Bee, Nit Anaconda American Brass Ltd. P. E. Hirst. November 8, 1968.	1689	....	×	....	....

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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	Line-cutting, Grid Survey, or Topographic Survey
53° 127°	N.E.	Dual Kennco Explorations, (Western) Ltd. A. Panteleyev. September 19, 1968.	1647	×	—	×	—
53° 127°	N.E.	Fab (Coles Creek Copper Prospect) Amax Exploration, Inc. A. C. Gambardella. September 9, 1968.	1679	×	—	×	—
53° 127°	S.E.	Gam Silver Standard Mines Ltd. N. W. Burmeister. August 19, 1968.	1631	—	—	×	—
53° 127°	S.E.	Mag Niagara Mining & Development Corporation Ltd. R. O. Crosby. February 14, 1968.	1192	—	×	—	—
54° 124°	S.E.	K Ajax Mercury Mines Ltd. H. Wober. April 8, 1968.	1237	×	—	×	—
54° 125°	S.E.	Lorne (Sam Ross Creek Property) Amax Exploration, Inc. R. A. Bell. May 21, 1968.	1235	—	×	—	—
54° 125°	S.E.	Omac, Pam, Neal, W, T (Indata Lake Group) Ajax Mercury Mines Ltd. H. Wober. April 8, 1968.	1236	×	—	×	—
54° 126°	N.W.	Argent D. A. Chapman and I. M. Burnett. D. A. Chapman. July 12, 1968.	1643	—	—	×	—
54° 126°	N.E.	Ascot Texas Gulf Sulphur Company. D. Watson. September 12, 1968.	1702A	—	×	—	—
54° 126°	N.E.	Ascot Texas Gulf Sulphur Company. C. C. McLeod. September 12, 1968.	1702B	—	—	×	—
54° 126°	N.E.	Ascot Texas Gulf Sulphur Company. G. R. Peatfield. September 12, 1968.	1702C	×	—	—	—
54° 126°	S.E.	Bornite Normont Copper Ltd. M. J. Beley. November 24, 1967.	1153	—	—	×	—
54° 126°	S.W.	Code Anaconda American Brass Ltd. T. A. Conto. May 7, 1968.	1229	—	×	—	—
54° 126°	S.W.	Deer (Mud Lake Copper Prospect) Amax Exploration, Inc. A. Gambardella. August 8, 1968.	1608	×	—	×	—
54° 126°	N.E.	Kare Tro-Buttle Exploration Ltd. G. A. Dirom. March 12, 1968.	1256	—	×	—	—
54° 126°	N.W.	Lucky, Lady, Pehu, Etc. Noranda Exploration Company, Ltd. G. E. Dirom. June 12, 1968.	1559	—	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*Continued*

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1° Quadr.	Quarter			Geological	Geophysical	Geochemical	Line-cutting, Grid Survey, or Topographic Survey
54° 126°	N.W.	Lucky, Lady, Pehu, Etc. Noranda Exploration Company, Ltd. J. Klein. July 15, 1968.	1667	—	×	—	—
54° 126°	S.W.	Nadina (Silver Queen) Kennco Explorations, (Western) Ltd. G. O. M. Stewart and P. T. Black. December 1, 1967.	1133	—	—	×	—
54° 126°	S.W.	Nadina (Silver Queen) Kennco Explorations, (Western) Ltd. R. A. Bell and D. B. Sutherland. December 1, 1967.	1184	—	×	—	—
54° 126°	S.W.	NC, Star, Klondike Normont Copper Ltd. S. H. Ward. November 17, 1967.	1157	—	×	—	—
54° 126°	S.W.	NC, Star, Klondike Normont Copper Ltd. B. O. Brynelsen and M. J. Beley. February 26, 1968.	1181	—	—	×	—
54° 126°	N.E.	O Rip Van Mining Ltd. P. J. Haman. January 23, 1968.	1160	×	—	—	—
54° 126°	N.E.	O, Pas Rip Van Mining Ltd. S. J. Hunter. January 23, 1968.	1168	—	—	×	—
54° 126°	S.E.	S.G. Kennco Explorations, (Western) Ltd. A. Panteleyev. September 13, 1968.	1683	×	—	×	—
54° 126°	N.E.	Stu, Al Canex Aerial Exploration Ltd. R. W. Cannon. March 25, 1968.	1218	—	×	—	—
54° 126°	N.E., N.W.	Tony, Brenda Dome Babine Mines Ltd. J. Klein. July 25, 1968.	1665	—	×	—	—
54° 127°	S.E.	A (Telkwa Canyon A claims) Phelps Dodge Corporation of Canada, Ltd. L. M. Appelgate. January 5, 1968.	1188	—	—	×	—
54° 127°	S.E.	B, FB (Telkwa Canyon B claims) Phelps Dodge Corporation of Canada, Ltd. P. G. Curtis. September 5, 1968.	1189	—	—	×	—
54° 127°	S.E.	Fog Noranda Exploration Company, Ltd. J. T. Walker. June 13, 1968.	1605	—	×	—	—
54° 127°	N.E.	Janet, Stock, Lorne, Larry, Premier, Ken, Don, Table, Saddle, Martin Copper Queen Explorations Ltd. F. L. C. Price. March 28, 1968.	1239	—	—	×	—
54° 127°	S.E., N.E.	Mike, Phil, John, Dave, Al Pyramid Mining Company Ltd. J. G. Baird. May 28, 1968.	1570	—	×	—	—
54° 127°	N.W.	NH Dome Babine Mines Ltd. R. A. Bell. October 7, 1968.	1640	—	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
54° 127°	S.W.	P.C., S.C., S.R. Telkwa Mountain Mines Ltd. F. C. Tomlinson. May 21, 1968.	1623	—	×	—	—
54° 128°	S.E.	Croesus Kleanza Mines Ltd. R. H. Bates. February 28, 1968.	1234	—	×	—	—
54° 128°	S.W.	J.Z. R. H. Parker. J. Sullivan and D. Fritz. June 22, 1967.	1202	—	×	—	—
54° 128°	N.W, N.E.	NAR (Mt. Vanarsdoll Property) Amax Exploration, Inc. A. Gambardella. September 3, 1968.	1661	×	—	×	—
54° 128°	S.E.	T, EX, DA Primac Exploration Services Ltd. C. T. Pasieka. June 28, 1968.	1581	—	×	×	—
55° 124°	N.E.	A, B, P, C (Wm. Rigler Molybdenum claims) Manson Sands Ltd. P. E. Page. September 4, 1967.	1161	×	—	—	—
55° 124°	N.E.	Asp Omineca Base Metals Ltd. W. G. Stevenson. August 9, 1968.	1659	×	—	×	—
55° 124°	N.W.	B.V.D. Canex Aerial Exploration Ltd. B. Ainsworth. August 20, 1968.	1653	—	×	×	—
55° 124°	S.E.	Chuchi Royal Canadian Ventures Ltd. J. A. Woodard. August 15, 1968.	1660	—	×	—	—
55° 124°	S.E.	Jay Tro-Buttle Exploration Ltd. G. A. Dirom. April 10, 1968.	1215	—	—	×	—
55° 124°	S.W.	Kim, S.K., S.S.K., Isa, Raj (Vector Group) D. L. Moore. H. Veerman. June 17, 1968.	1599	—	×	×	—
55° 125°	N.E.	Lucky, Buck, AB Agilis Exploration Services Ltd. R. H. D. Philp. September 9, 1968.	1678	—	×	—	—
55° 126°	N.W.	Brian, Add Hecla Mining Co. of Canada Ltd. E. D. Dodson. April 5, 1968.	1576	×	—	×	—
55° 126°	S.E.	CAVZ Texas Gulf Sulphur Company. G. Podolsky. September 19, 1968.	1672A	—	×	—	—
55° 126°	S.E.	CAVZ Texas Gulf Sulphur Company. C. C. McLeod. September 19, 1968.	1672B	—	—	×	—
55° 126°	S.E.	CAVZ Texas Gulf Sulphur Company. C. C. McLeod. September 19, 1968.	1672C	×	—	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
55° 126°	S.E.	CAVZ Texas Gulf Sulphur Company. D. Watson. September 19, 1968.	1672D	—	×	—	—
55° 126°	S.E.	DA, Wendy (Nakinilerak Lake Property) Noranda Exploration Company, Ltd. D. K. Fountain. March 22, 1968.	1198	—	×	—	—
55° 126°	S.E.	Dot, Lory Golden West Mines Ltd. R. W. Cannon. February 20, 1968.	1201	—	×	×	—
55° 126°	N.E.	Fire Northstar Explorations Ltd. A. J. Sinclair. February 18, 1968.	1191	×	—	—	—
55° 126°	S.E.	Marc, Cram, ML, Vee Texas Gulf Sulphur Company. A. J. Schmidt. July 16, 1968.	1611	—	—	×	—
55° 126°	S.E.	Marc, Kofit, ML, REG Texas Gulf Sulphur Company. J. Alix. June 11, 1968.	1255	—	—	—	×
55° 126°	S.E.	Miami, Luz, Maria, Lucha, Bay, Etc. (Norfall Property) Golden West Mines Ltd. H. H. Cohen. May 6, 1968.	1571	—	×	—	—
55° 126°	S.E.	Miami, Bay (part of Norfall Property) Golden West Mines Ltd. J. M. Thornton. May 7, 1968.	1568	—	×	—	—
55° 126°	S.E.	Mic Grandora Explorations Ltd. R. G. Jury. May 21, 1968.	1253	—	×	—	—
55° 126°	S.E.	Wolf, Kofit Tro-Buttle Exploration Ltd. G. A. Dirom. April 30, 1968.	1240	—	×	×	—
55° 127°	S.E.	King E. R. Wozniak. R. S. Verzosa. July 29, 1968.	1590	×	×	×	—
55° 127°	S.W.	MT (Corya Creek Property) Amax Exploration, Inc. H. W. Sellmer and J. F. Allan. January 5, 1968.	1134	×	—	×	—
55° 129°	N.E.	Dawn, Rupe, Jet, Luck Nadina Explorations Ltd. A. C. A. Howe. June 12, 1967.	1194	×	—	×	—
55° 129°	N.E.	Dawn, Rupe, Jet, Luck Nadina Explorations Ltd. C. S. Ney. May 22, 1968.	1242	—	—	×	—
55° 129°	N.W.	MoS_2 Erin Exploration Ltd. A. F. Reeve. May 16, 1968.	1588	×	—	×	—
56° 124°	N.W.	Donna Canex Aerial Exploration Ltd. B. Ainsworth. August 20, 1968.	1654	—	×	×	—

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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	Line-cutting, Grid Survey, or Topographic Survey
56° 125°	N.E.	Swannell, Tom Northlode Explorations Ltd. R. B. Galeski. June 7, 1968.	1584	—	×	—	—
56° 125°	N.E.	Swannell, Tom, NTX Northlode Explorations Ltd. J. F. McIntyre. June 15, 1967.	1136	—	×	—	—
56° 126°	S.W.	Dave Cominco Ltd. J. M. Hamilton. August 28, 1968.	1616	—	×	—	—
56° 131°	N.E.	Cat Cominco Ltd. R. G. Bagshaw. September 26, 1968.	1657	×	—	—	—
57° 126°	S.E.	Kemess Kennco Explorations, (Western) Ltd. R. W. Stevenson. December 4, 1968.	1705	×	—	×	—
57° 127°	N.E.	TK Quebec Cartier Mining Company. T. Kalnins. October 10, 1968.	1674	×	—	×	—
57° 130°	S.W.	Arctic, Big A Mitsui Mining & Smelting Co. Ltd. J. S. Dodge. October 21, 1968.	1675	×	—	×	—
57° 131°	S.E.	CAM Gaylord Mines Limited. B. D. Brett. September 30, 1968.	1673	×	—	—	—
57° 132°	N.E.	Gay, Tap Coast Silver Mines Ltd. J. Klein. November 18, 1968.	1701	—	×	—	—
58° 125°	N.E.	Bonanza Davis-Keays Mining Co. Ltd. J. F. McIntyre. August 28, 1967.	1128	×	—	—	—
58° 125°	N.E.	King E. Asp. A. R. Parker. February 29, 1968.	1650	—	×	—	—
58° 129°	S.W.	Nat G. E. Stevens. G. Gutrath. January 9, 1968.	1219	—	×	×	—
58° 132°	N.W.	KS (King Salmon Lake Property) Kennco Explorations, (Western) Ltd. A. Burton. December 28, 1967.	1171	×	—	—	—
58° 133°	N.E.	Anty Homestake Mineral Development Company and New Taku Mines Ltd. L. G. White and J. Buckholz. January 9, 1968.	1165	×	—	—	—
58° 133°	S.E.	Tap, Pat Mt. Ogden Mines Ltd. C. B. Selmser. March 7, 1968.	1627	—	×	—	—
59° 125°	S.W.	BV Delta Explorations Ltd. R. H. Dawson. August 2, 1968.	1682	×	—	—	—

REPORTS CREDITED FOR ASSESSMENT, 1968—*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	Line-cutting, Grid Survey, or Topographic Survey
59° 126°	S.E.	Palmer and Radium Springs Roving Exploration Services Ltd. M. McCombe. November 22, 1967.	1233	—	×	—	—
59° 129°	S.E.	Bill Dresser Industries Inc. D. R. Cochrane. February 5, 1968.	1220	—	×	—	—
59° 129°	N.W.	Emile E. Asp. P. H. Sevensma. August 23, 1968.	1649	—	×	—	—
59° 129°	S.E.	Kirk, Bob, Pete, Tom North Central Mining Ltd. E. D. Black. April 8, 1968.	1626	×	×	×	—
59° 129°	S.W.	Rusty, Daphne, Tail, Eloise, X, Hazel, Lilliam (Cassiar Molybdenum Property) Value Line Minerals Ltd. D. D. Campbell. August 7, 1968.	1700	×	—	—	—
59° 131°	N.W.	Top Mastodon-Highland Bell Mines Ltd. J. B. P. Sawyer. December 15, 1967.	1149	×	—	×	—
59° 133°	S.E.	Alice, Kathy, Nel, Kim O'Keefe Mountain Mines Ltd. C. G. McLennan. February 14, 1968.	1231	×	×	×	—
59° 133°	N.W.	Beaver, Loon Jason Explorers Ltd. A. Smith. May 15, 1968.	1637	—	×	—	—
59° 134°	S.E.	Jackpine, Wann, Alamo, Anyox, Rodeo, Juanitu Idaho Silver Mines Ltd. R. J. Cathro. May 15, 1968.	1628	—	×	—	—

Placer

CONTENTS

OMINECA MINING DIVISION

LORNE CREEK

Lorne Creek Placer

Location: (54° 128° N.E.) On Lorne Creek.
Claims: P.M.L. Nos. 1802 and 1803.
Operator: L. P. and A. Marchildon.
Work Done: A 200-foot trench and a series of test-pits were excavated in gravel; approximately 200 cubic yards of gravel was moved by suction dredge.

CARIBOO MINING DIVISION

QUESNEL LAKE

By T. M. Waterland

Ogden Placer

Location: (52° 121° N.E.) About 600 feet above Quesnel Lake on Ogden Creek near Likely.
Claims: P.M.L. Nos. 3744, 3745, 5907, and 5908.

ACCESS: By road from Likely.
OWNER: Percy Ogden.
OPERATOR: Percy Ogden and Bob Hampton worked as partners with two hired employees.
WORK DONE: They mined placer gravels with a 2½-yard shovel and a 12-yard truck and washed them in a sluice with water supplied from Ogden Creek by a 10-inch-diameter pipe-line 600 feet long. Approximately 250 yards per day was processed.

KEITHLEY CREEK

Kitchener Placer By T. M. Waterland

LOCATION: (52° 121° N.E.) Kitchener Channel, on Keithley Creek about 1 mile up from the mouth.
CLAIMS: P.M.L. No. 6906 covers the old Kitchener Channel.
ACCESS: By road up Keithley Creek from the Keithley Creek Post Office.
OWNER: Ernest F. Lang.
WORK DONE: E. F. Lang and G. Stengle dug placer gravel by hand and wheeled it to a sluicebox for washing. Gold values were reported to be good.

Little Snowshoe Creek Placer By T. M. Waterland

LOCATION: (52° 121° N.E.) Little Snowshoe Creek, a tributary of Keithley Creek.
CLAIMS: P.M.L. No. 3198.
ACCESS: By road up Keithley and Snowshoe Creeks to Little Snowshoe Creek.
OWNER: Tom Kinvig, P.O. Box 346, Williams Lake.
WORK DONE: Mr. Kinvig continued removing boulders from the creek and carried out some road repair work with the assistance of a Department of Mines and Petroleum Resources road grant.

Barr Creek Placer By T. M. Waterland

LOCATION: (52° 121° N.E.) Barr Creek, a tributary of McMartin Creek.
CLAIMS: P.M.L. No. 5678.
ACCESS: By road up Keithley and Snowshoe Creeks from Keithley Creek Post Office.
OWNER: R. Stratford.
WORK DONE: Ground sluicing with a 3-foot boom-dam.

CLINTON MINING DIVISION

FAIRLESS CREEK AND BORIN CREEK

Fairborn Placer By T. M. Waterland

LOCATION: (51° 122° S.W.) On Fairless and Borin Creeks, on the west side of Black Dome Mountain.
CLAIMS: P.M.L. Nos. 401 to 403, 448 to 453.
ACCESS: By the Empire Valley road from the Cariboo highway to a point 10 miles past the Churn Creek bridge, thence 15 miles by mine road to the camp.
OWNER: Fairborn Mines Ltd., 501, 402 West Pender Street, Vancouver 2; James L. Frese, president, was in charge of work.
WORK DONE: At the time of the writer's visit, a 32-inch by 10-foot trommel screen was being installed. Gravels were to be worked with the trommel, a movable sluicebox, and a tractor-type front-end loader. Water was to be supplied to the sluice with pumps.

KAMLOOPS MINING DIVISION

FRASER RIVER

Firebird Placer By T. M. Waterland

LOCATION: (51° 121° N.W.) On the Fraser River approximately 1½ miles north of McGillivray Creek and about half-way between Lillooet and Lytton.

CLAIMS: P.M.L. No. 669, formerly known as Au and Pt Placer.

ACCESS: The property is reached by an access road which leaves the Lytton-Lillooet road approximately 1 mile south of the Halfway Ranch.

OWNER: Firebird Placer Mines Ltd., 901, 736 Granville Street, Vancouver 2.

OPERATORS: Clarence Parker and William Farrow are operating the lease under option from the company.

WORK DONE: The plant set up on the Fraser River consisted of an aerial dragline operating on a cable across the river, a pulsating jig, a portable conveyor belt, and sluicebox. No mining had been done at the time of the writer's visit early in the year.

NEW WESTMINSTER MINING DIVISION

FRASER RIVER

Hope Placer Dredge By T. M. Waterland

LOCATION: (49° 121° S.E.) On the Fraser River immediately north of the confluence of the Fraser and Coquihalla Rivers.

CLAIMS: P.M.L. Nos. 766 and 767.

ACCESS: Access is via river from Hope or via one of several logging-roads.

OWNER: Marine Mining and Engineering (Canada) Ltd., 1443 River Road, Richmond; Norman Richards and George Tarr in charge of work.

WORK DONE: A suction dredge was assembled on the Fraser River at Hope and worked intermittently on the placer leases on the Fraser River north of Hope.

Choate Placer By T. M. Waterland

LOCATION: (49° 121° S.E.) On Fraser River downstream from the mouth of Stulkawhits Creek.

CLAIMS: P.M.L. Nos. 545, 591, and 599.

ACCESS: Half a mile from Trans-Canada Highway at Choate.

OWNER: G. F. McGannon, P.O. Box 85, Yale.

WORK DONE: Fifteen cuts 12 to 14 feet deep were dug with a front-end loader.

HARRISON LAKE

Harrison Lake Placer

LOCATION: (49° 122° N.E.) At the head of Harrison Lake at the mouth of the Lillooet River.

CLAIMS: P.M.L. Nos. 636 to 638, 642 to 647, 649, 651, and 652.

ACCESS: By boat 40 miles from Harrison Hot Springs.

OWNER: Zyrox Mining Company Ltd., 650 Clyde Avenue, West Vancouver; B. D. Weaver, engineer in charge.

WORK DONE: Fifty test-pits 3 to 9 feet deep were dug by hand, 20 drill-holes totalling, 1,500 feet were diamond drilled, and 20 3-inch holes totalling 1,500 feet were drilled with a Becker percussion drill.

SIMILKAMEEN MINING DIVISION

WHIPSAW CREEK

Whipsaw Creek Placer

LOCATION: (49° 120° S.W.) Along the Similkameen River downstream from the mouth of Whipsaw Creek.
CLAIMS: P.M.L. Nos. 1478, 1474, 1489, 1554, 1565, 1615, and 15 others.
ACCESS: From Highway 3, 13 miles from Princeton.
OWNER: Granite City Platinum Ltd., 1818 Marine Building, 355 Burrard Street, Vancouver 1.
OPERATOR: Bethlehem Copper Corporation Ltd.; R. J. Savelieff, geologist in charge.
METALS: Gold, platinum.
WORK DONE: The leases were surveyed and six leases immediately below Whipsaw Creek were mapped geologically. Eight trenches and 27 pits were dug, 22 holes totalling 215 feet were churn drilled, and eight holes totalling 425 feet were hammer drilled.

GOLDEN MINING DIVISION

BUGABOO CREEK

Bugaboo Creek Placer

LOCATION: (50° 116° N.W.) On Bugaboo Creek.
CLAIMS: P.M.L. Nos. 270 to 277.
ACCESS: By road about 12 miles west of Spillimacheen.
OWNER: Dillingham Corporation of Canada Ltd., 1500 West Georgia Street, Vancouver 5.
METAL: Uraniferous pyrochlore.
WORK DONE: A scintillometer survey and report was made by J. M. Black, consulting geologist; 40 trenches and test-pits were dug to provide samples for testing.
REFERENCE: Assessment Report No. 1711.

VOWELL CREEK

Vowell Creek Placer

LOCATION: (50° 116° N.W.) On Vowell Creek, a tributary of Bobbie Burns Creek.
CLAIMS: P.M.L. Nos. 282, 283, and 284.
ACCESS: By road 30 miles west of Spillimacheen.
OPERATOR: Dillingham Corporation of Canada Ltd., 1500 West Georgia Street, Vancouver 5.
METAL: Uraniferous pyrochlore.
WORK DONE: A scintillometer survey and report was made by J. M. Black, consulting geologist. Some trenches and pits were dug to provide samples for testing.
REFERENCE: Assessment Report No. 1713.

Upper Vowell Creek Placer

LOCATION: (50° 116° N.W.) On upper Vowell Creek.
CLAIMS: P.M.L. Nos. 278, 279, 280, and 281.
ACCESS: By road 35 miles west of Spillimacheen.
OPERATOR: Dillingham Corporation of Canada Ltd., 1500 West Georgia Street, Vancouver 5.

METAL: Uraniferous pyrochlore.
WORK DONE: A scintillometer survey and report was made by J. M. Black, consulting geologist. Road construction and bridge repairs were made. Some pits were dug to provide samples for testing.
REFERENCE: Assessment Report No. 1712.

FORT STEELE MINING DIVISION

MAUS CREEK

Maus Creek Placer
LOCATION: (49° 115° N.W.) On Maus Creek near Fort Steele.
CLAIMS: P.M.L. Nos. 732, 733, 945, 946, and 947.
ACCESS: From Fort Steele about 6 miles by road.
OWNER: Maus Minerals Ltd., 409 Dieppe Boulevard, Lethbridge, Alta., W. Strickland, mine foreman.
WORK DONE: The road leading to the property was repaired, and after dewatering the workings a further 12 feet of drift was driven in and on the bedrock from the bottom of the shaft.

BOULDER CREEK

Boulder Creek Placer
LOCATION: (49° 115° N.W.) On Boulder Creek, a tributary of Wild Horse River near Fort Steele.
CLAIMS: P.M.L. No. 1027.
ACCESS: By Wild Horse River road from Highway 95 at Fort Steele.
OWNER: D. O. Friedland, P.O. Box 372, Cranbrook.
WORK DONE: Bulldozing access road to drill-site and bulldozing site; 32 feet of diamond drilling; panning and testing.

FISHER CREEK

Fisher Creek Placer
LOCATION: (49° 115° N.W.) Fisher Creek near Fort Steele.
CLAIMS: P.M.L. No. 1009.
ACCESS: By road from Fort Steele.
OWNER: Jacques de Foras, P.O. Box 161, High River, Alta.
WORK DONE: Bulldozing trenches and pits, and panning and testing for gold.

Structural Materials and Industrial Minerals

CONTENTS

DRAWINGS

ASBESTOS

Cassiar Mine

Mining Division: Liard.

Location: (59° 129° S.W.) Between 5,870 and 7,000 feet elevation on Mount McDame 3 miles north of Cassiar.

Claims: Forty-two Crown-granted and five leased.

Access: Eighty-six miles by road from Mile 648.8 on the Alaska highway.

Owner: Cassiar Asbestos Corporation Limited, 1001, 85 Richmond Street West, Toronto, Ont.; J. D. Christian, president; A. C. Beguin, general superintendent.

Work Done: A 625-kva. diesel-driven generator was installed in the powerhouse to bring the connected horsepower to 8,548. Production, 75,742 tons fibre from 576,040 tons ore milled.

Moon Creek Asbestos Property

MINING DIVISION: Lillooet.
LOCATION: (50° 121° N.W.) Six miles northwest of Lillooet on Moon Creek, 1½ miles south of Bridge River.
CLAIMS: Ama 1 and 2, Blue 1 to 9, Newfie 1 to 4, Dee 1 to 21.
ACCESS: Via the Royal Jade Mine road, 9.8 miles from the Bridge River road. The Royal Jade road turn-off is at the Bridge River bridge, just north of Lillooet.
OWNER: Canadian Johns-Manville Company Limited; John Kerr, 1048 Kemano Street, Kamloops, in charge of work.
WORK DONE: Stripping, trenching, and line cutting.

BARITE

Parson Barite

By R. W. Lewis

MINING DIVISION: Golden.
LOCATION: (51° 116° S.W.) At 3,700 feet elevation 3½ miles due south of Parson.
CLAIMS: Three Crown grants—Hilltop (Lot 14351), Snowdrop (Lot 14352), Honest John (Lot 15734).
ACCESS: By Cranbrook Sawmills logging-road 5 miles south from Parson.
OWNER: Mountain Minerals Limited, P.O. Box 700, 529 Sixth Street, South, Lethbridge, Alta.; quarry office, Brisco; R. A. Thrall, managing director; William McPherson, superintendent.
WORK DONE: Four hundred and fifty-six tons of barite shipped to Lethbridge from stockpile, 435 feet diamond drilling, 650 feet percussion drilling.
DESCRIPTION: Two parallel veins of barite in quartzite.

Baroid of Canada

MINING DIVISION: Golden.
LOCATION: (50° 116° N.E.) At 3,100 feet elevation on west side of Jubilee Mountain, 5½ miles northwest of Spillimacheen.
ACCESS: By 8 miles of road from Spillimacheen.
OWNER: Baroid of Canada, Ltd., 44 King Street West, Toronto, Ont.
WORK DONE: Recovered 8,298 tons of barite from tailings of former Silver Giant lead-zinc mill for shipment to Onoway, Alta. Eight men employed from May to September.

Brisco Barite

By R. W. Lewis

MINING DIVISION: Golden.
LOCATION: (50° 116° N.E.) Between Templeton River and Dunbar Creek, 2½ miles west of Brisco.
CLAIMS: Five Crown grants—Wamineca (Lot 15044), Canyon (Lot 15045), Salmon (Lot 15046), Carmine (Lot 15047), Northisle (Lot 15048).
ACCESS: Good gravel road, 4.3 miles west from Brisco.
OWNER: Mountain Minerals Limited, P.O. Box 700, 529 Sixth Street South, Lethbridge, Alta.; quarry office, Brisco; R. A. Thrall, managing director; William McPherson, superintendent.
WORK DONE: Three men crushed and shipped 10,367 tons of barite to the company plant at Lethbridge; several hundred feet of development drifts and raises; three trenches; 1,197 feet of percussion drilling.
DESCRIPTION: Barite breccia zone in dolomite.

BUILDING-STONE

Gilley Quarry

By W. C. Robinson

LOCATION: (49° 122° S.W.) On west bank of Pitt River immediately south of mouth of Munro Creek.
ACCESS: Seven and one-half miles by road from Port Coquitlam.
OWNER: Ocean Cement Limited, north foot of Columbia Street, Vancouver 4; W. Foster, president; Francis J. McDonald, quarry superintendent.
WORK DONE: Twenty-six men produced 405,300 tons of quartz diorite; new 4-foot cone crusher installed; new ramp built for direct loading of scows.

Pitt River Quarry

By W. C. Robinson

LOCATION: (49° 122° S.W.) East bank of Pitt River on northern side of Sheridan Hill, 4 miles north of Pitt Meadows.
ACCESS: Five miles by road from Pitt Meadows.
OWNER: Pitt River Quarries Ltd., 16211—84th Avenue, Cloverdale; J. A. Connolly, quarry superintendent.
WORK DONE: Five men quarried 90,500 tons of quartz diorite.

Valley Granite Quarry

By A. R. C. James

LOCATION: (49° 121° S.W.) West side Highway No. 1, 10 miles west of Hope.
ACCESS: By Highway No. 1, 10 miles from Hope.
OWNER: Valley Granite Products Limited, 10070 Timberline Place, Chilliwack; K. Jessiman, general manager.
WORK DONE: Six men produced 5,000 tons of poultry grits, stucco dash, and sand-blast material.

Buse Lake Quarry

LOCATION: (50° 120° N.E.) At east end of Buse Lake, 5 miles east of Barnhart Vale.
ACCESS: From Kamloops by road, 15 miles.
OPERATOR: Lafarge Cement of North America Ltd., 1051 Main Street, Vancouver 4.
WORK DONE: Geological and topographical surveys; 10 diamond-drill holes with aggregate depth of 1,024 feet.
REFERENCE: *Mines Branch, Ottawa,* Publ. No. 452, 1917, pp. 179–181 (then called Dease Lake).
DESCRIPTION: Fine-grained volcanic tuff forms mound at east end of Buse Lake.

Ramshead Quarry

By P. E. Olson

LOCATION: (49° 118° S.E.) North side Highway No. 3, 2 miles east of Grand Forks.
ACCESS: Highway No. 3.
OWNER: Ramshead Quarries Ltd., 301, 402 West Pender Street, Vancouver 3.
WORK DONE: Selected blocks of building-stone shipped to Vancouver by truck.

Sheep Creek

By P. E. Olson

LOCATION: (49° 117° S.E.) Sheep and Waldie Creeks.
WORK DONE: About 100 tons of quartzite facing-stone was produced from talus slopes on Sheep and Waldie Creeks.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 301.

Porcupine

LOCATION: (49° 117° S.E.) North bank Porcupine Creek at forks, 7 miles east of Salmo–Ymir highway.
CLAIMS: Porcupine, Summit Snow.
ACCESS: Nine miles by road up Porcupine Creek.
OWNER: Porcupine Mines Ltd., P.O. Box 486, Salmo.
OPERATOR: D. Vieweger.
WORK DONE: Bulldozer trenching and some percussion drilling.
DESCRIPTION: Quartzite slabs quarried for building-stone.

International Marble & Stone Quarries

LOCATION: (49° 116° S.W.) Quarry and plant at Sirdar; quarry at Crawford Bay.
ACCESS: On Highway No. 3.
OWNER: International Marble & Stone Company Ltd.; company office, 4030 Seventh Street Southeast, Calgary, Alta.
WORK DONE: Small kiln installed at Sirdar to treat quartzite chips, changing colour from light brown to pink. Additional storage capacity installed at plant.

CEMENT

Ocean Cement Limited (B.C. Cement Division)

LOCATION: (48° 123° N.W.) Bamberton.
OWNER: Ocean Cement Limited (B.C. Cement Division), north foot of Columbia Street, Vancouver 4; W. F. Foster, president.
WORK DONE: Cement produced, 343,193 tons.

Lafarge Cement of North America Ltd.

LOCATION: (49° 123° S.E.) Cement plant on Lulu Island.
OWNER: Lafarge Cement of North America Ltd.; head office, 1051 Main Street, Vancouver 4; O. Lecerf, president.
WORK DONE: Cement produced, 313,170 tons.

CLAY AND SHALE

British Columbia Lightweight Aggregates Ltd.

By W. C. Robinson

LOCATION: (48° 123° N.E.) On peninsula between Winter Cove and Lyall Harbour at north end of Saturna Island.
ACCESS: By boat.
OWNER: British Columbia Lightweight Aggregates Ltd., 885 West Broadway, Vancouver 9; P. W. N. Graham, president; B. Begon, plant manager.
WORK DONE: Nineteen men mined 60,000 tons of shale and processed it to produce and ship 55,000 tons of coated expanded shale aggregate.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 264.

Haney Brick and Tile Limited

By W. C. Robinson

LOCATION: (49° 122° S.W.) On north bank Fraser River at Haney.
OWNER: Haney Brick and Tile Limited, Haney; G. E. Baynes, president; J. Hadgkiss, managing director.
WORK DONE: Clay mined adjacent to plant and manufactured into 12,000 tons of facebrick, common brick, drain and structural tile, flue lining, and flower pots.

Canadian Refractories Limited

By W. C. Robinson

LOCATION: (49° 122° S.E.) Plants at Kilgard and Abbotsford, mine and quarries at Kilgard, quarry 2½ miles east of Abbotsford.

OWNER: Canadian Refractories Limited, Clayburn-Harbison Division, 1685 Boundary Road, Vancouver 6. On October 15, 1968, the Kilgard plant was sold to Flex-Lox Industries Ltd., P.O. Box 157, Abbotsford; R. M. Hungerford, president.

WORK DONE: Clay produced by eight men at Kilgard fireclay mine, 29,306 tons; 39,285 tons of clay produced by eight men at the Kilgard No. 9, Straiton, and Selby pits; 53,639 tons of building-brick and refractories produced at Abbotsford plant; 6,483 tons of sewer pipe produced at Kilgard plant.

Thunder Hill Shale Quarry

By R. W. Lewis

LOCATION: (50° 115° S.W.) At bottom of Thunder Hill, 2 miles west of Canal Flats.

CLAIMS: Thunder Hill No. 1 and No. 2.

ACCESS: Road 2 miles from Canal Flats.

OWNER: Mountain Minerals Limited, P.O. Box 700, 529 Sixth Street South, Lethbridge, Alta.; quarry office, Brisco. R. A. Thrall, managing director; William McPherson, superintendent.

WORK DONE: Area 150 feet long by 50 feet wide stripped and washed, and 1,609 tons shale shipped to Lethbridge.

DIATOMITE

Fairey & Company Limited

LOCATION: (53° 122° S.W.) On Lot 6182, east bank of Fraser River 5 miles north of Quesnel.

ACCESS: By old Cariboo highway between Quesnel and Prince George.

OWNER: Fairey & Company Limited, 661 Taylor Street, Vancouver 3.

WORK DONE: Small amount of diatomite produced for use in the company plant in Vancouver.

Crownite Industrial Minerals Ltd.

LOCATION: (52° 122° N.W.) On Lot 906, 1¼ miles southwest of West Quesnel.

ACCESS: One and one-half miles by road southwest of West Quesnel.

OWNER: Crownite Industrial Minerals Ltd., 706 Seventh Avenue Southwest, Calgary, Alta.

WORK DONE: Trenching and sampling.

REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1959, p. 161.

FLUORITE

Lakeview

MINING DIVISION: Vernon.

LOCATION: (50° 119° S.E.) On Bursary Mountain, west side of Okanagan Lake 2 miles southwest of mouth of Whiteman Creek, southwest of Vernon.

CLAIMS: View 1 to 3, Fluorite 1 to 6, Spar 1 to 4, Jac 1 to 8, Lakeview 1 to 3, No. 2685.

ACCESS: One-third mile north on side road off Bouleau Lake road 1 mile from Westside road junction; 37 miles by road from Vernon.

OWNER: A. Holmwood.

OPERATOR: Kelver Mines Ltd., 209 One Bentall Centre, Vancouver 1.
WORK DONE: Surface mapping, 1 acre bulldozer stripping, four bulldozer trenches with total length 200 feet, four pits, 1,111 feet of AQ diamond drilling in three holes.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 303–305 (described under Whiteman Creek Fluorite).
DESCRIPTION: Fluorite in veins and lenses in shear zone in quartz monzonite.

Oliver Silica Quarry

MINING DIVISION: Osoyoos.
LOCATION: (49° 119° S.W.) One-quarter mile west of Highway 97, 1 mile north of Oliver.
CLAIM: Gypo (Lot 30985).
ACCESS: By road 1 mile north of Oliver.
OWNER: Cominco Ltd.
OPERATOR: Pacific Silica Limited, 717 West Pender Street, Vancouver 1; P.O. Box 39, Oliver; I. A. Hunter, manager; H. Carlson, superintendent.
WORK DONE: Produced 40 tons of fluorite.
REFERENCE: *See* report under this name on page 331 under Silica.
DESCRIPTION: Small lenses of fluorite occur in a massive quartz lens.

GYPSUM

Four small isolated gypsum deposits occur in the Rocky Mountain Trench a few miles southeast of Cranbrook. These have been known for many years, and some gypsum has been mined from them. However, because of the poor quality of the material there is no production at present. The deposits are similar in nature and are probably closely related if not remnants of what was originally one deposit. Lack of development, scarcity, and smallness of outcrops and the faulted and folded structure of the area make definite correlation difficult. The gypsum is probably of Devonian age, similar to that occurring in large beds in the Rocky Mountains to the northeast.

Canada Cement Company Quarry

By J. W. McCammon

MINING DIVISION: Fort Steele.
LOCATION: (49° 115° S.W.) North side of Highway 3, one-quarter mile north of Canadian Pacific Railway siding at Mayook, 16 miles southeast of Cranbrook.
CLAIMS: Cave (Lot 8597), Sunrise (Lot 8598).
ACCESS: Highway 3, 16 miles southeast of Cranbrook.
OWNER: Canada Cement Company, Exshaw, Alta.
REFERENCE: *Mines Branch, Ottawa,* Publ. No. 714, 1930, p. 65.
DESCRIPTION:

The gypsum underlies an area at least 1,800 feet long parallel to the highway and 700 feet wide. It is exposed in a quarry, a few small pits east of the quarry, three sinkholes, and two cutbanks on the highway, one on each side of the quarry road entrance. A small amount of gypsum, near the ground surface, is light grey, but most is dark grey to black. For 120 feet along the north wall at the quarry entrance the rock consists of 1-inch to 1-foot thick beds of light-grey gypsum with 6-inch to 1-foot zones of ¼-inch-thick beds of dolomite. The beds are folded into a small anticline that plunges about 60 degrees to the northeast. The north limb is

truncated by a fault, apparently a thrust, that strikes north 70 degrees east and dips 80 degrees north. To the north of the fault the gypsum is dark and strongly brecciated. Many dolomite fragments are included in the breccia. Most fragments are 1 to 5 inches wide, but some gypsum blocks are several feet wide. Multidirectional stringers, up to one-half inch thick, of secondary white gypsum, some with pronounced cross-fibre development, vein all exposures. Along the highway cutbank northwest of the quarry road, gypsum is exposed for 250 feet. It is all brecciated, light grey at the south end and dark at the north end. In the highway cutbank 900 feet southeast of the quarry entrance, dark brecciated gypsum is exposed for 25 feet, followed to the south by 25 feet of brecciated thin-bedded black limestone. Gypsum visible in the sinkholes is dark and brecciated.

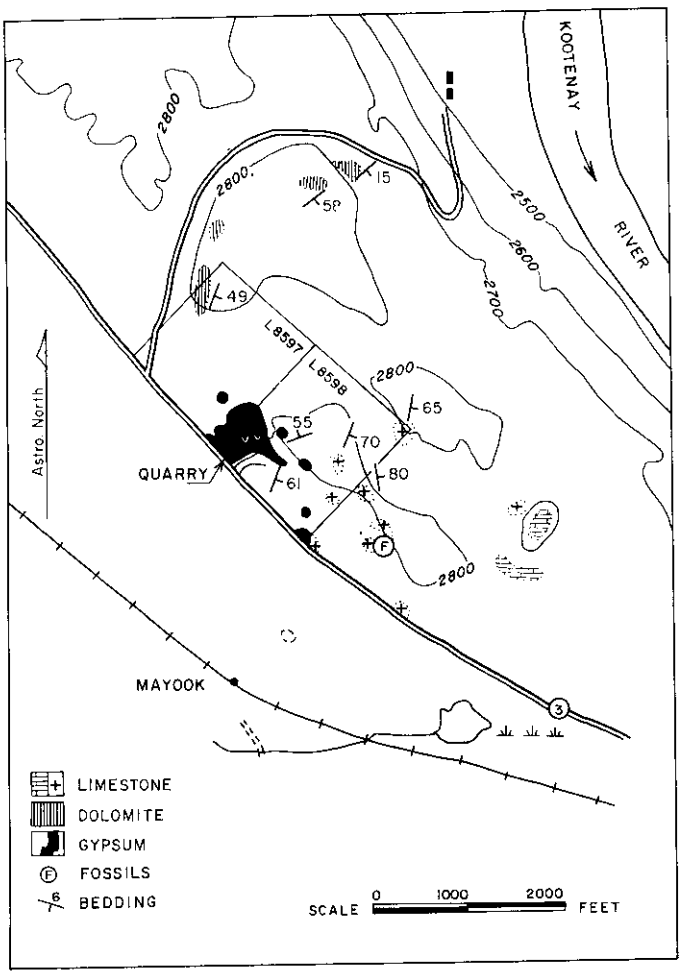

Figure 29. Canada Cement Company gypsum quarry, Mayook.

To the east of the quarry all of the outcrops that were found consist of thin-bedded fine-grained black limestone that weathers light grey. Most beds are between one-quarter and 2 inches thick, but a few range up to 1 foot thick. Fossils were noted in one outcrop 1,500 feet southeast of the quarry. The beds strike north to slightly east of north and dip between 60 and 80 degrees east.

The hill north of the quarry consists of grey to cream and brown dolomite in beds 1 to 2 inches thick. Near the crest of the hill are a few grit and gritty dolomite layers. These rocks strike northeast and dip 15 to 58 degrees east.

The quarry consists of a northwest-trending entry 200 feet long and 50 feet wide that opens out into a circular excavation 200 feet in diameter. The ground slope is such that the height of the south wall is only a few feet while that of the north wall attains a maximum of 40 feet. Overburden was 1 to 3 feet of till. Two samples were collected from around the north half of the circular opening. Sample 1 consisted of chips at 5-foot intervals around 300 feet in the northwest quadrant, and sample 2 consisted of chips at 5-foot intervals around 200 feet in the northeast quadrant. Both samples were collected from fresh surfaces of the face about 5 feet above the quarry floor. Samples 3, 4, and 5 were collected by J. M. Cummings from the quarry face as it was in 1948. The analyses of the samples, in per cent, were as follows:—

Sample	CaO	SO_3	H_2O (215° C.)	MgO	CO_2
1	29.73	36.06	15.78	4.14	7.54
2	29.12	37.24	16.31	3.85	6.82
3	28.00	35.50	15.90	.....	.....
4	28.80	34.90	15.80	.....	.....
5	30.20	38.90	17.40	.....	.....

The quarry on this property was worked from 1926 to 1929 and from 1948 to 1954. The gypsum produced went to the Canada Cement Company plant at Exshaw to be used as retarder in cement. Total reported production was 104,800 tons.

Western Gypsum Products Company Quarry

By J. W. McCammon

MINING DIVISION: Fort Steele.

LOCATION: (49° 115° S.W.) One-half mile south of Mayook siding.

CLAIMS: Badger (Lot 10107), Sheeny (Lot 10211), Mayook (Lot 10213), Renfrew (Lot 10212), Primrose (Lot 10219), Roughneck (Lot 10220), Jean (Lot 10221).

ACCESS: Highway 3, 16 miles southeast of Cranbrook.

OWNER: Western Gypsum Products Limited, 2650 Lakeshore Highway, Clarkson, Ont.

REFERENCE: *Mines Branch, Ottawa,* Publ. No. 714, 1930, p. 66.

DESCRIPTION:

The deposit is in relatively open rolling terrain with very few bedrock exposures. The gypsum is exposed in excavations in four small separated patches within an area half a mile long and 1,000 feet wide. The gypsum is light grey in the top 2 or 3 feet at the surface but is dark grey to black below. The light colour is probably due to surface bleaching. In most exposures the rock is completely brecciated and in some parts contains carbonate fragments. A vague foliation striking 5 to 10 degrees east of north and dipping 65 to 70 degrees east can be seen in two of the excavations at A—this may represent bedding but may be due to shearing. In the top pit at D, what appears to be bedding strikes 25 degrees east of north and dips 45 degrees north. In all of the showings below this pit the gypsum is completely brecciated.

No contacts were seen between gypsum and any other rock. Outcrops of limestone were found east and south of the gypsum, as shown on Figure 30. The lime-

stone is all very similar and consists of fine-grained dark-grey to black rock that weathers light grey. A foliation, at 1- to 3-inch and up to 1-foot spacings that strikes slightly west or east of north and dips steeply east, is present in several outcrops. This probably represents bedding but might be some form of jointing. In some of the exposures on top of the hill one-quarter mile east of D, the limestone is brecciated. Scattered fossil fragments project from weathered surfaces of the limestone 500 feet south of D. No rock outcrops were found in the area shown on the sketch west of the gypsum.

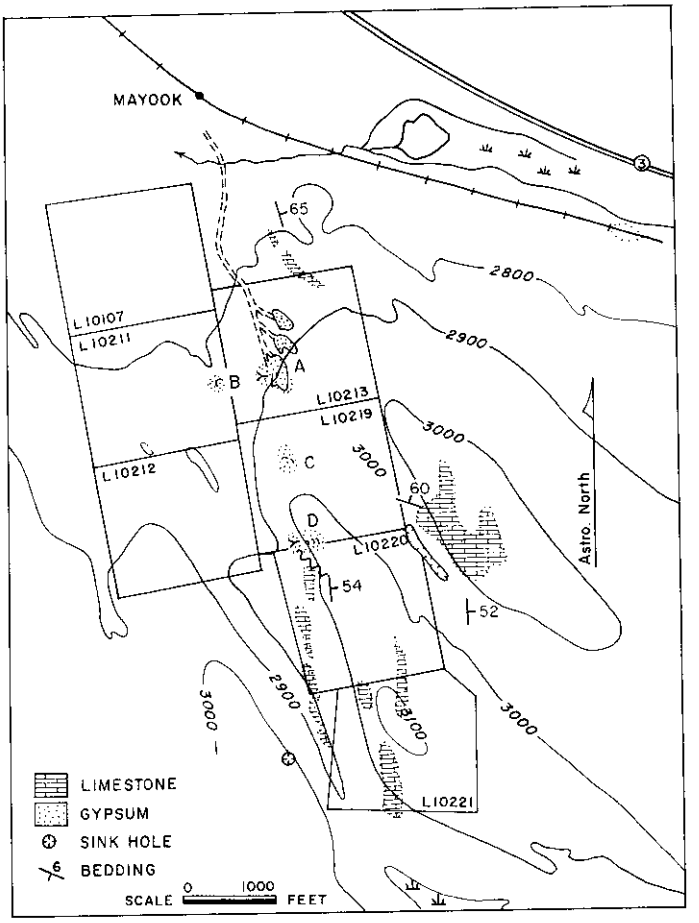

Figure 30. Western Gypsum Company gypsum property, Mayook.

Exploratory excavations have been concentrated in the areas marked A, B, C, and D on Figure 30. At A three small quarries, maximum face heights 10 to 12 feet, and a 20-foot-long adit have been excavated. Small pits and shallow trenches, now sloughed in, and small sinkholes indicate that the gypsum extends 300 feet or more southwest up the slope from the south quarry. At B a 3-foot-deep pit shows a little gypsum in one corner. Sinkholes and a caved-in trench to the west suggest gypsum extends at least 100 feet west of the pit. At C a series of trenches has been dug across the top of the ridge. A little gypsum is exposed in two of the trenches. Several small sinkholes are present southeast of the highest

trench. At D a 70-foot-long adit and three small open cuts expose gypsum across 200 feet up a bare gypsite-covered slope. Most of the gypsum visible is dark and brecciated. Near the top of the east side of the ridge about half a mile south of D is a sinkhole more than 50 feet in diameter and 20 feet deep. No bedrock is exposed in the bottom. However, in this region sinkholes commonly indicate underlying gypsum, so this might point to a continuation of the deposit.

L. H. Cole published the analyses of four samples shown in the following table. Sample 1 was an average from trenches in area A; sample 2 was from a 10-foot-deep pit in area A; sample 3 was a composite of four individual samples from areas C and D; sample 4 was a composite of five samples from area A plus one from B. Samples 1 and 2 were collected in 1926, and samples 3 and 4 in 1928. In 1948 J. M. Cummings collected the other samples: No. 5 from light surface gypsum at the south quarry at A, No. 6 from the dark gypsum below sample 5, and No. 7 from the black gypsum mixed with dolomite from the bottom bench of the same quarry.

Sample	CaO	SO_3	H_2O (215° C.)	MgO
1	28.54	33.03	16.25	5.00
2	30.40	33.50	17.23	5.78
3	31.90	43.52	18.70	1.30
4	31.18	40.13	17.15	2.50
5	29.30	33.70	15.20	.....
6	29.10	31.90	14.30	.....
7	28.20	24.10	10.60	.....

This gypsum has been known since sometime before 1926, when preliminary exploration work was done. Western Gypsum Company examined the property in 1945 and 1946 and shipped 7,725 tons of rock to its Calgary plant. No work is known to have been done since.

Chipka Creek Gypsum

By J. W. McCammon

MINING DIVISION: Fort Steele.

LOCATION: (49° 115° S.E.) Mouth of Chipka Creek, 1 mile south of Wardner.

CLAIMS: Majestic (Lot 9532), Prince (Lot 14290), Sir John (Lot 9534), Helen (Lot 14289), Betty (Lot 9530), Lilian (Lot 9529).

ACCESS: By road 2½ miles south of Wardner.

OWNER: Domtar Chemicals Ltd.; British Columbia office, 470 Granville Street, Vancouver 1.

REFERENCES: *Mines Branch, Ottawa,* Publ. No. 714, 1930, p. 67; *Minister of Mines, B.C.,* Ann. Repts., 1924, p. 187; 1925, p. 231.

DESCRIPTION:

Chipka Creek flows through a steep-sided narrow gully with a maximum depth of 200 feet. The bank and hillside to the north are open, the south bank is covered with thick bush, and the hillside farther south is partially open. Outcrops of bedrock are spotty, as shown on Figure 31.

There are four gypsum exposures. The main one forms a steep cliff that extends nearly a quarter of a mile along the south bank of the creek and reaches from water level to the lip of the gully. Much of the cliff face is too steep to be readily examined in detail. Where cleanly exposed the gypsum varies from black to dark grey with light streaks. Brecciation and shearing obscure the true attitude and have mixed some limestone with the gypsum. A mid-gully hummock 200 feet

long, 50 feet wide, and 15 feet high opposite the west end of the cliff is composed of the only gypsum seen on the north side of the creek. It consists of dark brecciated gypsum with pronounced shearing that strikes 70 degrees east of north and dips 55 degrees north. There is some question as to whether this rock is in place or is a block that has fallen from the cliff to the south. About 400 feet west of the west end of the cliff and 150 feet south of the creek a sinkhole, with its creek sidewall removed by erosion, exposes dirty gypsum. Twelve hundred feet farther west and 50 feet south of the creek, a 100-foot-long bank of gypsum is poorly exposed. A pit and adit, now caved, have been dug in the bank.

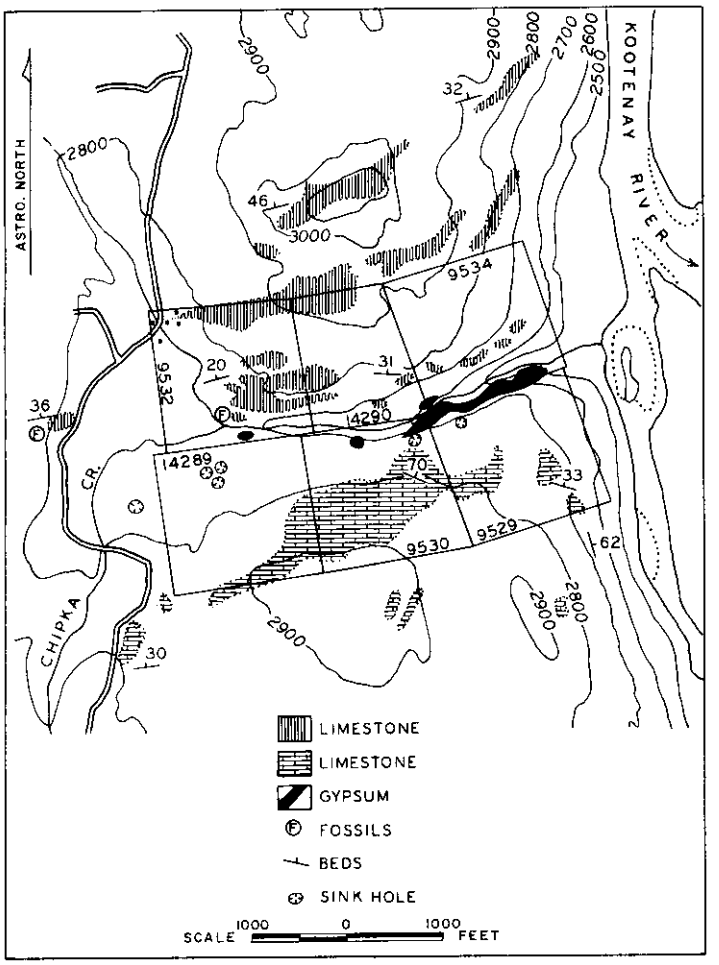

Figure 31. Chipka Creek gypsum deposit.

No other gypsum was seen during the examination. However, numerous sinkholes on the bench to the south and southwest of the creek suggest its presence where they occur. No gypsum is now exposed in the sinkholes, but old reports indicate that shallow pits in the bottoms of at least some of them reached gypsum.

Most of the limestone in the large outcrop south of the creek is massive black rock that weathers light grey. Two small outcrops off to the east and west consist of thin-bedded light-grey stone. At one or two places in the more northerly ex-

posures, streaks and lenses of chert are present in the limestone. The north end of the isolated outcrop near the centre of Lot 9529 is brecciated and highly silicified.

The lowest outcrops north of the creek are brecciated black fossiliferous limestone that weathers light grey. Above this is light-grey thin-bedded limestone with some shaly interbeds. Above this, in turn, and to the north the limestone is brownish-grey, somewhat sandy textured, and weathers light grey. The most northerly exposures examined are nodular fine-grained medium- to dark-grey limestone that weathers buff or grey and breaks up on the surface into ½-inch gravel.

The limestone north of the creek has a rather uniform strike of 70 to 75 degrees east of north and a dip of 20 to 46 degrees northwest. The limestone to the south rarely displays good bedding, and the few attitudes recorded were all different. The shearing of the gypsum and brecciation of the limestone outcrops closest to the gypsum indicate the presence of a fault in the valley of Chipka Creek, probably with a strike of about 70 degrees east of north and a dip steep to the north. Whether this faulting caused the changes in the attitude of the beds south of the creek or whether there is a northeast-plunging anticline present was not determined. However, a well-developed and close-spaced northerly striking and westerly dipping fracture system is present. This, if related to an axial plane cleavage, combined with the bedding attitudes would certainly indicate a fold.

The only evidence of exploration work found were the caved pit and adit on the westernmost gypsum deposit and a diamond-drill site on the bench above the main gypsum cliff.

Analyses of gypsum samples from this deposit were as follows: Sample 1 consisted of a grab taken at random up the main cliff; sample 2 was a grab taken at random up the face of the mid-gully mound; sample 3 was a general sample from the Lilian claim taken by Cole in 1926; and sample 4 was a general sample from the Sir John claim taken by Cole in 1926.

Sample	CaO	SO_3	H_2O (215° C.)
1	30.00	39.70	.....
2	31.52	39.59	17.03
3	31.32	43.26	19.42
4	32.74	44.46	20.68

This deposit was first mentioned in the Minister of Mines Report for 1924. It was acquired by the Manitoba Gypsum Company in 1925. Cole gave a brief description of the occurrence as it was in 1926. Little else appears to have been published on it.

Bull River Quarry

By J. W. McCammon

MINING DIVISION: Fort Steele.

LOCATION: (49° 115° S.E.) On Bull River 2½ miles northeast and upriver from Bull River townsite.

CLAIMS: Lots 7806, 7807, and 7808.

ACCESS: One thousand feet from Bull River hydro-plant road.

OWNER: Mountain Minerals Limited, P.O. Box 700, 529 Sixth Street South, Lethbridge, Alta.

REFERENCES: *Mines Branch, Ottawa,* Publ. No. 714, 1930, p. 68; *Minister of Mines, B.C.,* Ann. Rept., 1921, p. 129.

DESCRIPTION:

The only bedrock outcrops within a mile of the deposit are along the river bank as shown on Figure 32. The country is open with few trees, except for patches on the south bank of the river. Gypsum can be seen in a small sloughed quarry and two pits on the north bank and for 1,200 feet along the river and up the slope among the trees on the south bank. Sinkholes suggest the probable extension of the gypsum under the overburden.

At the old quarry is a gypsum exposure 80 feet long, 30 feet wide, and 20 feet high. The rock is highly contorted. In the upper part it is light grey and white streaked, and it grades through darker grey to black at the bottom. Some calcium carbonate is present, as shown by the vigorous effervescence displayed when dilute acid is applied to it. About 50 feet uphill and north from the quarry a sloughed pit shows gypsum in the bottom. Upstream 450 feet from the quarry a 40-foot-diameter face in the river bank exposes dark sheared gypsum. A small spring flows from the bottom of the face. On the south bank the gypsum along the water edge is black and white streaked and vertically sheared along a strike of 15 degrees north of east. Near the top of the bank, contorted bedding is visible that curves concave to the northeast and dips in the same direction.

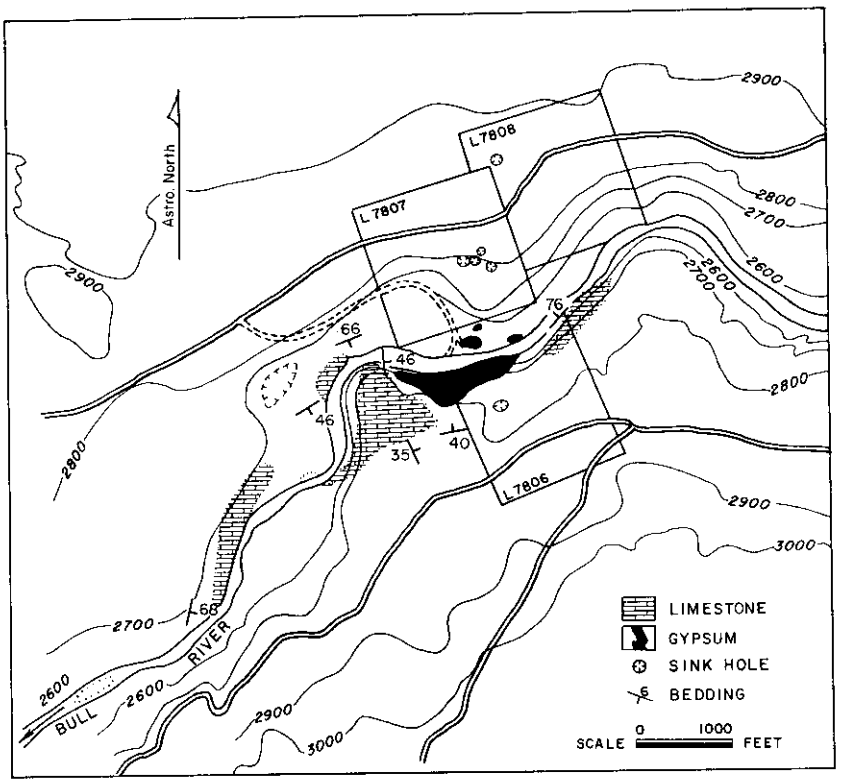

Figure 32. Bull River gypsum deposit.

The only other rock seen is limestone. No contacts between it and the gypsum were found. On the north side of the river, the limestone is in beds 3 inches to 1 foot thick. Part is black nodular rock which is interbedded with a black shaly type. The attitude varies as shown. On the south bank at the west cliff exposure, the

limestone beds are brecciated and tightly folded. In the other outcrop at the east end of the gypsum, little contortion is displayed.

It is thought that the rocks are folded in a tight double fold shaped as a reversed S with the axial planes of the two loops oriented northeast and dipping southeast. The limestone beds on the north shore to the west of the gypsum are probably right side up, but the beds adjacent to the east end of the gypsum on the south bank are twisted into an overturned position. The gypsum actually is stratigraphically lower than the limestone but has been squeezed up into the overturned southeast loop of the fold.

A sample of gypsum collected from across the face of the quarry below the loose weathered material had the analysis shown below as sample 1. Sample 2 was collected by Cole in 1926 from a 21-foot-deep adit then open at the quarry site.

Sample	CaO	SO_3	H_2O (215° C.)
1	30.38	39.16	17.02
2	30.72	39.36	19.36

This property is first mentioned in the Minister of Mines Annual Report for 1921. Cole described it as it was in 1926. In 1937 Mountain Minerals Limited (then Summit Lime Works) shipped 350 tons to Lethbridge for testing. Since that date nothing appears to have been done on the ground.

Beaver Gypsum Deposit

By J. W. McCammon

MINING DIVISION: Fort Steele.

LOCATION: (50° 115° S.W.) East bank of Lussier River, 2½ miles south of mouth of Coyote Creek.

CLAIMS: Beaver Group.

ACCESS: Twenty-five miles from Canal Flats via Highway 95 and White River–Lussier River forest access road.

OWNER: Domtar Chemicals Ltd., P.O. Box 7212, Montreal 101, Que.

WORK DONE: Surface geological mapping and five diamond-drill holes with aggregate length of 243 feet.

DESCRIPTION: Sedimentary gypsum associated with limestone visible in sinkholes and stripped area.

Western Gypsum Mines Limited

By R. W. Lewis

MINING DIVISION: Golden.

LOCATION: (50° 115° S.W.) Between 4,000 and 5,000 feet elevation on north side of Windermere Creek, 8 miles east of Windermere.

CLAIMS: Eighty-four mineral claims.

ACCESS: By private paved road 11 miles from Wilmer.

OWNER: Western Gypsum Mines Limited, 2650 Lakeshore Highway, Clarkson, Ont.; quarry address, P.O. Box 217, Invermere. Nigel Puttock, president; K. C. French, vice-president of production; R. J. Willox, quarry manager.

WORK DONE: Gypsum hauled to Wilmer, 327,796 tons; gypsum shipped from Wilmer, 236,191 tons; diamond drilling to prove northwest extension of gypsum.

DESCRIPTION: Large beds of sedimentary gypsum.

JADE

The following companies and individuals report having produced jade in 1968: Ben Seywerd from Dease Lake, Gerald Davis from Wheaton Creek, Walter Ellert from Liard district, W. Larry Owen from Ogden Creek, Tezzeron Nephrite Co. from O'Ne-ell Creek, R. Bouvette and R. Purvis from the Fraser and Bridge Rivers, Ed Osterlund from the Bridge River, Greenbay Exploration and Mining Co. from Brett Creek, and Birkenhead Jade Mines Ltd. from the head of Hell Creek.

Greenbay

By T. M. Waterland

MINING DIVISION: Lillooet.
LOCATION: (50° 122° N.E. and N.W.) On Brett Creek, 2½ miles southeast of Marshall Lake.
CLAIMS: Greenbay 1 to 5, Blue 1 to 4, John 1 to 9, Bev 1 and 2, G.B. 6.
ACCESS: From Lillooet via Bridge River road to the turn-off of Marshall Creek road, thence 6 miles to the property.
OWNER: Greenbay Exploration & Mining Co. Ltd., P.O. Box 36, Chilliwack; work supervised by Robert J. Smith.
WORK DONE: Three trenches were excavated by D-7 Caterpillar, a large area of bedrock was stripped of overburden, and a bedrock open cut of about 150 square feet was excavated. Jade *in situ* was being mined.

Genesis

MINING DIVISION: Omineca.
LOCATION: (54° 125° N.E.) Between 3,000 and 4,000 feet elevation on O'Ne-ell Creek 4 miles upstream from its junction with the Middle River.
CLAIMS: Genesis 1 to 39.
ACCESS: By air from Smithers, a distance of 75 miles, or by river boat from Fort St. James.
OWNERS: Mrs. Winnifred B. Robertson and D. Oram.
OPERATOR: Tezzeron Nephrite Limited, 3917—156th Street, Cloverdale; Mrs. W. B. Robertson, president.
WORK DONE: Four persons spent three months stripping 500 square feet of bedrock by pick and shovel and core drilling 100 feet in 50 holes to provide samples for identification and evaluation.
DESCRIPTION: Jade occurs as boulders in the creek as well as *in situ* in serpentinite.

LIMESTONE

Terrace Calcium Products Ltd. Quarry

LOCATION: (54° 128° N.W.) Four and one-half miles east of Terrace; elevation, 2,900 to 3,100 feet.
CLAIMS: Limestone lease and 16 recorded mineral claims on Thornhill Mountain.
ACCESS: By road 10 miles from Terrace.
OWNER: Art Curfman, P.O. Box 207, Terrace.
OPERATOR: Terrace Calcium Products Ltd., P.O. Box 1269, Terrace; registered office, 4635 Lazelle Avenue, Terrace.
WORK DONE: Quarry lease surveyed and geological mapping done; overburden removed from an area of 2 acres by five men over a period of seven months under the supervision of Art Curfman; warehouse erected at the mill-site.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1967, p. 308.

Limestone near Fort St. James

By J. W. McCammon

A large north-west trending band of limestone averaging nearly 3 miles wide extends for many miles through the central part of British Columbia near Fort St. James. It is exposed along the north shore of Stuart Lake between Fort St. James and Pinchi Creek. Two small quarries have been worked in the limestone a few miles northwest of Fort St. James. Both are on the Stones Bay road, which follows the north shore of the lake out of Fort St. James. One quarry is at the end of the road, 4 miles from the Germansen Landing road junction, and the other is 2 miles from the same junction.

The quarry at the end of the road is 300 feet from the lake and 100 feet above it. It consists of a rough face 60 feet long and 40 feet high blasted out at the base of a high bluff. The rock is medium-grey fine-grained limestone showing scattered crinoid plates. A thin-section revealed it to be full of microfossils. The rock is highly fractured, and a shear zone crosses the quarry face. The shear and fracture surfaces are streaked with iron stain. Bedding is not distinguishable near the quarry. Armstrong has shown the limestone as part of the Pennsylvanian(?) Permian Cache Creek Group on Geological Survey of Canada Map 907A, Fort St. James. A sample of chips collected at 2-foot intervals across the face contained: CaO=53.75; MgO=0.22; Insol.=3.30; R_2O_3=0.14; Fe_2O_3=0.08; MnO=0.05; P_2O_5=0.01; S=0.008; Ig. loss=42.52; H_2O (105° C.)=0.02.

There are houses within 800 feet of the quarry, and a new subdivision is being developed along the lakeshore so its is unlikely a quarry could operate in the future at this site.

The other quarry is 150 feet north of the road. It is on the south side of an isolated 50-foot-high knoll that shows good exposures of limestone bedrock across a maximum width of 250 feet for 1,000 feet along an easterly bearing parallel to the road. The rock appears quite uniform, except for some irregular colour variations from light to dark grey. It is very fine grained, highly fractured, and veined in all directions by hairline to ½-inch-thick white calcite stringers. No bedding is visible. A few irregular black and rusty cherty-argillite lenses are present. In thin-section scattered microfossils are visible. The quarry has a face 40 feet high and 150 feet long. A grab sample of chips picked at random from the muck on the quarry floor had the following analysis: CaO=54.81; MgO=0.93; Insol.=0.17; R_2O_3=0.10; Fe_2O_3=0.06; MnO=0.003; P_2O_5=0.01; S=0.002; Ig. loss=43.98; H_2O (105° C.)=0.10.

John Group

Location: (54° 124° S.E.) One-half mile north of Necoslie River, 8 miles southeast of Fort St. James.
Claims: John 1 to 4.
Access: Eight miles by road from Fort St. James.
Owner: Joseph Paradis.
Operator: Domtar Chemicals Ltd., P.O. Box 7212, Montreal 101, Que.
Work Done: Twelve diamond-drill holes with a total length of 942 feet.
Description: In long band of limestone.

Dahl Lake Quarry

By J. W. McCammon and G. W. Clarke

Location: (53° 123° N.E.) On hill at northeast corner of Dahl Lake, 22 miles southwest of Prince George.
Access: A 6-mile-long gravel road from the quarry joins Highway 16 on the south side 22 miles west of Prince George.

OWNER: Kokanee Contracting Limited, 1894 Valleyview Drive, Kamloops.

OPERATOR: Star Equipment, General Contractors, P.O. Box 518, Prince George.

WORK DONE: Sixteen acres stripped to bedrock; three 100-foot-deep percussion holes drilled; 3 miles road built; 36,000 tons limestone quarried, crushed, washed, and hauled to Prince George Pulp Mill and Inter-Continental Pulp Mill.

REFERENCE: *Geol. Surv., Canada,* Map 49-1960, Prince George.

DESCRIPTION:

Limestone forms a 400-foot-high hill at the northeast corner of Dahl Lake. The limestone is shown on Geological Survey of Canada Map 49-1960, Prince George, as belonging to the Permian Cache Creek Group and underlying a wedge-shaped area 3 miles long by 1½ miles wide. The rock is best exposed in extensive strippings on two humps about one-quarter mile apart on top of the hill.

The limestone visible varies from almost black to light grey and all weathers light grey. Most consists of a fine-grained groundmass which has numerous fossil fragments, chiefly crinoid plates, scattered through it. A thin-section of a specimen of very dark stone from the centre bench of the quarry contained microscopic rounded grains of quartz and irregular patches of chert among the calcite grains. A thin-section of light-grey rock from the top bench contained scattered round grains and irregular thin veinlets of quartz. Bedding is not well displayed in most exposures, but at one place on the face of the centre bench of the quarry bedding strikes 55 degrees west of north and dips 71 degrees northeast.

The north hump is the largest, and most of the stripping has been done on the southwest side of its top. In mid-August, 1968, a quarry with three benches, each 10 to 15 feet high, had been opened up in this area. The lowest bench was covered with dirt and dirty rock. The other two benches were covered with clean freshly broken rock. A small amount of stripping had been done on the second hump, and a portable crushing and screening plant had been erected at its base.

Three samples of the limestone were collected for analyses. Sample 1 consisted of chips picked at random from muck on the centre bench of the quarry, sample 2 was similar but from the top bench, and sample 3 was of chips picked up at random from the main stripping across the top of the south hump. Their percentage compositions were as follows:—

Sample	CaO	MgO	Insol.	R_2O_3	Fe_2O_3	MnO	P_2O_5	S	Ig. Loss	H_2O (105° C.)
1	55.07	0.59	1.03	0.18	0.06	0.01	0.03	0.005	43.34	0.05
2	54.70	0.28	1.39	0.20	0.04	0.01	0.03	0.018	43.30	0.06
3	50.83	4.00	0.70	0.12	0.05	0.003	0.03	0.002	44.38	0.02

Laredo Limestone Ltd.

LOCATION: (52° 129° N.E.) On the east coast of Aristazabal Island facing Laredo Channel, 100 miles south of Kitimat.

CLAIMS: Several limestone leases and all the claims which were formerly located by Pacific Rim Mines Ltd., 507, 475 Howe Street, Vancouver 1. The claims lie from tidewater to over 1,000 feet elevation. The property can be reached by boat and seaplane from Prince Rupert.

OWNER: Laredo Limestone Ltd., 515, 475 Howe Street, Vancouver; D. L. Cummings, president.

WORK DONE: Four men spent several months stripping overburden from bedrock; 4 miles of roadway was built; samples were sent to Vancouver for testing.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1952, p. 259.

Limestone Deposits at the North End of Vancouver Island

By J. W. McCammon

Large quantities of limestone occur in a sedimentary-volcanic rock sequence at the north end of Vancouver Island. Most of the limestone belongs to the Upper Triassic Quatsino Formation; small lenses may belong to the Upper Triassic-Jurassic Bonanza Formation. The Quatsino Formation forms one main band that has been traced from Quatsino Narrows southeast for nearly 75 miles to Tlupana Inlet. A shorter parallel band extends from the north end of Nimpkish Lake down the east side and on for 10 miles past the south end of the lake. A third parallel band reaches from the hill just west of Beaver Cove southeast across the Tsulton River to Bonanza Lake and down the west side of the lake to its south end. Some of the small isolated limestone lenses scattered through the area north and northwest of the main Quatsino bands may be part of the Bonanza Formation. During the 1968 field season, samples for chemical analyses were collected from accessible outcrops of the limestone. The general distribution of the limestone and sample sites are shown on Figure 33.

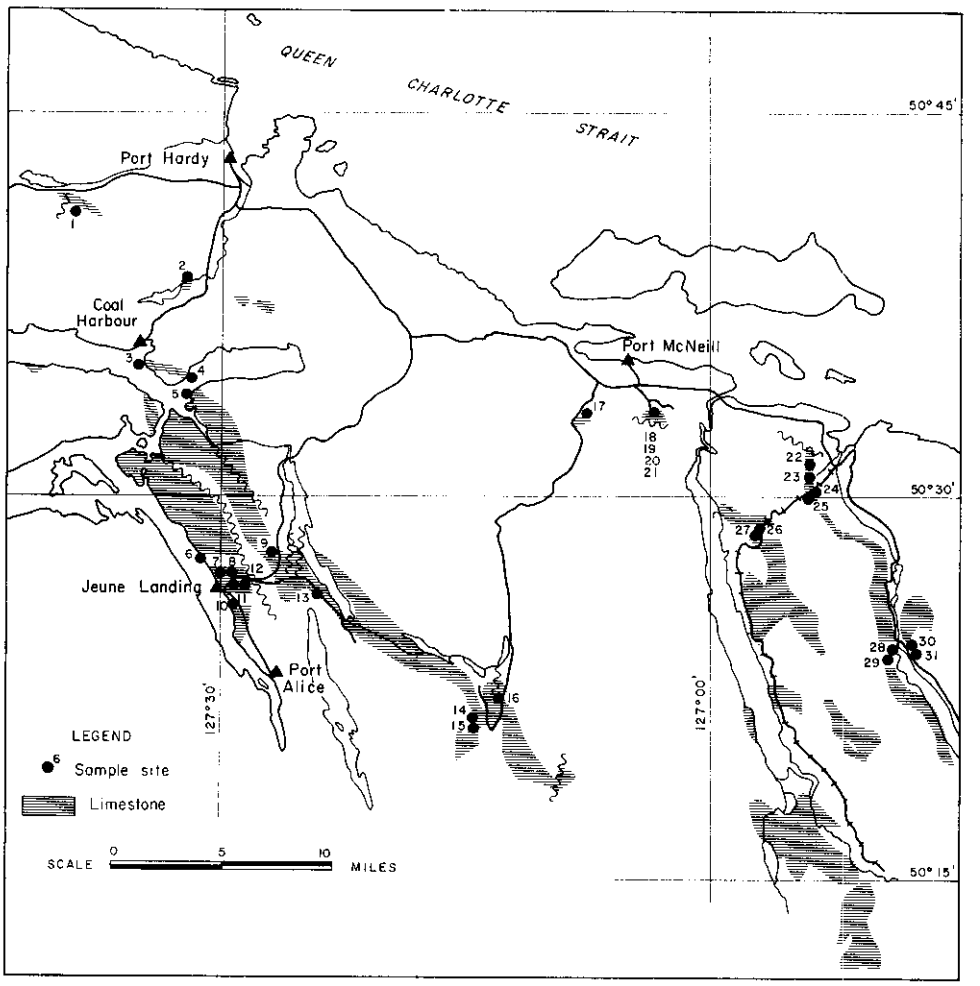

Figure 33. Limestone deposits at the north end of Vancouver Island.

K. E. Northcote has traced a narrow band of limestone for several miles southeast from Kains Lake, 8 miles west of Port Hardy. This is apparently part of the Quatsino Formation. The average of the analyses of four grab samples collected by Northcote from the band is shown as sample No. 1 in the accompanying table.

Sample No. 2 was collected 1 mile west of the Coal Harbour road on an old logging-road that extends to the east end of Quatse Lake. The limestone outcrops intermittently for 1,000 feet along the road with no other rock exposed on either side. At the eastern end the limestone is fine-grained pale-grey stone that weathers light grey. A streakiness that may represent bedding strikes 65 degrees west of north and dips 45 degrees south. About 300 feet west of the pale-grey rock is a 70-foot-long road cut in a 10-foot-high bluff of dark-grey limestone with light streaks. It contains some scattered lenses of chert and weathers to a rough surface. The amount of chert present increases to the west. A thin-section of a specimen of the dark stone consisted mainly of elongate parallel oriented grains 0.08 millimetre long and 0.03 millimetre wide, with occasional thin zones of non-oriented grains as large as 0.7 millimetre in diameter. Most grains were multiple twinned. Scattered fossil outlines were present. Sample No. 2 consisted of chips collected at 2-foot intervals along the 70-foot road cut. Muller(3) has mapped this limestone as Bonanza Formation, but it may be Quatsino.

A 1,000-foot-wide band of Quatsino limestone stretches southeast across Hankin Point between Holberg and Rupert Inlets at Coal Harbour. To the southwest the contact is with porphyritic basalt breccia; to the northwest the contact, on the beaches, is covered. The rock is light to dark grey. In one thin-section examined it consisted of brecciated fragments composed of cloudy calcite grains less than 0.01 millimetre in diameter cemented by coarse-grained clear calcite; small fossil forms and fragments were relatively numerous. A considerable amount of chert is present as irregular masses and lenses, particularly along the northeast side of the band. A few igneous dykes are exposed. Sample No. 3, from the northwest end of the band, consisted of chips collected at 10-foot intervals along the beach between 300 and 600 feet northwest of the basalt contact. Sample No. 4, from the southeast end of the band, consisted of chips gathered at 20-foot intervals along the beach for 400 feet north from the basalt.

The main band of Quatsino limestone is exposed along the shore from a bay on the south side of Rupert Inlet 1 mile east of the mouth of Marble River, west along the shore of Quatsino Narrows, around Evenson Point, and down the north shore of Neroutsos Inlet to approximately half-way between Jeune Landing and Port Alice. The apparent great width exposed is due to repetition of beds caused by faulting. Around the mouth of Marble River and on Rupert Inlet the shore is flat and covered with thick bush. Good rock exposures are only accessible at relatively low stages of the tide. Sample No. 5 consisted of chips collected at 10-foot intervals along 500 feet of the shore of Rupert Inlet between the two small points on Lot 315, three-quarters of a mile north of the mouth of Marble River. The stone is light grey with a brownish tinge, very brittle, has a general brecciated appearance, and weathers to a rough surface. A thin-section showed it to consist of small pellets composed of calcite grains under 0.01 millimetre in diameter mixed with fossil fragments and all veined by thin calcite stringers. South of the sampled area the limestone is thin bedded and interlayered with 1-inch-thick chert beds. The bedding strikes west of north and dips moderately to the southwest.

No samples of stone were collected along the shore of Neroutsos Inlet. However, Goudge(1) published several analyses of samples from the area. Samples

from various quarries, worked pre-1929, sites unstated, showed the following percentage composition ranges: Silica=0.4 to 6.0; $CaCO_3$=82.3 to 98.3; $MgCO_3$= 0.7 to 14.2. Samples from the former B.C. Pulp & Paper Co., Limited, quarry on the point on Lot 1582, 1½ miles northwest of Jeune Landing, sample-site No. 6, had the following percentage composition ranges: Silica=0.24 to 0.80; $CaCO_3$= 57.72 to 87.9; $MgCO_3$=39.74 to 10.71.

In 1968 good exposures of the limestone were accessible on recently logged-off Timber Licence 620 directly north of Jeune Landing. Two samples, 7 and 8, were collected from road cuts one-half mile north of the landing. Sample 8 consisted of chips collected at 20-foot intervals westward along 640 feet of cuts down the main logging-road starting from a point at an elevation of 600 feet on a bearing of north 15 degrees east from Jeune Landing. Sample 7 consisted of chips collected at 10-foot intervals along 200 feet of cuts down the same road, starting 600 feet west of the west end of sample 8. The rock is fine-grained dove-grey material that effervesces strongly in dilute hydrochloric acid and weathers light grey. Beds 8 inches and thicker strike northwest and dip 28 degrees southwest. In thin-sections of the rock, vague fossil and pellet shapes can be seen scattered through a groundmass of 0.01-millimetre-diameter calcite grains peppered with 0.1-millimetre-long rhombs of dolomite.

Sample 9 consisted of chips collected at random from outcrops along 500 feet of a logging-road that passes through the southwest corner of Timber Licence 11508 about 2½ miles northeast of Jeune Landing. Exposures are poor in this area, and the only rock seen along the road was limestone. It is fine-grained dove-grey rock similar in appearance to that at sample-sites 7 and 8.

The road from Jeune Landing to Port Alice passes through part of the limestone band for 2½ miles south of Jeune Landing. Outcrops on and near the road are scarce and small. In most exposures the limestone is dirty and mixed with other rock. One sample, No. 10, was collected along a road cut 0.8 mile south of Jeune Landing. It consisted of dark-grey to black rock, highly shattered, and veined by numerous thin stringers of white calcite. The sample was made up of chips collected at 5-foot intervals along 250 feet of road cut.

The first 1½ miles of the main road from Jeune Landing to the east coast crosses the limestone belt that provided samples 7, 8, and 10, but only two outcrops are cut by the road, at points 0.6 and 1 mile east of the landing. At the first point very fine-grained, massive, dark-grey limestone is exposed for 100 feet along the road. At the second point, rock is exposed for 500 feet along the road. A quarry 150 feet in diameter has been opened up at the east end of the outcrop. Most of the rock is very fine grained and dove grey with occasional black beds. Sample 11 consisted of chips collected at 10-foot intervals along 300 feet of outcrop on the road and sample 12 consisted of chips collected at 5-foot intervals across 120 feet at the east end of the quarry about perpendicular to the road.

The road from Jeune Landing to the south end of Alice Lake traverses several miles of ground mapped as underlain by Quatsino limestone. Outcrops are poor through the area, and exposures along the road are low and relatively small. The rock is fine grained, generally light grey but occasionally black, weathers light grey, sometimes contains chert nodules, and is contaminated with igneous dykes and sills. Three small quarries have been opened along the road. Sample 13 was collected at the largest quarry, which is on the south edge of the road one-third of a mile north of the Marble River bridge. It is about 200 feet in diameter with a 35-foot-high face. At the quarry the rock is very fine grained, light grey, and fossiliferous. It has a peculiar blotchy colouration, and on exposed surfaces has a " Swiss cheese "

appearance due to differential weathering. Thin-sections show this is the result of replacement of very fine-grained calcite by coarser dolomite rhombs in variable concentrations. There is an igneous sill in the quarry floor, another half-way up the face, and a dyke sloping across the face. The sample consisted of random chips from broken muck on the floor.

A considerable area of Quatsino limestone in the vicinity of Benson Lake and the old Empire mine is accessible via the road from Port McNeill to the mine-site. Sample 14 was composed of random chips collected by W. G. Jeffery, in 1960, from road cuts on the road between the mine camp and the workings. Sample No. 15 consisted of a limestone diamond-drill core from an unspecified locality on the mine property. Where the road runs north from Truite Lake into the Raging River valley and along the west shore of Iron Lake, outcrops are practically continuous. The rocks strike northwest and dip southwest and display a good section of the local stratigraphy from agglomerates of the Bonanza Formation at the south, through the Quatsino limestone, and into amygdaloidal lavas of the Karmutsen Formation at the north. Limestone exposures begin on the road at the north tip of Truite Lake. Here the rock is black, highly fractured, veined with multitudinous small white calcite stringers, and contains much silica. Half a mile north there is a short covered area, and then fine-grained, clean, dove-grey fossiliferous limestone is exposed. The light-grey rock continues for half a mile to opposite the centre of Iron Lake. Within the succeeding 400 feet to the north are interbeds of limestone and basalt and then continuous amygdaloidal lava. Sample 16 consisted of chips collected at 20-foot intervals along 500 feet of road cut along the shore of Iron Lake starting at the south end of the lake.

At the bridge across the Cluxewe River on the Benson Lake road, limestone forms 15-foot-high walls for 200 feet along the river. The limestone is fine grained, dark grey, and contains fossils and pods of dark chert. About three-quarters of a mile northeast of the bridge and one-third of a mile down a side road south of the Benson Lake road, a quarry has been opened up on a limestone knoll, probably part of the same mass exposed at the bridge. The quarry is 500 feet long and 150 feet wide with a 20-foot face. The limestone in the quarry is mostly fine-grained black rock that weathers light grey and displays ¼- to ½-inch striping that appears to be bedding with a northerly strike and 56 degree westerly dip. Just east of the east end of the quarry a 100-foot-in-diameter rounded mound of fine-grained light-grey stone has been stripped. Sample 17 consisted of chips collected at 3-foot intervals across 60 feet of clean face in the south end of the quarry.

During the 1967/68 winter a quarry was operated for a short time by Lamac Construction Ltd., on a limestone deposit 2½ miles southeast of Port McNeill. The quarry, known as the S.U.P. 6000 or the Joe, is in the centre of the east half of Timber Licence 2362 on the west bank of a fork of Hyde Creek. It is 3.7 miles by good road from the quarry to Port McNeill. The limestone forms a lens-shaped mound, at least a mile long in a westerly direction and half a mile wide, that is bisected by the north-trending gully of Hyde Creek. The quarry is at the base of the north edge of the mound just west of the creek. The mound behind the quarry is 100 to 110 feet high. To the north and west the ground is flat and lacks outcrops. Along the east the limestone appears to overlie amygdaloidal and porphyritic lavas. To the south there is a fault contact with basalt flow rock. The limestone is mostly light grey to white with occasional irregular dark patches. It weathers white with a frosted and fluted surface, from which project small scattered siliceous protuberances, probably fossil remnants. In thin-sections the grains are seen to vary from less than 0.1 millimetre to slightly greater than 0.2 millimetre in diameter and to display multiple twinning. Small rounded quartz grains occur

sparsely distributed among the calcite grains. In patches of dark rock on the top of the knob, a foliation, assumed to represent relict bedding, is visible. This may, however, represent shearing with recrystallization. In the face of the bottom bench of the quarry, a vague coarse banding appears to represent bedding. In both cases the strike is northwest and the dip is steep southwest. One sheared pyritiferous andesite dyke 1 to 5 feet wide is exposed in the quarry. Joints and small slips are abundant and multi-directional, so blocks larger than 2 feet long are not easy to produce in quarrying. One strong fault passes through the centre of the workings. Rock was quarried from three different benches, as shown on Figure 34. The quarry was meant to produce jetty rock for a breakwater at the Port McNeill dock, but the rock broke too small for this purpose and mining ceased. Four samples were collected for analyses: No. 18 was a grab of random chips from the floor of the top bench; No. 19 was similar, but from the middle bench; No. 20 and No. 21 consisted of chips collected at 1-foot intervals across the rock faces of the bottom bench as marked.

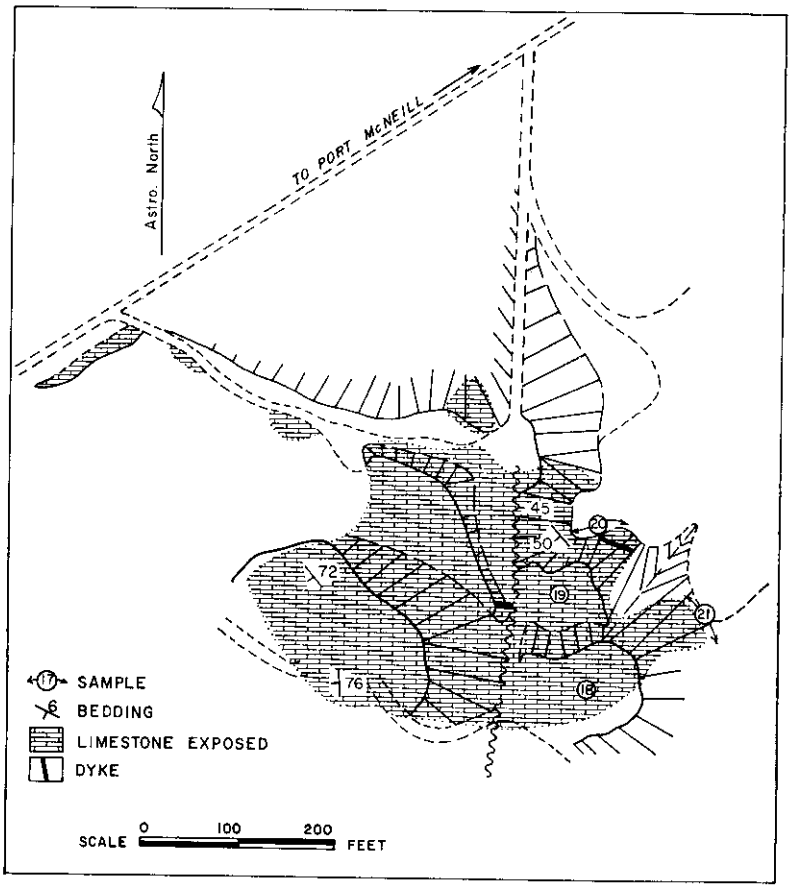

Figure 34. S.U.P. 6000 quarry, Port McNeill.

The most easterly band of Quatsino limestone crosses the east side of the hill just west of Beaver Cove and terminates northward against a northwest-trending fault in a gully that cuts across the north side of the hill. A logging-road with a branch along the north side of the hill and another along the east side provides access to the limestone. The best exposures are between 450 and 710 feet eleva-

tion on the east branch road about 1½ miles from the main highway. Here the limestone band, probably 400 to 500 feet thick stratigraphically, is exposed discontinuously for 1,700 feet along the road. It is underlain by basalt on the east and is cut off by diorite on the west. The forest cover has been removed by recent logging, so visibility is good, but overburden covers much of the rock. The limestone varies from white to white and grey streaked to black. Most is fine grained, but near the diorite the grains are as much as a quarter-inch in diameter. Variable amounts of chert, 2- to 4-foot thick igneous dykes, and a few tuffaceous beds are present in the outcrops. Some pyrrhotite-garnet-epidote skarn occurs at the diorite contact. Sample 22 consisted of chips taken at 10-foot intervals across 220 feet of sugary white rock in a cut on the logging-road 1½ miles from the highway.

On the north side of the hill the limestone band pinches down to a width of 100 feet and becomes badly contaminated with volcanic rock and skarn.

The same band of limestone is exposed on the west side of the Tsulton River on Lots 1, 8, and 1583 about three-quarters of a mile above the highway bridge. Most of the stone is creamy-white sugary rock. At this point the band is exposed for nearly 2,000 feet along the river but probably represents about 500 feet of beds. Goudge(1) published an analysis of a sample from this exposure that is shown as No. 23 in the accompanying table.

Southeast of the river good exposures of the limestone can be seen in cuts on the Nimpkish Valley logging-railway. The limestone outcrops begin 1.6 miles from the highway crossing and are nearly continuous for 2,000 feet to the bridge over the canyon of the east fork of the Tsulton River. In the first 250 feet the limestone forms a small anticline and is overlain by a layer of andesite. The limestone is grey to white, partly fine grained, and partly sugary white marble with grains 0.2 millimetre in diameter. A sample of chips collected at 10-foot intervals across the chord of the fold had the composition shown as No. 24 in the table. Sample 25 consisted of chips collected at 10-foot intervals along the next 350 feet to the south along the tracks. Dykes are fairly numerous in the succeeding 400 feet of exposures. The limestone in the last 1,000 feet is very dark grey to black, fine grained, and contains scattered fossil remnants.

In the vicinity of the 6-mile post the railway passes through the central band of Quatsino limestone. The rock seen was all fine grained, massive, and black. Two samples were collected in this area: No. 26 consisted of chips at 5-foot intervals across 130 feet of outcrop in a cut 400 feet south of mile-post 6, and sample 27 was made up of chips gathered at 5-foot intervals across 160 feet in a cut 600 feet north of the mile-post.

The eastern band of Quatsino limestone can be traced southeast from the Tsulton River to the north end of Bonanza Lake. At the lake the band divides, the main part continuing up the entire west side of the lake and the other part forming the 3,000-foot-high hill at the northeast corner of the lake and extending about a mile up the east shore. A main-line logging-road runs along the east shore. Good exposures of limestone occur along and above the road between mile-posts 12 and 13. Most is fairly uniform white and dark-grey streaked, sugary textured, crystalline marble with grains as much as one-eighth inch in diameter. Scattered 1- to 3-inch patches of light chert and indeterminate siliceous fossil fragments protrude from weathered surfaces. A few igneous dykes are present. The largest dyke exposed on the road is one-quarter mile south of mile-post 13 in a long road cut. Sample 30 consisted of chips collected at 25-foot intervals along 500 feet of the cut north of the dyke, and sample 31 consisted of chips gathered at 25-foot intervals along 500 feet south of the dyke.

On the west side of Bonanza Lake the limestone is 1,000 feet thick. The lower part consists of white and grey fine-grained limestone, higher up the rock is darker and includes dolomitic bands, and in the upper part it is black and contains scattered 2- to 6-inch lenses of black chert and many fossils. Continuous exposures suitable for sampling are not large. Sample 28 consisted of chips gathered at 10-foot intervals across 200 feet of mixed black and white layers exposed up a creek bed about 200 feet up the main logging-road on the west side. Sample 29 consisted of chips picked up at random along 100 feet of exposure in the logging-road bed at 1,200 feet elevation.

Analysis of Limestone Samples from the North End of Vancouver Island

Sample	CaO	MgO	Insol.	R_2O_3	Fe_2O_3	MnO	P_2O_5	S	Ig. Loss	H_2O (105° C.)
1	54.29	0.04	1.64	0.17	0.14	0.060	0.02	0.03	43.40	0.07
2	54.69	0.40	1.36	0.33	0.14	0.039	0.05	0.03	43.11	0.18
3	54.26	1.01	0.60	0.42	0.06	0.019	0.02	<0.01	43.77	0.05
4	54.09	1.21	0.53	0.40	0.09	0.018	0.01	0.01	43.81	0.06
5	54.41	1.18	0.44	0.16	0.10	0.007	0.02	0.02	44.01	0.15
7	53.08	1.89	0.91	0.28	0.04	0.007	0.01	<0.01	43.84	0.13
8	53.50	1.71	0.78	0.18	0.05	0.006	0.01	0.01	43.79	0.05
9	51.39	3.23	1.81	0.15	0.11	0.020	0.01	0.01	43.60	0.02
10	54.12	0.79	1.25	0.33	0.17	0.016	0.01	0.02	43.55	0.03
11	53.98	1.13	0.97	0.19	0.05	0.005	0.01	0.01	43.67	0.07
12	53.53	1.65	0.59	0.21	0.06	0.006	0.01	0.02	43.87	0.02
13	44.59	9.43	0.46	0.30	0.07	0.004	0.01	<0.01	45.31	0.01
14	48.72	4.90	1.88	0.40	0.30	0.012	0.006	0.04	43.44	0.09
15	51.40	2.20	2.46	0.38	0.63	0.006	0.02	0.27	42.31	0.11
16	54.60	0.58	1.10	0.31	0.12	0.013	0.01	0.11	43.62	0.25
17	55.24	0.20	0.26	0.22	0.05	0.013	0.01	0.02	43.88	0.17
18	55.26	0.08	0.92	0.12	0.06	0.003	0.03	0.01	43.43	0.11
19	55.04	0.16	0.83	0.21	0.09	0.004	0.02	0.05	43.38	0.04
20	40.58	0.50	21.41	3.35	2.65	0.010	0.09	2.02	30.40	0.59
21	53.64	0.22	3.10	0.33	0.17	0.015	0.02	0.05	42.49	0.20
22	55.17	0.08	1.22	0.30	0.13	0.023	0.02	0.01	43.21	0.05
23	54.34	0.34	1.04	0.12	0.16	.....	.....	0.02	.....	.....
24	54.37	0.16	2.34	0.21	0.14	0.011	0.01	0.08	42.81	0.09
25	54.51	0.10	1.77	0.21	0.09	0.008	0.01	0.03	43.02	0.14
26	55.43	0.08	0.84	0.18	0.03	0.003	0.01	<0.01	43.62	0.19
27	55.27	0.04	0.95	0.45	0.06	0.009	0.03	<0.01	43.39	0.11
28	54.65	0.22	1.88	0.35	0.09	0.006	0.03	0.02	42.94	0.09
29	52.81	2.13	1.16	0.30	0.09	0.007	0.03	0.04	43.76	0.06
30	55.10	0.10	0.96	0.49	0.06	0.010	0.03	0.07	43.54	0.13
31	55.06	0.12	1.08	0.16	0.05	0.006	0.01	<0.10	43.56	0.01

[References: (1) *Canada, Dept. of Mines and Resources,* Mines Branch Pub. No. 811, Limestones of Canada, Pt. V, British Columbia, by M. F. Goudge, 1944, pp. 136–142; (2) *Geol. Surv., Canada,* Mem. 272, Zeballos-Nimpkish Area, J. W. Hoadley, 1953; (3) *Geol. Surv., Canada,* Paper 67-1, Pt. A, p. 82; (4) *B.C. Dept. of Mines,* Prelim. Geol. Map, Alice Lake-Benson Lake, W. G. Jeffery, 1962.]

Spencer Creek Limestone

By J. W. McCammon

LOCATION: (48° 124° N.W.) Between forks of Spencer Creek on T.L. 8122 and T.L. 6886, east side Alberni Inlet, 21 miles south of Port Alberni.

CLAIMS: Spencer 1 and Spencer 2.

ACCESS: Logging-roads from Alberni Inlet, from Spencer log dump via Spencer Creek Main Line and Branch No. 10, a distance of 3 miles, or from Coleman dump via Coleman Creek Main Line and Branch No. 1. Both main lines join the Port Alberni–Bamfield road. It is 38 miles by road from the limestone to Port Alberni.

OWNER: E. J. Hudson, 701 Vanalman Avenue, Victoria.

DESCRIPTION:

Limestone is exposed at the deposit across an average width of 2,000 feet for more than 1½ miles in a northwesterly direction. It is bounded along the sides by near-parallel fault contacts with volcanic rocks and continues on strike in both directions beyond the area examined. The forest cover has been removed by recent logging, and bedrock exposures are good over much of the ground.

The limestone is mainly very fine-grained dark-grey rock that shows little signs of bedding. Thin white calcite veinlets that stand out in relief on weathered surfaces are plentiful. In a few places thin sandy-textured beds are visible and scattered fragments of indeterminable fossils and irregular patches of brown-weathering dolomite are present. Dolomite bands up to a foot thick occur sparingly, particularly near fault No. 2. Along the road south of the south fork of Spencer Creek, small irregular lenses of black chert are conspicuous. Just above the road crossing on the north fork the limestone consists of contorted soft, thin, black, shaly beds crowded with *Halobia* shells. This would indicate the rock could be correlated with the Upper Triassic Quatsino limestone of northern Vancouver Island. Where attitudes could be measured, the beds strike slightly north of west and dip between 37 and 65 degrees north. Joints of variable orientations and spacings are numerous throughout the exposures.

Several discontinuous andesite dykes were noted in the limestone. They are from 4 to 40 feet thick. Most are vertical and strike northwest, but a few small ones strike northeast.

Two patches of volcanic rock are faulted into the limestone in the southeastern part of the area. One consists of light-coloured thin-bedded tuffs. The beds are contorted and fractured. The other patch is sheared and shattered flow rock.

Along the northeast side the limestone is in fault contact with medium- to fine-grained medium-green volcanic flow rock that weathers greyish-green. A thin-section of one specimen showed it to be dacite.

Along the southwest side the limestone is in fault contact with medium- to coarse-grained dark grey-green volcanic rock that weathers brownish. A thin-section of one specimen showed it to be andesite.

Three large faults are believed to cut the rocks as shown on Figure 35. No good exposure of fault F1 was seen from which the nature of the movement could be determined. Rocks on either side are not much disturbed. Fault No. 2 is indicated by a prominent scarp, dipping 35 degrees, that forms the southwest slope of the ridge. Apparent downward movement of the block southwest of the fault is suggested. Fault No. 3 consists of a zone of shearing as much as 300 feet wide in some places. At one spot in the south fork of the creek above the upper bridge, relative downward movement of the block on the north is indicated. The block of ground between F2 and F3 would therefore appear to be a graben. Exposures are not good in this area, and the ground and rocks, where seen, are considerably broken up.

Four samples were collected, as indicated on Figure 35. They consisted of chips gathered at 10-foot intervals across the distances marked. The results of the chemical analyses of the samples were as follows:—

Sample	CaO	MgO	Insol.	R_2O_3	Fe_2O_3	MnO	P_2O_5	S	Ig. Loss	H_2O (105° C.)
1	55.43	0.32	0.53	0.15	0.10	0.008	0.03	<0.01	43.62	0.15
2	55.26	0.52	0.42	0.20	0.10	0.008	0.04	<0.01	43.78	0.06
3	55.74	0.11	0.24	0.12	0.07	0.008	0.03	<0.01	43.82	0.05
4	55.66	0.16	0.46	0.17	0.10	0.007	0.02	<0.01	43.80	0.03

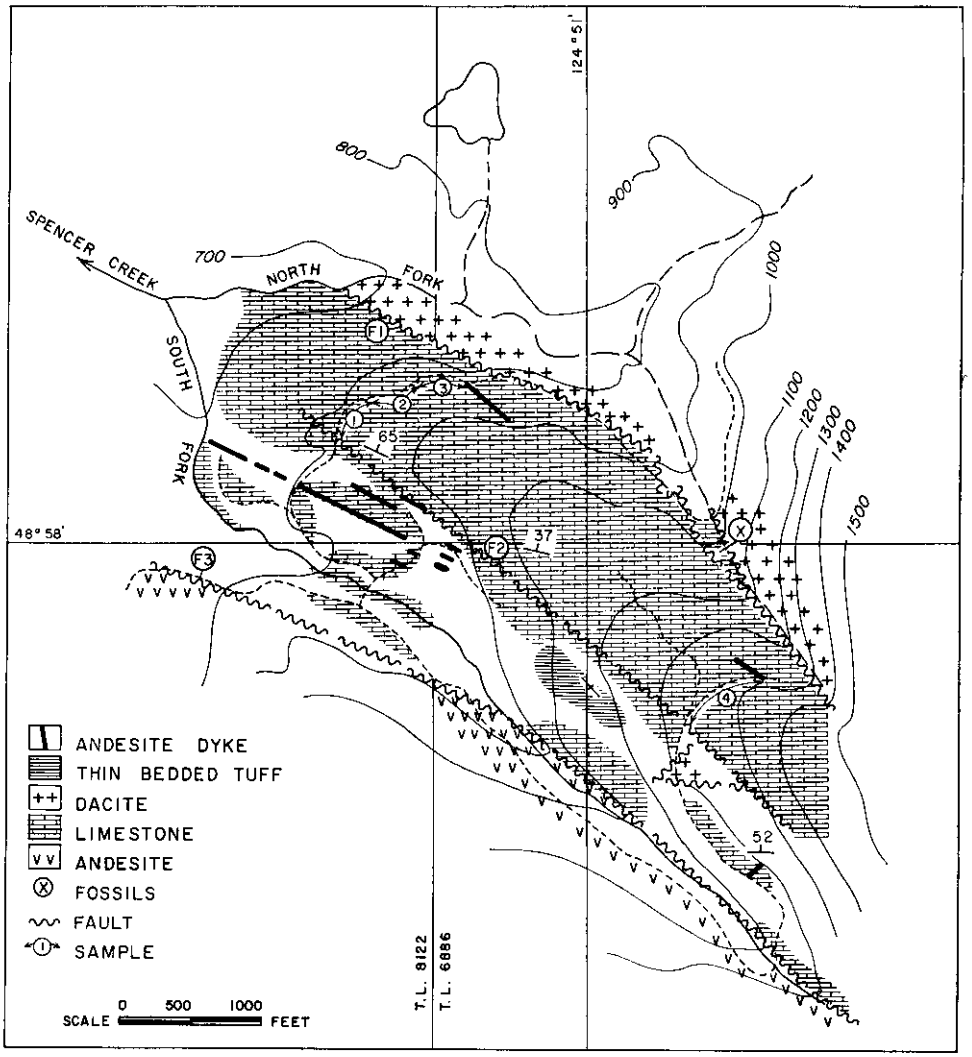

Figure 35. Spencer Creek limestone deposit.

Cobble Hill Quarry

LOCATION: (48° 123° N.W.) Lot 9, Range 3, at southwest corner of Cobble Hill, 2 miles southwest of Cobble Hill Station.

ACCESS: Private paved road from Bamberton.

OWNER: Ocean Cement Limited (B.C. Cement Division), north foot of Columbia Street, Vancouver 4; W. F. Foster, president.

WORK DONE: Limestone produced for use in Bamberton cement plant, 453,274 tons.

Domtar Chemicals Limited (Lime Division)

By W. C. Robinson

LOCATION: (49° 124° N.W.) Blubber Bay at north end of Texada Island.

ACCESS: By water.

OWNER: Domtar Chemicals Limited (Lime Division), 470 Granville Street, Vancouver 1; M. T. Pero, Blubber Bay plant manager.

WORK DONE: Forty-three men quarried 835,600 tons of limestone and shipped 597,795 tons.

Beale Quarry

By W. C. Robinson

LOCATION: (49° 124° N.W.) On north coast of Texada Island 1 mile southeast of Vananda.

ACCESS: By water or road 1 mile from Vananda.

OWNER: Lafarge Cement of North America Ltd. (Beale Quarries Division), 1051 Main Street, Vancouver 5; O. Lecerf, president; W. D. Webster, quarry superintendent.

WORK DONE: New minus 6-inch stockpiling and reclaiming system using five conveyors and two feeders installed to increase storage capacity to 40,000 tons; 28 men quarried 1,200,000 tons limestone and shipped 895,000 tons.

Ideal Cement Company

By W. C. Robinson

LOCATION: (49° 124° N.W.) On Lot 25, Texada Island, about 2½ miles south of Vananda.

ACCESS: By road, 3½ miles from Vananda.

OWNER: Ideal Cement Company, 610, 1200 West Pender Street, Vancouver 1; W. S. Beale, general manager, Rock Products Division; J. K. Johnson, quarry superintendent.

WORK DONE: Thirty-eight men quarried 965,000 tons of limestone, which was trucked to a crushing, screening, and washing plant at Marble Bay beside Vananda.

Imperial Limestone Company Limited Quarry

By W. C. Robinson

LOCATION: (49° 124° N.W.) Summit of hill three-quarters of a mile southwest of Spratt Bay on north coast of Texada Island 2 miles southeast of Vananda.

ACCESS: By water or road from Vananda.

OWNER: Imperial Limestone Company Limited, 5427 Ohio Avenue South, Seattle, Wash. 98134; James H. Jack, president; A. Diewert, quarry superintendent.

WORK DONE: Twenty-five men quarried 183,121 tons of limestone and shipped 168,615 tons; new Jeffrey hammermill installed; stucco dash and whiting prepared at plant at Vananda dock; whiting and coarse limestone prepared in plant at Spratt Bay.

Fraser Valley Lime Supplies

By A. R. C. James

LOCATION: (49° 121° S.W.) East side Highway 1, three-quarters of a mile east of Popkum.

ACCESS: Highway 1.

OWNER: Fraser Valley Lime Supplies, 7583 Edmonds Street, Burnaby 3.

WORK DONE: Quarried 6,815 tons limestone; crushed 7,343 tons limestone for agricultural use and industrial filler; seven men employed.

Harper Ranch Quarry

LOCATION: (50° 120° N.E.) On hillside north of Thompson River 11 miles east of Kamloops.

ACCESS: By road on north bank of South Thompson River, 12 miles east from Highway 5.

OWNER: Lafarge Cement of North America Ltd., 1051 Main Street, Vancouver 5.

WORK DONE: Geological and topographical mapping; 84 percussion-drill holes aggregating 7,062 feet.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1966, p. 267.

DESCRIPTION: Large lens of limestone in Cache Creek Group rocks.

Annis Industries Ltd.

By J. W. McCammon

LOCATION: (50° 119° S.W.) Seven hundred feet above the valley, 2½ miles southwest of Westwold.

ACCESS: By road 1.7 miles from the Salmon River road 1.8 miles south of Westwold.

OWNER: Annis Industries Ltd., 280, 180 Seymour Street, Kamloops; Donn Spankes, president.

DESCRIPTION:

Limestone forms a north-trending knoll approximately 600 feet long and 250 feet wide that projects about 100 feet out of the hillside, 700 feet above the floor of the Salmon River valley. The knoll is almost bare of overburden and has few trees growing on it.

The rock is medium- to coarse-grained limestone, more correctly designated marble. The grains range to one-quarter inch in diameter. On the whole it is fairly white, but some places show considerable yellow staining, particularly on fracture surfaces. The weathered surface is light grey. In thin-sections, small grains and irregular patches of quartz can be seen sparsely distributed among large strained calcite crystals. Fractures of various orientations are abundant at 4- to 18-inch spacings. On Geological Survey of Canada Map 1059A, Vernon, Jones has shown this as part of the Carboniferous(?) and Permian Cache Creek Formation.

At the north end the limestone is in contact with dark granodiorite. To the east a 600-foot-wide covered area lies between the limestone and granodiorite. To the south the limestone mass narrows and mingles with skarn and quartzite in a complex contact zone along the edge of granodiorite. On the west there are no outcrops for several hundred feet.

The west side of the knoll drops off for 100 feet almost vertically to a small gully. The company levelled off the floor of the gully and built a crushing plant against the base of the knoll. From the back of the plant it drove an entry and raise up to the top of the knoll. In August, 1968, the plant had just been put into operation. A 20-foot-wide trench was excavated easterly across the crest of the knoll from the top of the raise. Rock was blasted into the trench and pushed by bulldozer into the raise. In the plant, rock from the foot of the raise passed through a 10- by 12-inch jaw crusher and onto a four-deck shaker provided with ¼-inch, ⅜-inch, ½-inch, and ¾-inch screens. The screened products passed into storage bins or piles and were classified as fines, stucco dash, roof rock, driveway rock, and oversize.

Two samples were collected for analysis. No. 1 consisted of random chips from the muck pile in the trench and No. 2 consisted of random chips picked from the oversize stock pile. The composition, in percentages, of the samples were as follows:—

Sample	CaO	MgO	Insol.	R_2O_3	Fe_2O_3	MnO	P_2O_5	S	Ig. Loss	H_2O (105° C.)
1	54.68	0.34	0.79	0.18	0.08	0.01	0.02	0.004	43.62	0.02
2	54.82	0.60	0.90	0.15	0.06	0.01	0.02	0.002	43.70	0.01

Olalla Creek Limestone

By J. W. McCammon

LOCATION: (49° 119° S.W.) At 4,800 feet elevation on north side of the north fork of Olalla Creek, 3.2 miles northwest of Olalla.

ACCESS: By poor road 6.4 miles from Highway 3 at Olalla.

OWNER: Apex Exploration and Mining Company, Ltd., 306 Martin Street, Penticton.

DESCRIPTION:

Marble forms a northwest-trending lens that is 500 feet long and has a maximum width of 200 feet. There is about 400 feet difference in elevation between the lowest and highest exposures.

The deposit consists of medium- to coarse-grained crinoidal marble with crinoid plates commonly one-half inch in diameter. Colour ranges from white to grey and red-brown in irregular patches. One thin-section of the brown crinoidal marble showed it to contain about 20 per cent quartz as grains distributed through the mass. The rock is brecciated and highly fractured. The largest piece seen loose was 2 feet in diameter. Where visible the borders of the marble are sheared contacts with an altered rock, probably originally a fragmental volcanic, and now consisting largely of iron oxide, silica, and feldspar.

The road crosses the deposit about 50 feet below its top as a rock cut 200 feet long. A branch road extends to a stripping on the marble 300 feet below the road cut. At the lower working an area 150 feet wide by 250 feet long has been stripped.

The value of this marble as a building-stone is severely limited by the irregularity of the colouring and closeness of the fracture planes. A sample of chips collected at 5-foot intervals along 150 feet of the road cut had the following percentage composition: CaO=53.14; MgO=0.16; Insol.=3.65; R_2O_3=0.60; Fe_2O_3 = 0.41; MnO = 0.13; P_2O_5 = 0.05; S = 0.008; Ig. loss = 41.93; H_2O (105° C.)=0.01.

ROK — MAGNESITE

MINING DIVISION: Golden.

LOCATION: (50° 115° N.W.) Between junctions of Assiniboine Creek-Mitchell River and Mitchell River-Cross River, 20 miles northeast of Radium Junction.

CLAIMS: ROK group of 70 claims.

ACCESS: Horse trail for 8 to 10 miles from end of Cross River road.

OWNER: New Jersey Zinc Exploration Company (Canada) Ltd., 905, 525 Seymour Street, Vancouver 2.

WORK DONE: Four diamond-drill holes, total length 817 feet.

REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 310.

DESCRIPTION: Large band of magnesite in dolomite-limestone sequence.

MARL

Cheam Marl Products

By A. R. C. James

LOCATION: (49° 121° S.W.) Cheam Lake near Popkum.

ACCESS: Road 1 mile north off Highway 1 at Popkum.

OWNER: Cheam Marl Products Limited, 13 Fletcher Street South, Chilliwack; P. C. Woodward, general manager.

WORK DONE: Three men produced 21,007 tons of marl and 2,423 cubic yards of topsoil.

PHOSPHATE

Crows Nest Industries Phosphate

By R. W. Lewis

MINING DIVISION: Fort Steele.

LOCATION: (49° 114° N.W.) In Elk Valley about 15 miles north of Natal.

CLAIMS: Fording, Line, Horseshoe, Tornado South groups.

ACCESS: By road and jeep-road 15 miles from Natal.

OWNER: Crows Nest Industries Limited, 2000 Washington Building, Seattle, Wash.; J. J. Crabb, exploration geologist.
WORK DONE: Topographical and geological surveys were made; 6,200 feet of bulldozer trenching; one pit 30 feet deep; one 25-foot adit; 6 miles jeep-road; sampling.
DESCRIPTION: Sedimentary phosphorite in Rocky Mountain and Fernie Formations.

WW (Western Warner)

MINING DIVISION: Fort Steele.
LOCATION: (49° 114° S.W.) At 6,000 to 6,800 feet elevation on ridge, one-half to 1 mile north and east of Barnes Lake, 5 miles southwest of Corbin.
CLAIMS: WW 1 to 110.
ACCESS: From Natal 30 miles by road via Corbin.
OWNER: Western Warner Oils Ltd., 215A Tenth Street Northwest, Calgary 41, Alta.
OPERATOR: Imperial Oil Limited, 500 Sixth Avenue Southwest, Calgary 1, Alta.
WORK DONE: Seven drill-holes, total length 641.5 feet; 5 miles access road to Corbin–Flathead road.
REFERENCE: *Minister of Mines, B.C.,* Ann. Rept., 1967, p. 314.
DESCRIPTION: Oolitic phosphatic shale near Spray River-Rocky Mountain Formation contact.

R.A.

MINING DIVISION: Fort Steele.
LOCATION: (49° 114° S.W.) On fork of Flathead River directly opposite mouth of Foisey Creek, 4¾ miles northwest of Flathead townsite.
CLAIMS: R.A. 1 to 12.
ACCESS: Forty miles by road from Michel via Corbin.
OWNER: J. S. Adamson.
OPERATOR: Medesto Exploration Ltd., 215A Tenth Street Northwest, Calgary 41, Alta.
WORK DONE: Two trenches, 50 feet total length; two diamond-drill holes, 100 feet total length.
DESCRIPTION: Sedimentary phosphate rock.

PYROPHYLLITE

Island Copper (Bay)

By J. W. McCammon

MINING DIVISION: Nanaimo.
LOCATION: (50° 127° N.E.) One-half to three-quarters of a mile southeast of Bay Lake, 4 miles east of Coal Harbour.
CLAIMS: Bay group, Cove group.
ACCESS: Twelve miles by road south of Port Hardy.
OWNER: Utah Construction & Mining Co., 510 West Hastings Street, Vancouver 2.
REFERENCE: Assessment Report No. 710.
DESCRIPTION:

A peculiar altered rock, now consisting essentially of quartz and pyrophyllite with minor amounts of dumortierite and clay, occurs on the Island Copper (Bay) copper-molybdenum property being explored by Utah Construction & Mining Co. The rock forms an oval knoll about 200 feet high, 1,000 feet long, and between 200 and 300 feet wide, oriented slightly north of west. Exposures are spotty,

being chiefly on the south side and east end of the knoll. One cut has been excavated across part of the east end of the knoll.

In the cut the exposed rock is pale grey with some pale-brownish patches and speckles of bright blue. It consists of hard lumps and kernels in a soft matrix. In some places the hard parts are rounded and in mixed sizes up to one-quarter inch in diameter, giving the rock the appearance of a very coarse grit. In other places the appearance is that of a breccia. In thin-section it is seen that the hard parts are quartz, the matrix is a mixture of minute quartz grains with pyrophyllite shreds, and the blue is dumortierite in patches of very fine needles. The rounded quartz grains are strained and partially replaced around the margins by fine-grained secondary quartz and pyrophyllite. In some places dumortierite replaces quartz and pyrophyllite and in other places pyrophyllite veins dumortierite patches.

In other outcrops the rock is brownish-grey to buff, has a uniform fine-grained dense texture, and is soft, strongly resembling steatite. In thin-section this type is seen to consist of tiny discrete angular quartz grains surrounded by pyrophyllite with occasional small patches of dumortierite. This same rock can be found with dumortierite in 6- to 8-inch-wide patches and ¼-inch-wide fracture fillings. Some specimens were obtained that contain small irregular blotches of an opaque white clay mineral. On weathered surfaces nearly everywhere a distinct brecciated pattern is visible. The diameters of fragments are generally less than an inch, but some range up to 1 foot or more. The fragments may be of quartz, pyrophyllite, dumortierite, or of any combination of these. Occasionally spots of dark-brown stain containing a remnant core of pyrite can be found.

This rock was probably originally a quartz porphyry or fragmental that was fractured and altered. Since the first alteration there has been more shattering and alteration.

A chip sample collected across 50 feet of solid exposure in the cut at the east end of the mound had the following percentage analysis: $SiO_2 = 83.18$; $Al_2O_3 = 13.36$; H_2O ($+105°$ C.) $= 2.78$. The spectrogram indicated the presence of minor amounts of iron and titanium and 0.05 per cent boron.

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 materials; AP=asphalt paving mix; RM=ready-mix concrete.

Sand and Gravel Pits

Location	Operator	Equipment and Plant	Men	Production
Stewart	Stewart-Northern Materials Ltd.	Screening, sizing, washing	5	WS=2,830 yd.
Kitkatla Gravel Pit—Porcher Island	Rupert Cement Products (1965) Ltd.	Tractor, conveyor, and barge	3	RP=36,320 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=40,000 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, 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, Highway No. 16 West	Department of Highways	Front-end loader	2	RP.
(9) Mile 29.0, 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, Highway No. 16 East	Department of Highways	Front-end loader	2	RP.
(14) Mile 11.0, Highway No. 16 East	Department of Highways	Front-end loader	2	RP.
(15) Mile 23.7, 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) Canadian National Railway, 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	L. G. Scott and Sons Construction	Front-end loaders, screening, crusher, and paving plant	5	SA and AP=35,460 tons.
Sandhill—Kitimat	Ocean Cement Limited	Sauerman dragline, conveyors, washing, screening, ready-mix concrete, concrete bricks	5	RP, WS, RM=83,890 yd.
Highway No. 16—Carnaby	Department of Highways	Front-end loader	2	RP.
Coquitlam Municipality—				
(1) West end of Westwood Road	Corporation of the District of Coquitlam	Front-end loader, portable crushing and screening	1	RP and SA=102,000 yd.
(2) Pipeline Road, 3½ miles north of Lougheed Highway	Jack Cewe Ltd., P.O. Box 300, New Westminster	Shovel, screening, crushing, paving plant	7	RP, SA, and AP.
(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	RP, WS, and SA.
(4) Pipeline Road	Columbia Bitulithic Limited	Front-end loader, crushing and screening	....	SA and AP=85,055 yd.

(5) Pipeline Road, 1½ miles north of Lougheed Highway	Allard Concrete Construction Co., 1930 Pitt River Road, New Westminster	Front-end loader	4	RP and topsoil.
(6) Pipeline Road, 1 mile north of Lougheed Highway	Deeks-LaFarge Limited, 1051 Main St., Vancouver	Shovel, 600-tons-per day washing and screening, ready-mix	15	SA, WS, and RM=700,000 yd.
(7) Fraser River at Mary Hill, 2 miles south of Port Coquitlam	Ocean Cement Limited, north foot of Columbia St., Vancouver	Shovels, etc., 500-tons-per-hour processing plant, barge-loading facilities	56	WS=1,423,760 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	2[1]	RP.
Maple Ridge Municipality—				
(1) 33rd Road, 1 mile south of Silver Valley	S. Berto, Haney	Front-end loader	1[1]	RP.
(2) Grant Hill, 1 mile east of Albion and also adjoining Kirkpatrick pit	Corporation of the District of Maple Ridge	Front-end loader, crushing	....	RP and SA=53,383 yd.
(3) Grant Hill,½ mile north of municipal pit	McIntosh Sand and Gravel Limited, 10412 Industrial Ave., Whonock	Shovel, front-end loader, crushing, and screening	4[1]	RP and SA.
(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 Ltd., 22648 Lougheed Highway, Haney	Shovel, front-end loader, crushing, washing, and screening, ready-mix	4[1]	WS and RM=77,875 yd.
(6) 1 mile north of Websters Corners, ½ mile east	Kirkpatrick Sand and Gravel Ltd., P.O. 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=2,271 yd.
Mission Municipality—2.3 miles south of Steelhead, Dewdney Trunk Road	Cannon Contracting Ltd., P.O. Box 178, Mission	Shovel	1[1]	RP.
Kent Municipality—				
(1) West end of Cemetery Road, south of Mount Agassiz	Corporation of the District of Kent	Shovel and front-end loader	....	RP=8,030 yd.
(2) McCallum Road, 1½ miles west of Harrison Hot Springs road	Danielson Contractors Ltd., McCallum Road, Agassiz	Front-end loader	2[1]	RP.
(3) McCallum Road	Department of Highways	Front-end loader	....	RP=21,416 yd.
Indian Reserve No. 1—Cheam	George Beamin	Front-end loader, screening and washing	2	RP, SA, and WS=30,150 yd.
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	1	RP=35,231 yd.
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.
Matsqui Municipality—				
(1) 1 mile east of Abbotsford	Blackham's Construction Ltd., Abbotsford	Front-end loaders, screening, washing, and crushing	6	RP, SA, and WS=47,366 yd.
(2) Tretheway Road, ¾ mile north of Clearbrook	Department of Highways	Front-end loader	....	RP=10,475 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=37,800 yd.

[1] Part time.

Sand and Gravel Pits—Continued

Location	Operator	Equipment and Plant	Men	Production
Matsqui Municipality—*Continued*				
(4) 12th Ave., 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.
(5) Corner of King (16th Ave.) and Foy Roads (316th St.)	Braun Excavating Ltd., Abbotsford	Front-end loader	2[1]	RP.
(6) Corner of LeFeuvre Road and Eighth Ave., Caplette pit	Ernie's Trucking, Aldergrove	Front-end loader	3[1]	RP.
(7) LeFeuvre Road	Corporation of the District of Matsqui	Front-end loader	—	RP and SA=90,600 yd.
Langley Municipality—				
(1) Kinch Road at 36th Ave. and Jackman Road	Corporation of the Township of Langley	Shovel, crushing	5	RP=93,417 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=2,500 yd.
(4) Dogwood Ave., off Brown Road	Kitsul Bros. Gravel Sales Ltd., 24306 Fraser Highway, R.R. 3, Langley	Front-end loader	1[1]	RP=25,000 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[1]	RP, WS, and SA.
(6) Bradshaw and Berry Roads (Gun Club pit)	B & B Trucking, P.O. Box 24, Cloverdale	Shovel	1[1]	RP.
(7) 2962 Lambert Road (Highland pit)	Ocean Cement Limited, north foot of Columbia St., Vancouver	Dragline, front-end loader, crushing, screening, and washing	8	RP, WS, and SA=147,819 yd.
(8) 32nd Ave. at Kinch Road	Oscar W. Rees, 3003—208th St., R.R. 2, Langley	Shovel, front-end loader	5[1]	RP=109,979 yd.
(9) 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.
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=18,999 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	2	RP, WS, and SA.
(3) 24th Ave. at Langley boundary	Corporation of the District of Surrey	Front-end loader	—	RP, SA, and topsoil=127,224 yd.
(4) 160th St., south of 24th Ave.	Corporation of the District of Surrey	Front-end loader	—	RP=1,032 yd.
(5) 53rd Ave. at Delta boundary	Corporation of the District of Surrey	Front-end loader	—	RP and SA=1,758 yd.
(6) 28th Ave. at 194th St.	Corporation of the District of Surrey	Front-end loader	—	RP and topsoil=3,240 yd.
(7) 96th Ave. at Langley boundary	Corporation of the District of Surrey	Front-end loader	—	RP, SA, and topsoil=43,182 yd.
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 and screening	4	RP, WS, and SA=153,967 yd.
(2) Corner First Ave. and 56th St.	Century Manufacturing Co. Ltd., Ladner	Shovel	1[1]	RP.
(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.	Bulldozers, front-end loader, crushing, washing, and screening	35	WS, RP, and SA=1,638,399 yd.
(2) Gower Point, Sechelt Highway	Ed Fiedler, Gibsons	Front-end loader	1[1]	RP.
(3) Veterans Road, Gibsons (Pacific pit)	Gibsons Building Supply, Gibsons	Front-end loader, screening and washing	1	RP and WS.
(4) Cemetery Road, Gibsons	P & W Development Co. Ltd., P.O. Box 248, Gibsons	Front-end loader, crushing and screening, ready-mix	1[1]	RP and RM.
(5) Porpoise Bay Road, Sechelt	L & H Swanson Ltd., P.O. Box 172, Sechelt	Front-end loader, shovel, screening	1[1]	SA and RP=3,205 yd.
Powell River—Off Allen Road, 3 miles northeast of Westview	P. Nassichuk	Screening	1[1]	RP and sand =2,661 yd.
Vancouver Island—				
(1) Port McNeill	Island Readimix Limited		2	SA and RM.
(2) Campbell River, south of Buttle Lake Road at Elk Falls Road	G & A Trucking Ltd.	Front-end loader, crushing	20[1]	RP.
(3) Painter's Spit, Campbell River	Island Readimix Limited	High-line scraper, front-end loader, crushing, washing, and screening	3	WS, SA, RM.
(4) Cumberland Road near Courtenay	Island Readimix Limited	Bulldozer, mobile loader, crushing, washing, and screening	4	RM and WS=55,953 yd.
(5) Parksville	Fouty Bros.	Front-end loader	1	
(6) Alberni	Dolan's Limited	Front-end loader, washing, and screening plant	3	
(7) Cassidy No. 4 pit, Island Highway at Cassidy	Ocean Cement Limited	Front-end loader, washing, crushing, and screening	4	WS, RP, and SA=36,039 yd.
(8) Duncan—Cowichan Lake Road	Butler Bros. Supplies (Duncan) Ltd., P.O. Box 214, Duncan	Front-end loader, washing, crushing, and screening, ready-mix	7	RP, WS, SA, and RM.
(9) Duncan—Koksilah	Doman Industries Limited, Duncan	Front-end loader, crushing and screening, asphalt paving, ready-mix	6	RP, WS, SA, and RM=48,816 yd.
(10) Sooke—Sooke Road east of Milnes Landing	Butler Brothers Supplies Ltd.	Front-end loader	3[1]	RP, WS, SA, and RM.
(11) Royal Bay	Ocean Cement Limited	Scraper, shovel, crushing, screening, and sizing	----	RP=150,144, AA=106,952, WS=152,417 yd.
Creston—Goat River	Louis Salvador & Sons	Front-end loader, screens	3	WS and RP.
Wynndel—Duck Creek	Louis Salvador & Sons	Front-end loader, screens	3	RP and RM.
Wynndel—Duck Lake	Frank Merriam & Sons	Front-end loader, screens	3	RP and AP.
Nelson—Anderson Creek	Premier Sand & Gravel Company Limited	Front-end loader, crusher, screens	5	RP, WS, and RM.
Trail—Casino Road	McGauley Ready-Mix Concrete Company	Front-end loader, crusher, screens	4	RP, WS, and RM.
Castlegar—Columbia River	McGauley Ready-Mix Concrete Company	Front-end loader, screens	3	RP, WS, and RM.
Salmo—Erie Creek	Valley Concrete Products Ltd.	Front-end loader, screens	2	Concrete pipe.

[1] Part time.

SILICA

Apple (Lafarge Silica)

By J. W. McCammon

MINING DIVISION: Nanaimo.
LOCATION: (50° 127° N.W.) Apple Bay on north shore Holberg Inlet, 4½ miles west of Coal Harbour.
CLAIMS: Helen, Betty, Rainbow.
ACCESS: Boat from Coal Harbour.
OWNER: Lafarge Cement of North America Ltd., 1051 Main Street, Vancouver 4.
REFERENCE: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 276.
DESCRIPTION:

This property was investigated primarily as a source of silica for use in the manufacture of cement. The material of interest is a highly silicified part of an interlayered sequence of acid flows and tuffs. The rock forms an isolated knoll about 100 feet high and 800 feet in circumference on the shore of a small point in Apple Bay. A sharp gully separates the knoll from similar rock that outcrops 150 feet inland to the northeast. The rock is strongly brecciated. In the area of the knoll that was stripped for quarrying parts of the rock appear to be altered rhyolite flow rock, but most seem originally to have been a lapilli tuff with fragments as large as 1 inch in diameter. In some thin-sections examined the fragments were found to be pumiceous and perlitic. A low outcrop on the shore 120 feet west of the knoll consists of dark tuff partly replaced by pyrite. Some of this rock contains carbonized tree fragments. No reliable attitudes were found, but in one place a foliation that may represent the attitude strikes north 55 degrees east and dips 30 to 35 degrees northwest. The alteration has consisted chiefly of silicification with some kaolinization and, in places, considerable pyritization. The secondary silica is partly chalcedony and partly microcrystalline quartz.

A grab sample of equal-sized chips gathered at random over the stripped surface of the knoll contained 93.9 per cent SiO_2, 3.86 per cent Al_2O_3, and 0.13 per cent Fe.

FS No. 1 and No. 2

MINING DIVISION: Kamloops.
LOCATION: (50° 119° N.W.) Nine miles north of Pritchard, just west of Mile 8 on McGillivray Lake forestry road, 1½ miles south of McGillivray Lake.
CLAIMS: FS No. 1, FS No. 2.
ACCESS: Forty-three miles from Kamloops via Highway 1 and McGillivray Lake forest access road.
OWNER: John Filek, 1013 Tranquille Road, Kamloops.
WORK DONE: Bulldozer trenching, 500 to 600 feet.

Hopeful

LOCATION: (50° 119° N.E.) One mile east of Marble Point (Quartzite Point), near Sicamous Narrows on Shuswap Lake.
CLAIMS: Hopeful 1.
ACCESS: By road 8 miles from Sicamous.
OWNER: Wm. Campbell, Sicamous.
OPERATOR: Camoel Associates, R.R. 1, Sicamous.
WORK DONE: Three thousand square feet of stripping done by bulldozer and hand-tools.
REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1965, p. 275.
DESCRIPTION: Quartzite bed in biotite-hornblende gneiss.

Ivan (Mount Rose Silica)

By J. W. McCammon

MINING DIVISION: Vernon.
LOCATION: (50° 119° S.E.) At 2,590 feet elevation on Mount Rose ridge, 4 miles southwest of Armstrong.
CLAIMS: Ivan Nos. 1 to 10.
ACCESS: Side road 2.6 miles off Grandview Bench road 1 mile west of Otter Lake.
OWNER: H. G. Powell.
OPERATOR: Mount Rose Mining Co. Ltd., P.O. Box 986, Vernon.
WORK DONE: Three hundred tons quartz quarried for processing and market testing.
DESCRIPTION: A lens of bull quartz on the property forms a knob 200 feet in diameter that protrudes 20 feet above the surrounding drift. The quartz is highly shattered with iron stain on many fracture faces. Scattered patches of pyrite, pyrrhotite, and occasional grains of galena are present.

Oliver Silica Quarry

By David Smith

MINING DIVISION: Osoyoos.
LOCATION: (49° 119° S.W.) One-quarter mile west of Highway 97, 1 mile north of Oliver.
CLAIMS: Gypo (Lot 30985).
ACCESS: Road from Oliver.
OWNER: Cominco Ltd.
OPERATOR: Pacific Silica Limited, 717 West Pender Street, Vancouver 1; P.O. Box 39, Oliver. I. A. Hunter, manager; H. Carlson, superintendent.
WORK DONE: Production, 35,300 tons; shipments, 6,600 tons in sacks and 28,700 tons in bulk. Thirty people employed until August 6th, when a large slide forced closure of the quarry. Eight men continued work to year-end.
DESCRIPTION: Large quartz lens in granite.

Petroleum and Natural Gas

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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, including the collection of revenue from fees, rents, dispositions, and royalty. Regulations governing geophysical operations and petroleum-development road regulations are also administered by the Chief Commissioner.

During the year there were four dispositions of Crown reserve petroleum and natural-gas rights resulting in tender bonus bids of $15,077,020.47.

As at December 31, 1968, 43,556,808 acres, or approximately 68,057 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	492	32,622,739
Natural-gas licences		
Drilling reservations	34	384,925
Leases (all types)	4,110	10,549,144
Total		43,556,808

Details of land disposition for the years 1947–1960, inclusive, may be found on page A 61 of the 1960 Annual Report. Details of land disposition for the years 1961–1968, inclusive, are included in this report.

Petroleum and Natural-gas Revenue, 1968

Rentals and fees—		
Permits	$1,184,456.79	
Drilling reservations	87,758.50	
Natural-gas licences		
Petroleum, natural-gas, and petroleum and natural-gas leases	9,349,480.29	
Total rentals and fees		$10,621,695.58
Disposal of Crown reserves—		
Permits	$9,554,003.93	
Drilling reservations	1,785,527.02	
Leases	3,737,489.52	
Total Crown reserve disposal		15,077,020.47
Royalties—		
Gas	$3,217,227.03	
Oil	7,677,404.82	
Processed products	50,761.62	
Total royalties		10,945,393.47
Miscellaneous fees		17,955.34
Total petroleum and natural-gas revenues		$36,662,064.86

Details of yearly revenue, 1947–1960, inclusive, are tabled on page A 61 of the Annual Report for 1960. Details of yearly revenue from 1961–1968, inclusive, are included in this report.

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.

Acreage of Crown Petroleum and Natural-gas Rights Held, 1961–1968

	1961	1962	1963	1964	1965	1966	1967	1968
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Petroleum and natural-gas permits	25,898,913	17,374,307	24,902,690	22,417,836	23,517,709	29,716,610	23,214,363	32,622,739
Petroleum and natural-gas leases	6,900,933	9,226,375	10,753,287	11,289,962	10,642,259	10,439,595	10,596,352	10,029,674
Natural-gas licences	159,027	84,499	74,987	9,669	.....	27,815	.....	.....
Natural-gas leases	416,869	505,982	543,966	555,829	540,088	524,612	549,218	518,826
Petroleum leases	2,568	2,568	2,568	2,568	2,568	2,568	644	644
Drilling reservations	546,699	471,487	641,919	451,998	534,868	503,603	462,138	384,925
Totals	33,925,009	27,665,218	36,919,417	34,727,862	35,237,492	41,214,803	34,822,715	43,556,808

Petroleum and Natural-gas Revenue, 1961–1968

	Cumulative, 1947–1960	1961	1962	1963	1964	1965	1966	1967	1968	Cumulative, 1947–1968
Rentals and Fees	$	$	$	$	$	$	$	$	$	$
Permits	29,220,305	2,856,551	2,138,070	1,618,748	1,302,305	1,176,501	1,661,591	1,369,232	1,184,457	42,547,760
Drilling reservations	218,207	59,989	126,149	121,632	64,800	114,483	113,496	86,303	87,759	992,818
Natural-gas licences	44,326	12,638	2,086	4,738			1,466			65,254
Leases (all)	6,657,095	3,616,123	4,916,971	5,957,533	7,077,488	7,013,187	8,432,386	8,901,196	9,349,480	61,921,459
Total rentals	36,139,933	6,545,301	7,183,276	7,722,651	8,444,593	8,304,171	10,208,939	10,356,731	10,621,696	105,527,291
Crown Reserve Disposition Bonuses										
Permits	12,874,050	1,493,679	1,208,400	79,519	721,193	1,825,322	6,982,439	8,428,409	9,554,004	43,167,015
Drilling reservations	3,213,186	3,082,821	3,067,675	1,585,935	1,541,685	3,278,641	4,657,510	3,013,979	1,785,527	25,226,959
Leases	9,193,658	3,065,391	7,088,659	5,426,555	10,830,994	13,057,470	4,199,528	2,855,428	3,737,489	59,455,172
Crown Reserve disposition total	25,280,894	7,641,891	11,364,734	7,092,009	13,093,872	18,161,433	15,839,477	14,297,816	15,077,020	127,849,146
Crown Royalties										
Gas	1,851,164	1,152,396	1,260,419	1,531,977	1,583,292	1,682,444	2,256,725	2,870,656	3,217,227	17,406,300
Oil	732,499	207,392	2,265,167	3,858,985	3,502,222	3,697,668	5,449,663	6,678,245	7,677,405	34,069,246
Processed products	208,162	119,405	108,737	115,042	104,990	93,226	61,568	58,536	50,762	920,428
Crown royalties total	2,791,825	1,479,193	3,634,323	5,506,004	5,190,504	5,473,338	7,767,956	9,607,437	10,945,394	52,395,974
Miscellaneous fees	79,263	23,817	31,950	29,376	26,851	17,790	18,073	17,917	17,955	262,992
Total petroleum and natural-gas revenue	64,291,915	15,690,202	22,214,283	20,350,040	26,755,820	31,956,732	33,834,445	34,279,901	36,662,065	286,035,403

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

During 1968 the activity in the petroleum and natural-gas industry in British Columbia was about the same as in 1967. Production of oil and gas continued their annual increases, the footage drilled was up a small percentage, and the number of well completions recorded a minor decrease.

Exploration was down by almost one-half, indicative that the immediate future holds no great upward surge in drilling activity. During 1968 no significant discoveries were made that will create development programmes in a specific area.

Production of oil and gas was increased by 13 and 14 per cent respectively. The secondary recovery schemes operating in the oil-producing areas accounted for most of the gain in oil production. The greatest increase was obtained from the Inga field, where production doubled over the 1967 total to 1,647,144 barrels. Another large gain was the 16-per-cent increase from the Boundary Lake field, where production reached 7,807,936 barrels. These two fields, plus initial production from numerous small areas, resulted in the over-all gain. Some of the long-producing fields declined, with Milligan Creek, Weasel, and Wildmint being the most prominent ones.

The increase in gas production was accounted for by the newly connected fields in the Fort Nelson area. New production was received from the Clarke Lake South, Kotcho, and Yoyo fields, with a substantial production increase from the Clarke Lake field. Except for the Nig Creek field, which gained 8 per cent in production, most of the other producing fields showed a decline from 1967.

The number of well authorizations issued during 1968 was 180, compared to 201 in 1967. Total footage drilled was up 7 per cent, but the number of completed wells decreased 4 per cent. This reflects the trend of deeper drilling which was indicated in 1967. It is notable that the number of abandonments increased 12 per cent while the number of completed oil wells was unchanged, and the number of gas wells decreased 21 per cent. These results further indicate that 1968 was not as successful a year as 1967.

Two major changes in the marketing of petroleum products were the completion of gas distribution to the Prince Rupert area and the approximate doubling of the Clarke Lake gas plant throughput. Extension of the gas-gathering system to the Kotcho and Yoyo fields was also significant and contributed to the increase in gas production.

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 in the Provincial Building at Fort Nelson is used periodically by the field staff.

During 1968, renovation of the field office building complex at Charlie Lake was completed, with the result that a new office wing and enlarged core storage and geological laboratory facilities were officially opened on October 28, 1968.

The field office staff is responsible for the enforcement at the field level of the "Regulations Governing the Drilling of Wells, and the Production and Conservation of Oil and Natural Gas."

The Provincial standard for bottom-hole pressure gauges is maintained at Charlie Lake. All bottom-hole pressure gauges used in the Province are calibrated to this standard. During 1968, 317 pressure bombs were calibrated.

During 1968 seven vehicles were driven a total of 113,215 miles to conduct inspections and various surveys pertaining to the drilling and production phase of the oil and gas industry. A specialized bottom-hole unit was used to conduct pressure surveys on 42 wells. The surveys are used as a check on pressure data submitted by operating companies and also for special studies by Departmental personnel.

The continuing increase of oil and natural-gas production resulted in a greater number of inspections required on production facilities. Complete inspections were made on 461 gas meters and an additional 357 fast meter inspections were made. Eighty-two absolute open-flow tests were witnessed on natural-gas wells, and six tests were conducted by the field staff on oil wells to verify production characteristics.

Surface production equipment, storage facilities, and production batteries were inspected on 34 occasions. Battery inspections are also done in conjunction with the inspection of oil wells and the calibration of gas meters, with the result that all battery facilities were visited several times during 1968.

Inspections were carried out at 194 drilling and 1,050 producing or abandoned leases to ensure that the abandonment and completion procedures conform to the "Regulation Governing the Drilling of Wells, and the Production and Conservation of Oil and Natural Gas."

GEOLOGICAL SECTION

During 1968, the Geological Section interpreted, recorded, and filed geologic data from northeastern British Columbia. New data were incorporated into the subsurface maps for determination of oil and gas 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.

Geological data were interpreted in relation to the reservoir geology of the oil and gas fields. Fields receiving the greatest attention were those producing from the Halfway and Charlie Lake Formations in the Fort St. John area, and the Slave Point and Pine Point Formations in the Fort Nelson area. Special projects were undertaken to deal with numerous industry submissions. All approved well locations are classified by the Section according to the Lahee System, as defined by the American Association of Petroleum Geologists. A summary of the wells classified by the Lahee System is shown in Table 14. 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.

TABLE 14.—EXPLORATORY AND DEVELOPMENT WELLS COMPLETED, JANUARY TO DECEMBER, 1968

	Oil		Gas		Total Producers		Abandonments		Status Undetermined		Service Well		Total	
	No.	Footage	No.	Footage	No.	Footage	No.	Footage	No.	Footage	No.	Footage	No.	Footage
New field wildcats	1	6,859	12	76,774	13	83,633	42	301,973	----	----	----	----	55	385,606
New-pool wildcats	1	3,919	3	21,145	4	25,064	19	86,293	----	----	----	----	23	111,357
Deep-pool tests	----	----	----	----	----	----	4[1]	8,636	----	----	----	----	4[1]	8,636
Outposts	4	18,712	4	25,904	8	44,616	19	99,363	1	7,091	----	----	28	151,070
Total exploratory wells	6	29,490	19	123,823	25	153,313	80	496,265	1	7,091	----	----	106	656,669
Total development wells	40	184,282	15	91,852	55	276,134	25	118,065	----	----	2	12,425	82	406,624
Sub-total	46	213,772	34	215,675	80	429,447	105	614,330	1	7,091	2	12,425	188	1,063,293
Other wells drilled	----	----	----	----	----	----	----	----	----	----	3	11,592	3	11,592
Total	46	213,772	34	215,675	80	429,447	105	614,330	1	7,091	5	24,017	191	1,074,885

[1] Deep-pool tests are not included in the well total as they are counted under development.

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 1968, 1,486 boxes of core from 110 wells were received at the laboratory. At the end of 1968, 27,192 boxes from 1,594 wells were being 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 of 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 1968 the Charlie Lake sample library contained 615,302 samples, while 613,663 samples were retained in the Victoria library.

During 1968, samples were received at the laboratory from 186 wells. A total of 85,982 10-foot samples was washed and bottled in 1968.

Core and Sample Examination

A nominal fee is charged for the use of the core- and sample-examination facilities provided by the Department.

In 1968, 9,705 boxes of core from 495 wells were studied by oil company personnel and other interested individuals. Cores from 16 wells were temporarily removed from the laboratory by the operators for further studies. Samples from 17 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, 60,556 boxes of core have been removed from the racks for examination.

Exploration

In northeastern British Columbia during 1968, 26 oil and gas companies employed seismic crews for a total of 199 seismic crew-weeks. During February the most active month, 13 crews were working. In September a gravity meter survey was made in northeastern British Columbia. In the Fernie area a magnetometer survey was run and two companies completed four seismic crew-weeks. One company flew 305 aeromagnetic line-miles over the Beaver Harbour-Port McNeill area on Vancouver Island and Queen Charlotte Strait. Surface geological parties worked in northeastern British Columbia, the Fernie area, and the Bowser Basin. These exploration activities are listed in Tables 15 and 16.

All the drilling for oil and gas was confined to northeastern British Columbia. Of the 46 producing oil wells completed in 1968, 43 were completed in Triassic

strata and 3 in the Cretaceous. Of the 34 gas wells, 11 were Devonian, 2 Mississippian, 3 Permian, 15 Triassic, and 3 Cretaceous. All these potential producing wells were located in the plains of northeastern British Columbia, except one gas well in the Liard Basin and one gas well in the Pine River Foothills area.

Thirty-nine wells were drilled to Devonian horizons during 1968. The wells Pan Am IOE Hostli d-48-J and Texaco NFA Missle d-54-A discovered gas in the Pine Point Formation, and Slave Point gas was discovered in new areas by the wells CanDel Barnwell HB Hoss b-82-G and Midwest Chevron Peggo d-65-A. Devonian development drilling was carried out in the Clarke Lake, Yoyo, Tsea, and Beaver River drilling areas.

Two wells discovered Mississippian gas, one in the Banff Formation and one in the Debolt. Two Permian (Belloy Formation) gas wells were completed.

The Triassic rocks continued to reward exploration efforts in northeastern British Columbia, and discoveries were made in the Halfway, Charlie Lake, and Baldonnel Formations. Most of the development drilling was aimed at Triassic production in the Boundary Lake field, the non-continuous Halfway trend, and in the Inga field. The discovery of Baldonnel gas in the Inga area seems promising.

Two Cretaceous gas discoveries were made in 1968, one being Dunlevy and one Bluesky-Gething.

Gas Discoveries, 1968

Well Authorization No.	Well Name	Total Depth (Ft.)	Status
	Mesozoic		
2160	Mesa et al Prophet c-97-D	11,087	Halfway gas.
2245	Champlin Bass Martin c-91-B	4,541	Baldonnel gas.
2354	IOE Fina Rigel a-89-J	3,630	Dunlevy gas.
2230	TGS Falls c-32-F	12,506	Baldonnel gas.
2327	Pacific Inga 6-29-86-23	4,950	Baldonnel gas.
2406	Pan Am Dome Silver d-81-L	4,030	Bluesky-Gething gas.
2296	Union HB Bluebell d-22-H	3,725	Halfway gas.
	Palæozoic		
2287	Pan Am IOE Hostli d-48-J	6,646	Pine Point gas.
2232	Texaco NFA Missle d-54-A	8,730	Pine Point gas.
2234	CanDel Barnwell Hoss b-82-G	7,655	Slave Point gas.
2276	Midwest Chevron Peggo d-65-A	8,090	Slave Point gas.
2260	Pacific et al Milo c-43-E	7,131	Slave Point gas.
2225	Dome et al Imp Slave d-10-I	9,750	Banff gas.
2160	Mesa et al Prophet c-97-D	11,087	Debolt gas.

Oil Discoveries, 1968

	Mesozoic		
2352	Monsanto Bear Flat 7-16-84-20	6,859	Charlie Lake oil.
2264	Texaco N Pine 6-15-85-18	4,340	Charlie Lake oil.
2323	Union et al Spruce d-62-E	3,919	Halfway oil.

RESERVOIR ENGINEERING SECTION

In general, the Reservoir Engineering Section is responsible for determination of reservoir and production characteristics of oil and gas pools in the Province. This involves interpretation of reservoir pressure, rock and fluid properties, and production data. The results of these studies are applied in making recommendations concerning the approval of submissions from industry for improved recovery and other production schemes, and also for estimating Provincial hydrocarbon and hydrocarbon-associated sulphur reserves.

The Section ensures that requisite reservoir data are obtained, either by industry or Branch personnel, and maintains files of these data. In addition, oil and gas allowable production rates are established by the Section. Other responsibilities of the Section include matters affecting conservation and correlative rights, approval of measurement practices, and approval of produced water-disposal schemes.

Oil Allowables, M.P.R.s, and Improved Recovery Schemes

Maximum permissible rates (M.P.R.s) are assigned to all oil wells in the Province, either as individual wells or for groups of wells in the form of project or unit M.P.R.s. Single-well M.P.R.s are based on well-bore net-pay properties, while project M.P.R.s are derived from mapped pore volume data and the estimated recovery factor for the production scheme in effect. Monthly oil allowables are established from M.P.R. values, and periodic checks are made to ensure that wells and projects are being produced in accordance with regulations governing over-production.

A report is issued monthly, in which M.P.R.s are summarized by field and operator. Table 17 presents individual well and project M.P.R.s as of December 31, 1968, and Plans 1, 2, 3, 4, 6, 8, 9, 12, 15, 16, and 17 show the areas included in project or unit M.P.R. approvals.

During 1968 a total of 42 individual well M.P.R.s was issued, including revisions of previously approved values due to re-evaluation of pertinent data or changes in well-spacing. In addition, by the end of the year revised M.P.R. applications had been received for a total of 44 individual wells and 17 projects, in response to the memorandum sent to all operators on November 21, 1967. This memo was discussed in the 1967 Annual Report, and was issued in an attempt to obtain uniformity in calculating M.P.R.s. Most of these revised applications had received a preliminary review by December 31st, the objective being to issue interim M.P.R.s early in 1969. These M.P.R.s will be finalized following exhaustive evaluation of reservoir and production performance data.

At the beginning of 1968, an application by Tenneco Oil & Minerals Ltd. for a project M.P.R. for a block of wells under primary depletion in the Inga field, was under review by the Reservoir Engineering Section. This application requested an M.P.R. of 1,535 stock tank barrels per day. Approval at a level of 1,272 stock tank barrels per day was granted on February 7th, to become effective on March 1st.

In September, 1967, a project M.P.R. of 627 stock tank barrels per day was granted Pacific Petroleums Ltd. as operator of Unit No. 1 in the Currant field. This M.P.R. was contingent on commencement of water injection into the unit, and became effective on February 1, 1968, following start-up of water-injection operations.

Also on February 1st, the off-target penalty factor was removed from Halfway Zone oil production from the well located at 11-14-85-14 W6M in the Boundary Lake field. This was done in response to a request from Pacific Petroleums Ltd., which was published in the Gazette on December 21 and 28, 1967.

On July 2, Pacific Petroleums Ltd. made application for an annual oil allowable for the well located at d-33-I/94-A-15. This well has an M.P.R. of 5 stock tank barrels per day and the operator contended that production at such a low rate was uneconomic. Since the well is completed in an isolated Halfway Zone pool in the Peejay field and no question of drainage or impairment of conservation was apparent, the request was granted on July 11th. Under the approval, the well has an annual allowable for each " production period " (as defined in the regulations) based on the M.P.R. of 5 stock tank barrels per day and the appropriate gas-oil

ratio penalty factor. Maximum daily production rate is not to exceed 50 stock tank barrels per day.

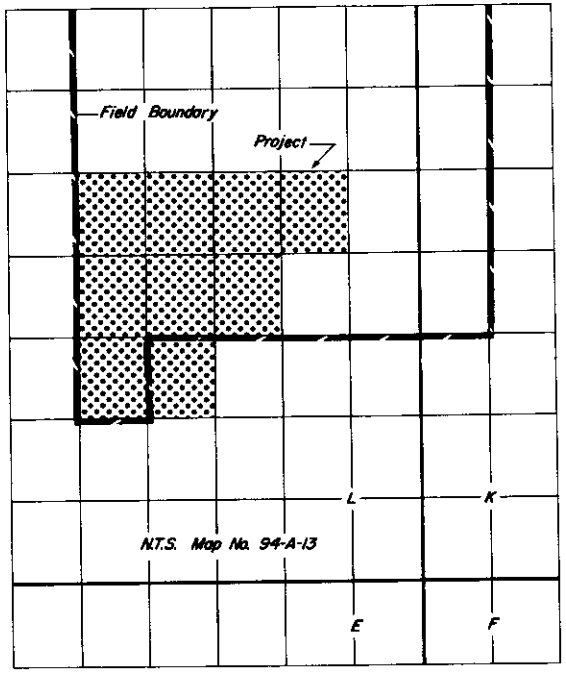
Approval was granted on August 30th for conversion to water-injection service of the well located at d-62-H/94-A-15 in the Peejay Unit No. 3. This was requested on August 19th by Pacific Petroleums Ltd. as unit operator, due to an unfavourable reservoir withdrawal balance in the vicinity of the proposed injector.

An application was received from Pacific Petroleums Ltd. for waiver of gas-oil ratio penalty on Halfway Zone oil production from the well located at 8-11-87-25 W6M, in the Halfway field. At year-end, approval had not been granted, pending the submission of additional test data.

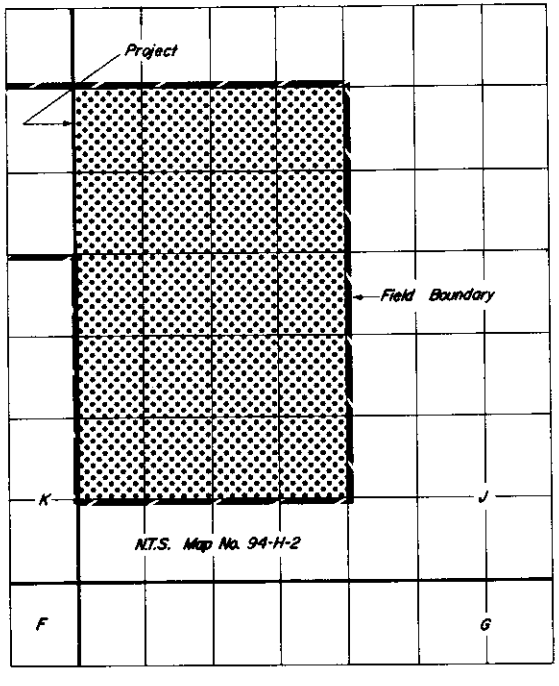
During the year the Reservoir Engineering Section made several reservoir analyses and improved recovery studies, in co-operation with the Geological Section. These studies were made in response to various requests for production schemes and their associated project M.P.R.s. The following tabulation summarizes the projects examined:

Project	Operator	Scheme	Gazette Advertisement	M.P.R. (S.T.B./D.)		Remarks
				Applied for	Approved	
Weasel Unit No. 1	Tenneco Oil and Minerals Ltd.	Waterflood and project M.P.R.	April 25 and May 2	2,388[1]	2,551	Scheme approved on June 24; M.P.R. effective when water injection commenced (June, 1968).
Weasel Unit No. 2	Pacific Petroleums Ltd.	Waterflood and project M.P.R.	April 25 and May 2	1,510[2]	1,296	Scheme approved on June 24; M.P.R. effective when water injection commenced (no water injected as of Dec. 31).
Inga Unit No. 1	Canadian Superior Oil Ltd.	Primary project M.P.R.	Not advertised	4,199	4,199	Interim M.P.R. granted on effective date of unit (Aug. 1).
Inga Unit No. 1	Canadian Superior Oil Ltd.	Waterflood and project M.P.R.	Oct. 24 and Oct. 31	7,921	7,064	Scheme approved on Dec. 12; M.P.R. effective following commencement of water injection (no water injected as of Dec. 31).
Rigel-Dunlevy oil wells in: 19-87-16-W6M, 13 and 23 87-17 W6M	Monsanto Oil Ltd.	Gas gathering and relief of well M.P.R.s from gas-oil ratio penalty	Oct. 24 and Oct. 31	(3)	(3)	Scheme approved and wells granted relief from gas-oil ratio penalty, to be effective following implementation of scheme (not in effect at year end).
Beatton River	Triad Oil Co. Ltd.	Revision of waterflood project M.P.R. due to drilling of two additional wells	Not advertised	2,340	2,270	Revised M.P.R. granted, effective Dec. 1.
Weasel Unit No. 2	Pacific Petroleums Ltd.	Revision of waterflood project M.P.R. due to unit enlargement and infill drilling	Not advertised	1,317	———	Under review at year-end.

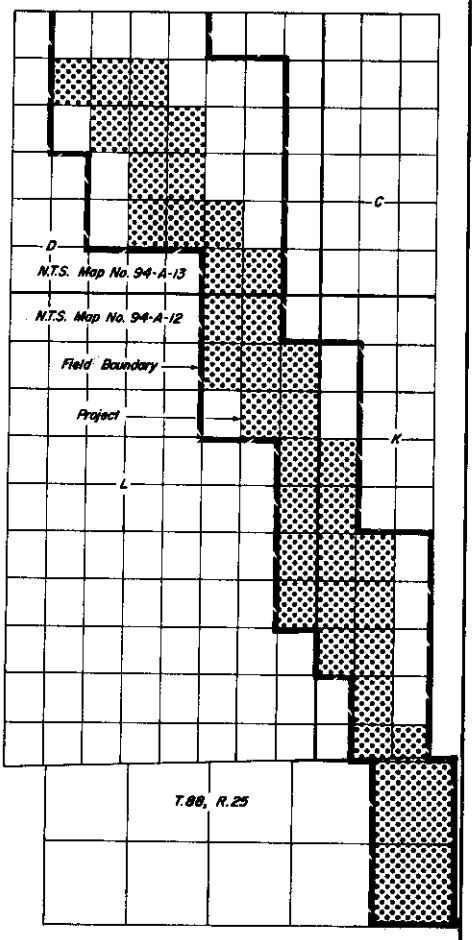
[1] Revised to 2,547. [2] Revised to 1,448. [3] Not available.



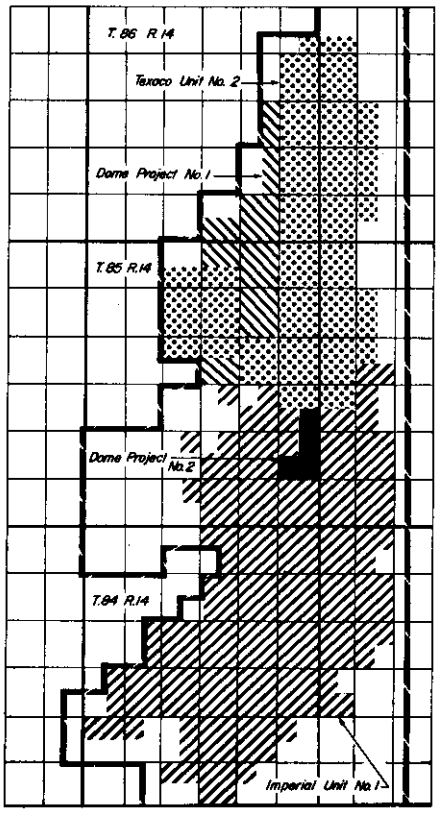
PLAN 1
UNION OIL PROJECT
GETHING ZONE
AITKEN CREEK FLD.



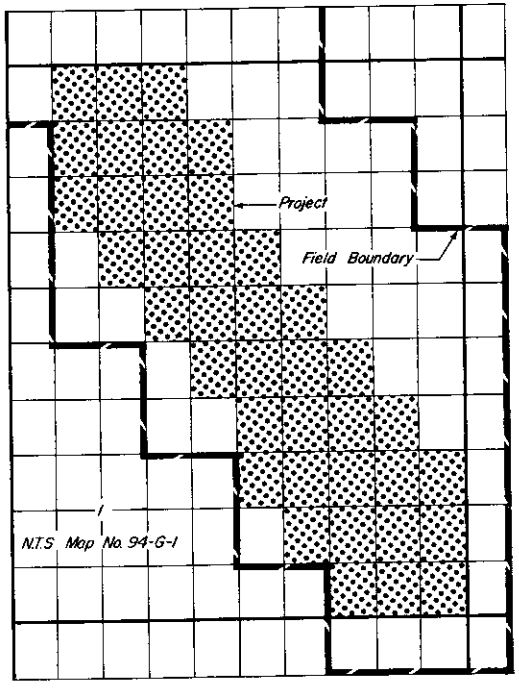
PLAN 2
TRIAD OIL PROJECT
HALFWAY ZONE
BEATTON RIVER FLD.



PLAN 3
PACIFIC PETROLEUMS PROJECT
MISSISSIPPIAN ZONE
BLUEBERRY FLD.

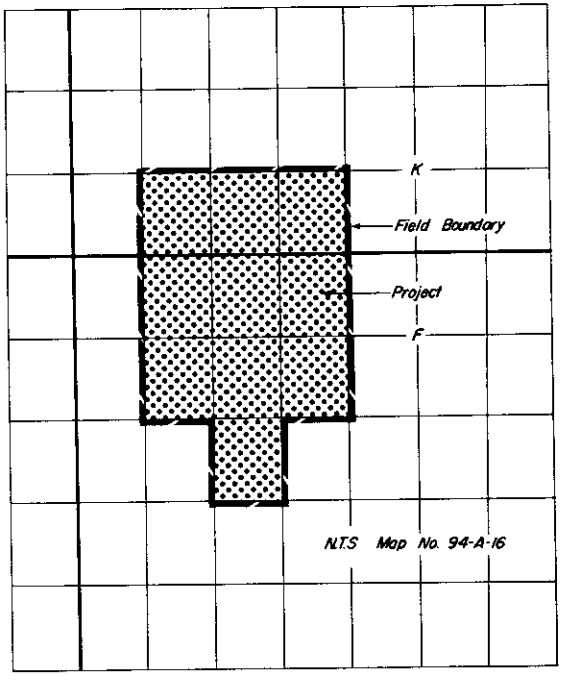


PLAN 4
BOUNDARY LAKE ZONE PROJECTS
BOUNDARY LAKE FLD.



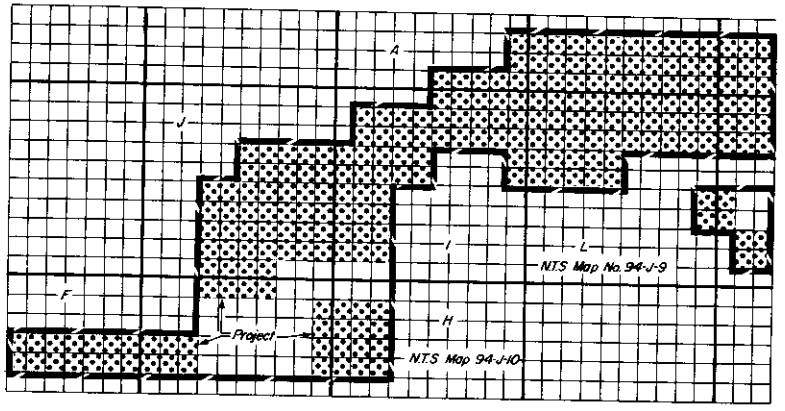
PLAN 5

PACIFIC PETROLEUMS PROJECT
BALDONNEL ZONE
BUBBLES FLD.



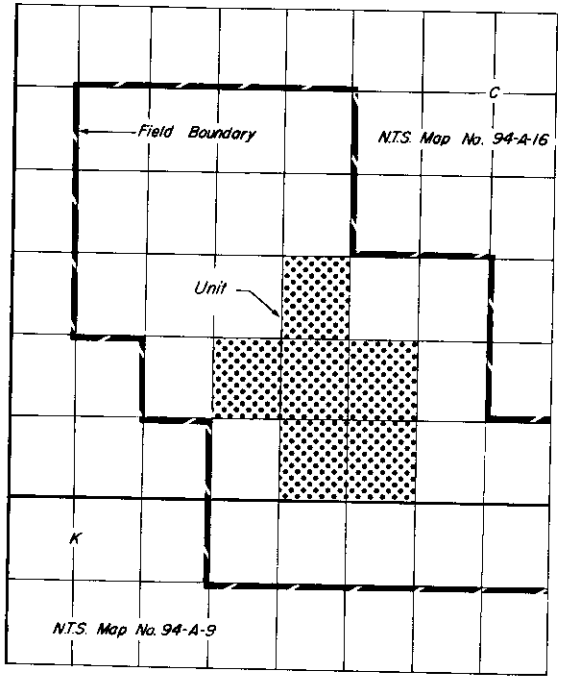
PLAN 6

UNION OIL PROJECT
HALFWAY ZONE
BULRUSH FLD



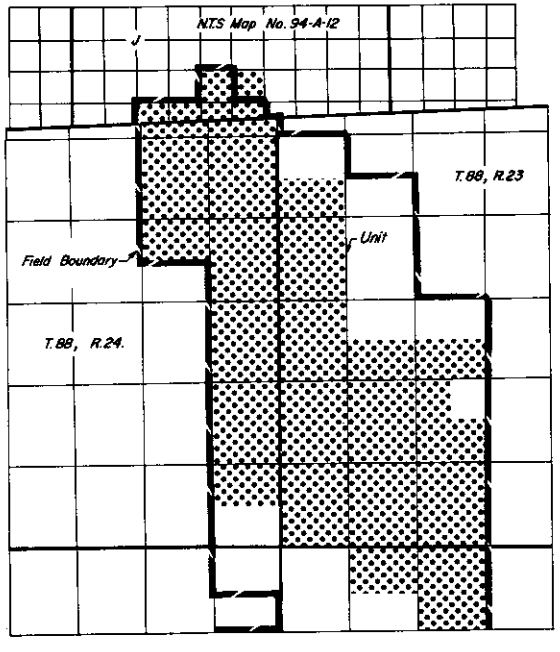
PLAN 7

PACIFIC PETROLEUMS PROJECT
SLAVE PT. ZONE
CLARKE LAKE AND CLARKE LAKE SOUTH FLDS.

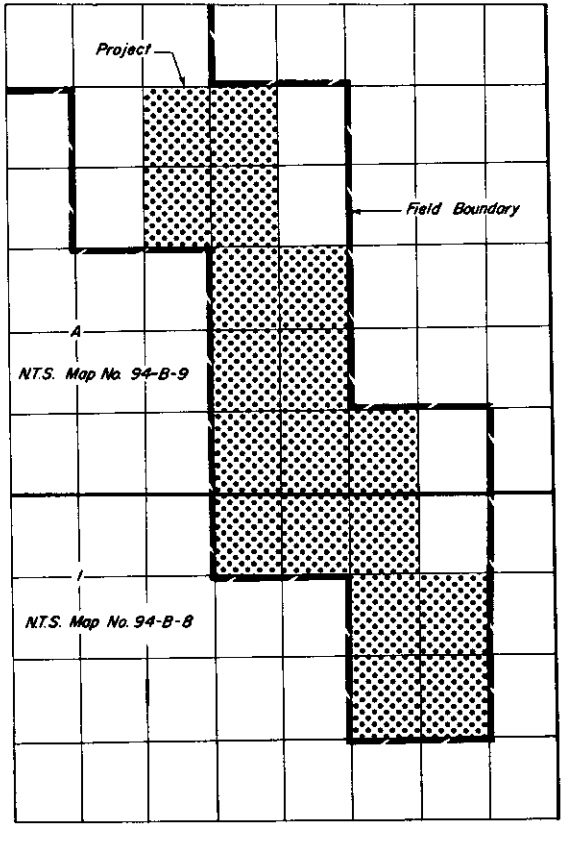


PLAN 8

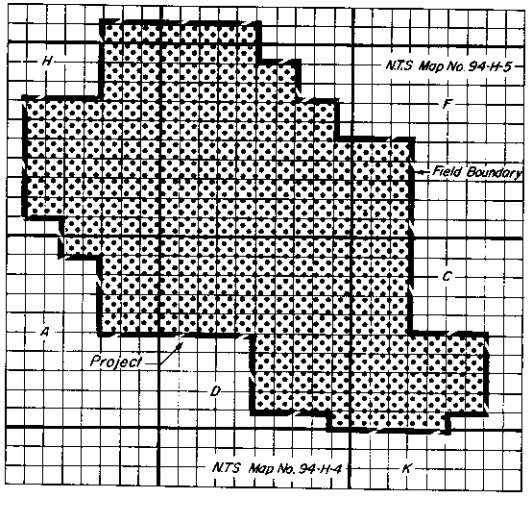
PACIFIC PETROLEUMS UNIT I
HALFWAY ZONE
CURRANT FLD.



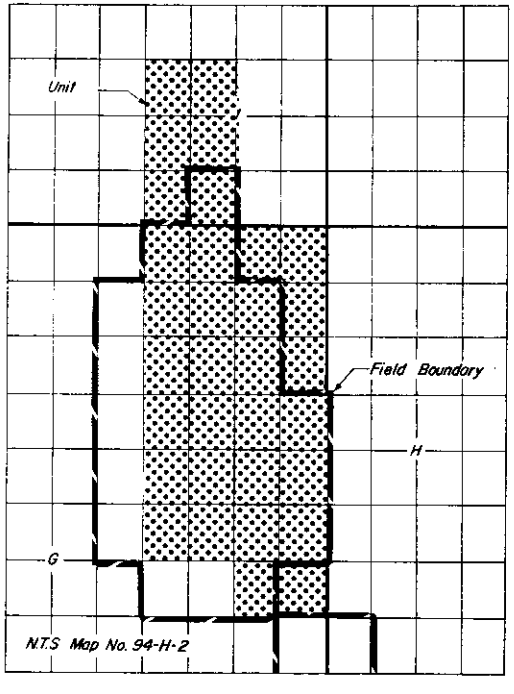
PLAN 9
CANADIAN SUPERIOR OIL UNIT I
INGA SAND ZONE
INGA FLD.



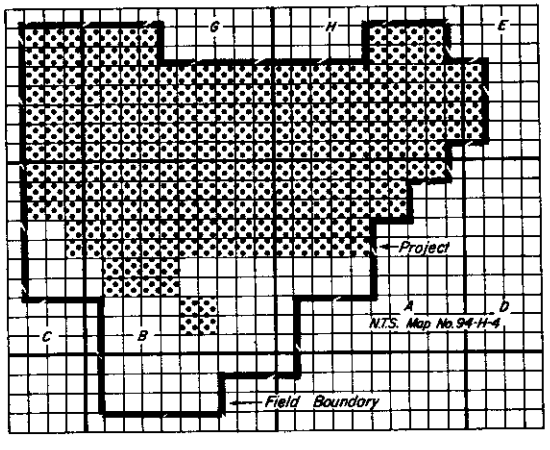
PLAN 10
PACIFIC PETROLEUMS PROJECT
HALFWAY ZONE
KOBES-TOWNSEND FLD.



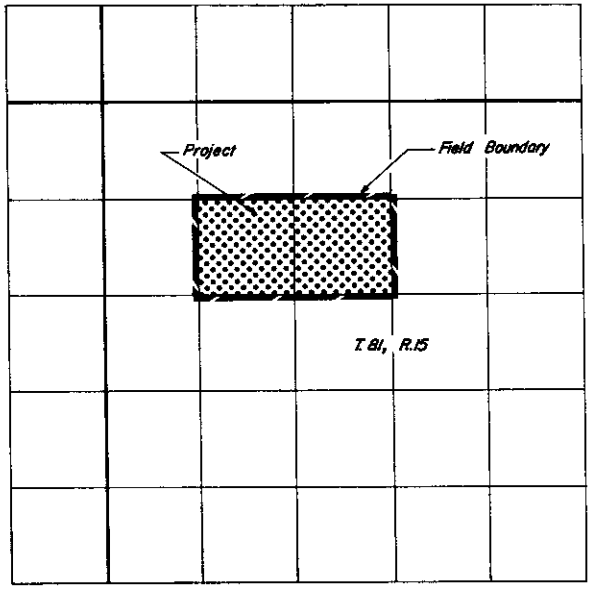
PLAN 11
BALDONNEL POOL PROJECT
LAPRISE CREEK FLD.



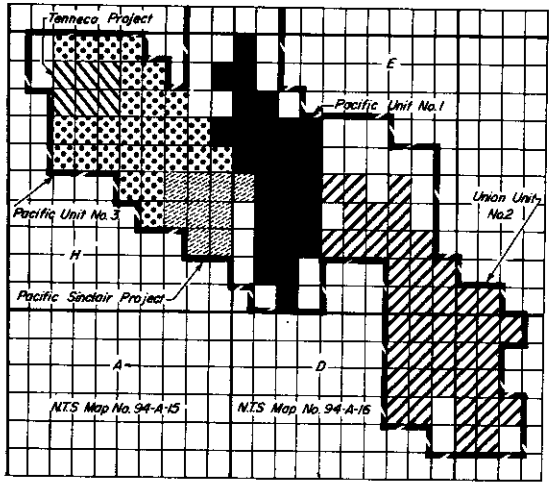
PLAN 12
UNION OIL UNIT NUMBER 1
HALFWAY ZONE
MILLIGAN CREEK FLD.



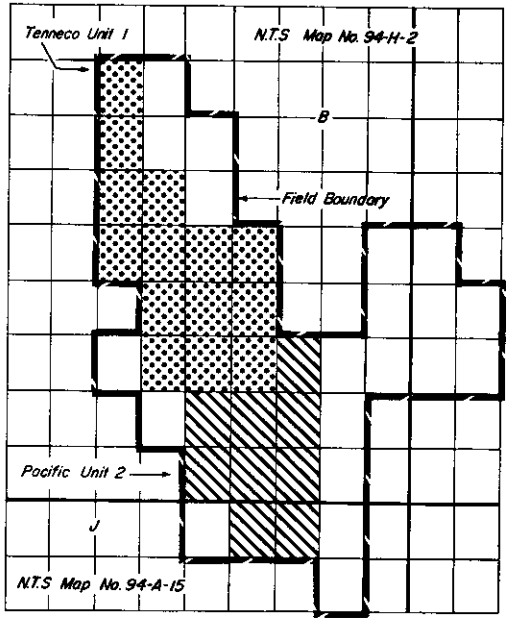
PLAN 13
TEXACO EXPLORATION PROJECT
BALDONNEL ZONE·
NIG CREEK FLD.



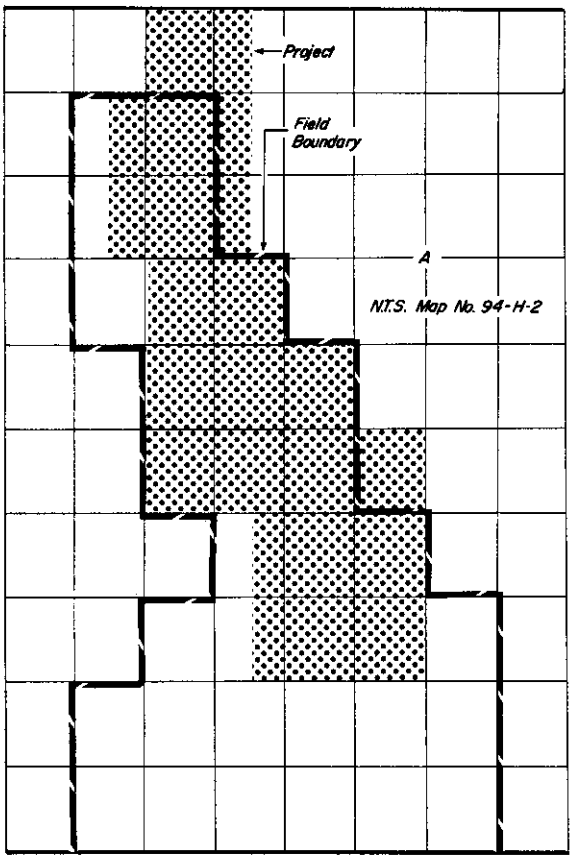
PLAN 14
PACIFIC PETROLEUMS PROJECT
WABAMUN ZONE
PARKLAND FLD.



PLAN 15
HALFWAY ZONE PROJECTS
PEEJAY FLD.



PLAN 16
HALFWAY ZONE UNITS
WEASEL FLD.



PLAN 17
UNION OIL PROJECT
HALFWAY ZONE
WILDMINT FLD.

In early April it appeared probable that light crude oil produced in British Columbia would be subject to prorationing to market demand. Consequently, in conjunction with an industry committee, prorationing factors were derived for all oil wells in the Province. However, prorationing was avoided and the factors were never put into effect.

Gas Allowables and Well Tests

The " daily gas allowables " or production rate limits (P.R.L.s) for gas wells in the Province are established from the results of absolute open-flow potential (A.O.F.) tests. These tests are witnessed by Branch field personnel and the data collected are interpreted by the Reservoir Engineering Section to establish P.R.L.s. Under the regulations in force during 1968, producing gas wells were required to be A.O.F. tested annually, and a total of 271 tests was run during the year.

Restriction of individual well production rates has not been deemed necessary in some gas pools, and in these cases either Project Allowables have been issued, or the pools' operators have approval to produce according to " Good Engineering Practice " (G.E.P.). Table 18 presents A.O.F. test data, individual well P.R.L.s, Project Allowables, and G.E.P. schemes in effect at December 31, 1968. The areas included in the various Project Allowable and G.E.P. schemes are shown on Plans 5, 7, 10, 11, 13, and 14.

In recent years the Reservoir Engineering Section has sent an A.O.F. testing schedule to all operators. The purpose was to ensure that reservoir pressure determinations within a pool were co-ordinated, in order to obtain meaningful performance data. The proposed 1968 schedule was sent out on April 19th. Procedures for A.O.F. testing of wells in British Columbia have been established for a number of years, and operators have been advised by means of memoranda. During 1968, modifications to these procedures and requirements were made in three gas pools, at the request of operators and in anticipation of forthcoming changes in regulations, testing procedures, and test requirements. An alternative to a standard A.O.F. test was approved in the Laprise Creek Baldonnel and Clarke Lake Slave Point G.E.P. projects. This alternative test comprised a wellhead deliverability test followed by a shut-in pressure build-up test. The additional option of testing by the modified isochronal method was approved in the case of wells producing from the Rigel Dunlevy gas pool, with the proviso that, where this method was adopted, P.R.L.s were to be calculated from data pertaining to a four-hour flow at the maximum test rate.

In October an application was received from Champlin Petroleum Company for reclassification of the well located at 10-5-83-16 W6M from oil well to gas well. A study of the reservoir and well characteristics was made by the Section, from which it was concluded that conservation would benefit from such a change in classification, and that equity matters would not be a complicating factor. The request was therefore granted, subject to certain conditions.

A review of the possible extent of the Baldonnel gas reservoir in the Inga field was started toward year-end, with the bulk of the work being done by the Geological Section. This study was occasioned by the completion during the year of three Baldonnel gas wells in the vicinity of a Baldonnel oil well located at 7-16-86-23 W6M. The purpose of the work was to determine whether the gas accumulation was in communication with the oil; no conclusions had been reached by December 31st. Consequently, P.R.L.s were not issued for the gas wells, pending completion of the study.

In December an application was received from Amarillo Oil Company for enlargement of the Jeans West field, and for approval to produce gas from the Inga

Sand reservoir in the field. The Reservoir Engineering and Geological Sections had already commenced a joint study of the available data, in order to resolve the question of whether or not the gas accumulation was a gas cap to the Inga Sand oil reservoir in the nearby Inga field. In order to assist in this study, it was requested that additional reservoir pressure data be obtained. By December 31st the study was still incomplete, although Amarillo's application had been advertised in the Gazette on December 24th.

Three applications for production of gas pools under Good Engineering Practice were received during 1968. The first of these was a joint submission by Pacific Petroleums Ltd. and Dome Petroleum Ltd., covering all Baldonnel Zone gas wells in the Laprise Creek field. This application was dated coincidentally with the approval granted to Dome, as operator of the Baldonnel Unit 1 in this field, for a revised Project Allowable to become effective on January 1, 1968. After clarification from the operators involved, the joint submission was advertised in the Gazette on January 25th and February 1st. Production of all Baldonnel Zone gas wells in accordance with Good Engineering Practice was subsequently approved, effective March 1st.

An application was received from Pacific Petroleums Ltd. for approval of production by Good Engineering Practice of Slave Point gas wells in the Clarke Lake and Clarke Lake South fields. The submission was advertised in the Gazette on April 25th and May 2nd, and elicited comment from Marathon Oil Company. Basically, no objection was raised against the principle involved, but a request was made that all wells offsetting a Marathon-operated well in the field be restricted to rates consistent with the normal P.R.L. In the meantime, a study by the Reservoir Engineering Section, into the reservoir and producing characteristics of the pools involved, led to the conclusion that a Project Allowable would best serve the interests of conservation and equity. Accordingly, effective June 1st, a Project Allowable of 400 million standard cubic feet per day was granted for wells in certain areas of the Clarke Lake and Clarke Lake South fields, as shown on Plan 7.

Imperial Oil Ltd. applied for approval of production by Good Engineering Practice of Dunlevy gas wells in the Rigel field. The disposition of the application had not been finalized by December 31st, pending resolution of some apparent problems regarding equity between operators. The submission was advertised in the Gazette on November 7th and 14th.

Reserves

Estimates of the Provincial reserves of crude-oil, natural gas, and natural-gas by-products, as of December 31, 1968, are presented in Table 19. It is apparent that moderate decreases are recorded in proved oil and established raw and residue gas reserves, when compared with estimates made as of December 31, 1967. This is mainly the result of a major review and normalization of reserves estimates undertaken during the year. Concurrent with this, changes in internal procedures were implemented. Under these the Geological Section are assigned major responsibility for determination of net-pay parameters and calculation of reservoir volumes. The Reservoir Engineering Section assists in this phase to the extent of consulting on defining limits of effective pay and advising on methods to be used in water saturation estimates. The finalized reserve estimates are then prepared by the Reservoir Engineering Section, using appropriate fluid properties and recovery factor estimates.

The proved oil reserves in British Columbia at December 31, 1968, are estimated to be 273 million stock tank barrels. This is 23.5 million stock tank barrels

less than the estimate for December 31, 1967. Of this decrease, 22.1 million stock tank barrels is production during 1968, and the remaining 1.4 million stock tank barrels is due to the net effect of revisions to previous estimates and additions occasioned by drilling during 1968.

The probable oil reserves are estimated at 99.4 million stock tank barrels as of December 31, 1968. This is significantly larger than the estimate made at December 31, 1967, due to a change in definition. Previously, probable reserves have been essentially proved reserves on undrilled acreage. The present estimate, however, includes reserves attributable to probable increases in ultimate recovery from pools under improved recovery schemes or for which such schemes are likely. Some 90 per cent of the probable reserves falls into this category.

Natural-gas and gas by-products reserves shown in Table 19 are " established " reserves, which comprise proved reserves plus a percentage (usually 50 per cent) of probable. The established raw-gas reserves at December 31, 1968, are estimated to be 8.6 trillion standard cubic feet. Adjustment for removal of liquid hydrocarbons and acid gases results in established residue gas reserves of 7.5 trillion standard cubic feet, or 7.8 trillion standard cubic feet when converted to a standard heat content of 1,000 B.T.U. per standard cubic foot. It is apparent from the data presented in Table 19 that additions to reserves due to drilling during 1968 are offset by net reductions due to revisions to previous estimates. As a result, the December 31, 1968, reserves estimates are less than the December 31, 1967, estimates by approximately the volume of gas produced during 1968. Established natural-gas liquids and sulphur reserves estimates at December 31, 1968, are slightly larger than the 1967 estimates and stand at 118.5 million stock tank barrels and 2.8 million long tons respectively. It should be noted that these estimates are based on theoretical calculations of the volumes of these materials contained in the raw-gas reserves. Comparisons between the theoretical and actual quantities produced during 1968 are included in footnotes to Table 19.

The current estimates of oil and gas reservoir rock, fluid, and producing characteristics, are presented in Tables 20 and 21.

Miscellaneous

During the year two items were dealt with which related to measurement practices. The first involved an application by Pacific Petroleums Ltd. for modification of the produced-fluid metering requirements in the Blueberry field with respect to Debolt Zone oil production. The second involved arrangements for metering gas produced from a multiple completion Halfway-Baldonnel well operated by Champlin Petroleum Company, located at 6-9-83-16 W6M.

A proposal to dispose of salt water produced with gas in the Clarke Lake field was received from Pacific Petroleums Ltd. Approval to inject this water into the Slave Point Zone in the well located at b-69-L/94-J-9 was granted, effective May 1st.

During the year the Reservoir Engineering Section handled miscellaneous requests for information concerning reservoir and production characteristics, and in addition prepared a map showing maximum concentrations of hydrogen sulphide detected in gas produced from fields or from individual wells of other areas. This map is updated in September each year, and is available for inspection at the Charlie Lake Field Office for the benefit of personnel about to work in the field.

The Reservoir Engineering Section assisted the Development Section in planning modifications and additions to the Oil and Gas Production Report. Work is now in progress in the Development Section to implement the plans.

During the year the Reservoir Engineering Section made several miscellaneous studies in order to assist other Departmental or Government personnel. These included: making an estimate of crude-oil productive capacity in British Columbia, defining a commercial well for lease-renewal purposes under section 79 of the *Petroleum and Natural Gas Act, 1965,* and assisting with the drafting of new Drilling and Production Regulations. In addition, the Section assisted the Chief Commissioner in evaluating acreage posted periodically at Crown land sales during the year.

DEVELOPMENT SECTION

Drilling

The level of drilling activity in the Province during 1968 was similar to that of 1967. Total footage drilled, which exceeded one million feet, increased by 7 per cent, while the number of well completions decreased 4 per cent. No significant change was recorded in the type of drilling, with the following footages accomplished: development, 442,747 feet; exploratory outpost, 265,891 feet; and exploratory wildcat, 366,247 feet. The increase in the development and combined exploratory footages were 10 and 5 per cent respectively. It must be noted that the method of determining footage and number of completions was altered in 1968 to conform with the Lahee System. By the revised method, the entire footage for a well and its status are considered during the year when the drilling rig was released. If a well was continuing drilling at the year-end, the footage would be recorded in the following year or in the year that the rig was released. Previous compilations employed the actual footage made during the month or year.

The Branch well classifications were assigned during 1968 in accordance with the regulations. Reference is made to the Lahee System in the Geological Section of this report. To explain the Branch classification system, the following 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 area between development and wildcat wells. Development wells may be further classified as deep-pool or shallow-pool tests where undeveloped pools below or above the known pool are being explored.

All drilling operations, which were completed by 56 operating companies employing 54 different drilling rigs, during 1968 were confined to the northeastern corner of the Province.

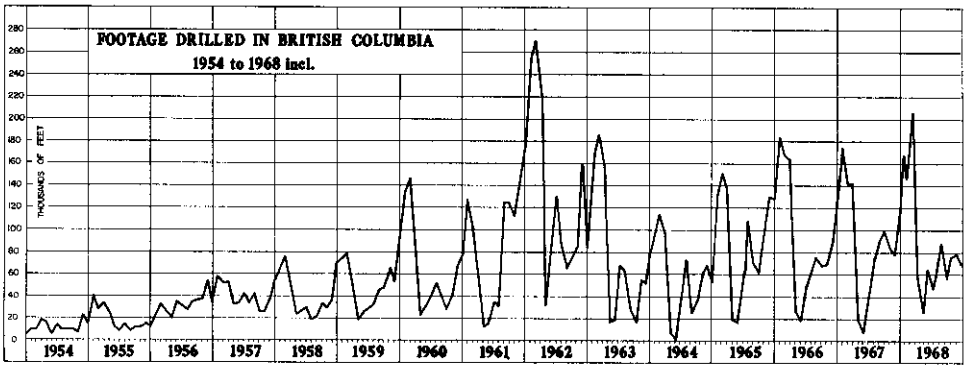


Figure 36. Footage drilled in British Columbia, 1954–68.

Well completions during 1968 were 191, a decrease of 8 compared to 1967. These consisted of 105 abandonments, 46 oil wells, 34 gas wells, 5 service wells drilled to aid production, and 1 well whose status was undetermined. At the close of the year, 16 locations were being actively drilled and two were suspended pending further drilling at a later date.

In the foregoing compilations, each zone of a multiple completion is counted as a completed well. As there was one multiple gas completion in 1968, 190 wells were actually the number drilled.

Wells drilled and drilling during 1968 are listed in Table 22. Monthly footages drilled since 1954 are given graphically on Figure 36, which reflects the seasonal fluctuations during the years caused by accessibility difficulties.

Work-overs at completed wells were performed at approximately the same volume as during 1967. Work-overs are any operation carried out after the rig-release date that changes the producing interval or alters, or intends to alter, the producing characteristics of a 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 do not include the replacement of equipment.

Six new fields were designated by the Branch in 1968, and 10 amendments were made to others. Release of information obtained during the drilling of a well is withheld on the basis of 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 1968 new fields were made at Airport, Clarke Lake South, Crush, Farrell Creek, Jeans West, and North Pine, and field boundaries were altered in Clarke Lake, Crush, Inga, Peejay, Rigel, 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 59 oil and gas fields of British Columbia are listed in Table 23 and their locations are shown on 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 180 well authorizations issued in 1968, representing a decrease of 10 per cent from 1967. No well authorizations were cancelled during the year.

FIELDS AND POOLS, DECEMBER 31, 1968			
No.	FIELD	PRODUCING HORIZON	
		OIL	GAS
1	AIRPORT		CADOMIN HALFWAY BALDONNEL
2	AITKEN CREEK	GETHING	
3	BEATTON RIVER	HALFWAY	
4	BEATTON RIVER WEST	BLUESKY-GETHING	
5	BEAVERDAM	HALFWAY	
6	BEG		BALDONNEL HALFWAY
7	BEG WEST		BALDONNEL
8	BERNADET		BLUESKY-GETHING
9	BLUEBERRY	DEBOLT	DUNLEVY BALDONNEL CHARLIE LAKE
10	BLUEBERRY EAST		BALDONNEL HALFWAY DEBOLT
11	BLUEBERRY WEST		DUNLEVY BALDONNEL
12	BOUNDARY LAKE	BOUNDARY HALFWAY	BLUESKY-GETHING GETHING DUNLEVY BALDONNEL
13	BOUNDARY LAKE NORTH		HALFWAY
14	BUBBLES		BALDONNEL
15	BUICK CREEK		DUNLEVY CHARLIE LAKE
16	BUICK CREEK EAST		BLUESKY-GETHING DUNLEVY
17	BUICK CREEK WEST	DUNLEVY	BALDONNEL HALFWAY
18	BUICK CREEK NORTH		DUNLEVY
19	BULRUSH	HALFWAY	
20	BULRUSH EAST	HALFWAY	
21	CHARLIE LAKE	GETHING	
22	CLARKE LAKE		SLAVE POINT
23	CLARKE LAKE SOUTH		SLAVE POINT
24	CRUSH	HALFWAY	
25	CURRANT	HALFWAY	HALFWAY
26	DAWSON CREEK		CADOTTE
27	FARRELL CREEK		CHARLIE LAKE HALFWAY
28	FORT ST. JOHN	CHARLIE LAKE	CADOMIN BALDONNEL HALFWAY BELLOY
29	FORT ST. JOHN S.E.		CADOMIN BALDONNEL HALFWAY BELLOY
30	GUNDY CREEK		BALDONNEL CHARLIE LAKE
31	HALFWAY	CHARLIE LAKE	BALDONNEL HALFWAY
32	HIGHWAY		DUNLEVY BALDONNEL DEBOLT
33	INGA	INGA	
34	JEANS WEST		CHARLIE LAKE
35	JEDNEY		GETHING BALDONNEL HALFWAY
36	JEDNEY WEST		BALDONNEL HALFWAY
37	KOBES-TOWNSEND		DUNLEVY CHARLIE LAKE HALFWAY DEBOLT
38	KOTCHO LAKE		SLAVE POINT
39	LAPRISE CREEK		BALDONNEL
40	LAPRISE CREEK WEST		BALDONNEL
41	MILLIGAN CREEK	HALFWAY	
42	MONTNEY		BLUESKY-GETHING CHARLIE LAKE HALFWAY
43	NETTLE	BLUESKY-GETHING	HALFWAY
44	NIG CREEK		BALDONNEL
45	NORTH PINE		CHARLIE LAKE
46	OSPREY	HALFWAY	
47	PARKLAND		WABAMUN
48	PEEJAY	HALFWAY	
49	PEEJAY WEST	HALFWAY	
50	PETITOT RIVER		SLAVE POINT
51	RED CREEK		CHARLIE LAKE HALFWAY
52	RIGEL		DUNLEVY
53	STODDART		BELLOY
54	STODDART WEST		BELLOY
55	WEASEL	BLUESKY-GETHING	
56	WILDMINT	HALFWAY	
57	WILLOW	HALFWAY	BLUESKY-GETHING
58	WOLF	HALFWAY	
59	YOYO		SLAVE PT.-PINE PT.

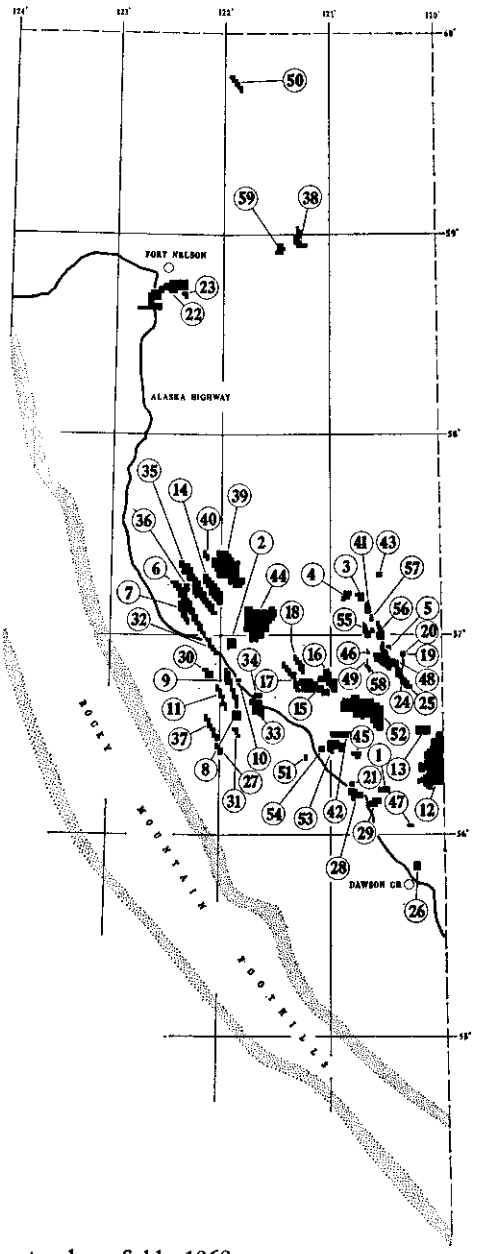


Figure 37. Petroleum and natural-gas fields, 1968.

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 six water-disposal wells situated in the producing areas. During 1968 there were 1,465,205 barrels injected into subsurface formations and 701,860 barrels delivered to flare pits for disposal by evaporation.

Water-flood operations to enhance the production of oil continued to expand in 1968. A total of 44,051,910 barrels, including both formation and salt water, was injected into seven producing pools in the Province.

PRODUCTION

Production of crude oil and natural gas in British Columbia during 1968 significantly increased compared to 1967. Crude-oil production was up 13 per cent to 22,151,353 barrels and natural-gas production increased 14 per cent to 280,462,773 M s.c.f.

The Boundary Lake field, with 239 wells producing at year-end, was again the largest oil-producer at 7,807,936 barrels. Peejay at 5,458,180 barrels, Milligan Creek at 3,469,743 barrels, and Inga at 1,647,144 barrels were the next-largest producing fields. Production from the Inga field doubled that of 1967 and was the area of greatest development during 1968. Fields which recorded moderate declines in production were Blueberry, Rigel, Weasel, and Wildmint.

In natural-gas production, all established fields, except Clarke Lake, Fort St. John, Fort St. John Southeast, Nig Creek, and Stoddart reported decreased production. The major change in gas production over 1967 totals was the 50 per cent increase in deliveries from the Clarke Lake field. Another significant change was the initial production obtained from the Kotcho Lake and Yoyo fields. These northern fields contributed more than 40 per cent of the Provincial total. The largest producing fields, in order of volumes, were Clarke Lake at 103,605,080 M s.c.f., Laprise at 26,857,891 M s.c.f., Nig Creek at 20,260,890 M s.c.f., Jedney at 19,106,079 M s.c.f., and Rigel at 14,807,814 M s.c.f.

Monthly crude-oil and natural-gas production by fields and pools for 1968 are given in Tables 25 and 26.

Graphs of the monthly production for 1954 to 1968 are shown in Figures 38 and 39.

Only minimal changes were noted in the 1968 production of butane, propane, and sulphur, compared to 1967.

General statistics showing well operation and production data are given in Table 27. The monthly dispositions of the various petroleum products are shown in Tables 28, 29, and 30. Monthly values to the producers are given in Table 31.

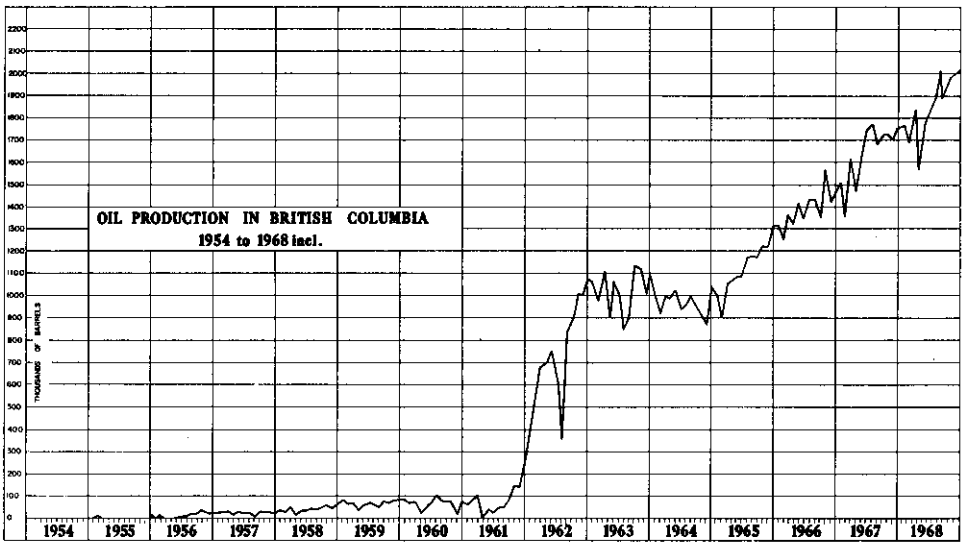


Figure 38. Oil production in British Columbia, 1954–68.

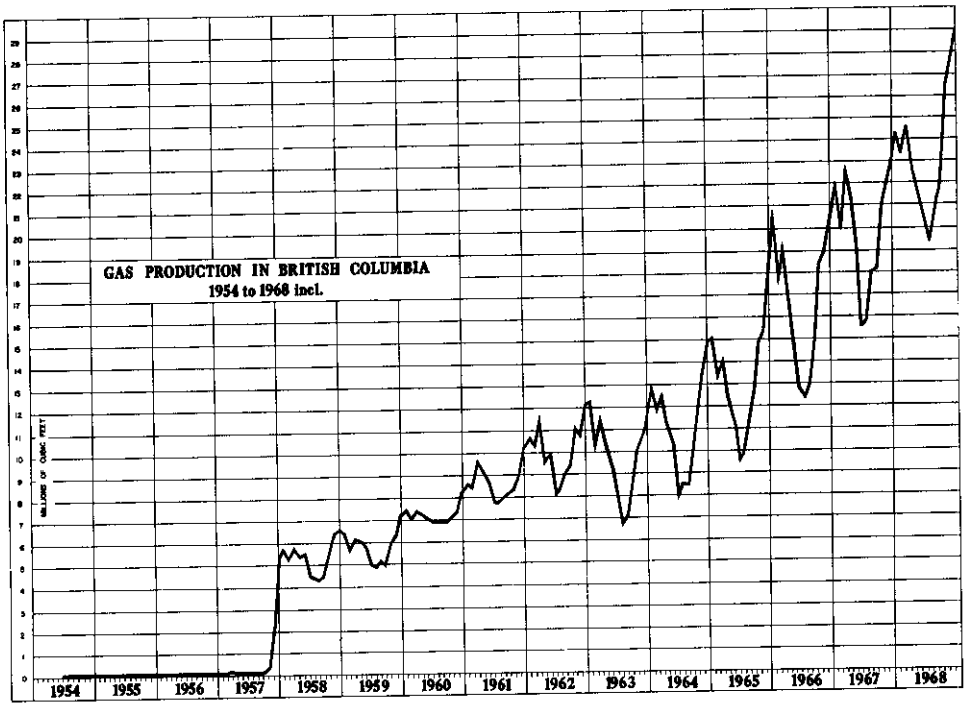


Figure 39. Gas production in British Columbia, 1954–68.

PIPE-LINES

Oil-gathering System

Throughput volumes for all pipe-lines gathering oil in British Columbia were increased during 1968.

Oil-transmission System

The number of barrels per day carried by the Western Pacific Products and Crude Oil Pipelines Ltd. was increased from 48,762 in 1967 to 54,668 in 1968.

Gas-gathering System

During 1968, the pipe-line connecting the Kotcho Lake and Yoyo fields to the Westcoast Transmission System was put into operation and greatly increased the gas volumes available from the Fort Nelson region. Other gas-gathering pipe-lines operated by Westcoast Transmission Co. Ltd. were extended and capacities were increased.

Gas-transmission System

Although extensions were made to all gas-transmission systems in the Province, the most significant installation was completion of the pipe-line to serve communities and industries between Summit Lake and Prince Rupert.

Gas-distribution System

Further expansions were completed to the Provincial gas-distribution systems during 1968. British Columbia Hydro and Power Authority, Columbia Natural Gas Ltd., Inland Natural Gas Co. Ltd., and Plains Western Gas & Electric Co. Ltd. added appreciably to their distribution networks, while Pacific Northern Gas Ltd. commenced service in the area west of Prince George.

Plate IX. Helicopter stringing pipe along the Pacific Northern Gas right-of-way. (Courtesy of Westcoast Transmission Co. Ltd.)

Oil Refineries

Expansions were completed at the Imperial Oil and Pacific Petroleums refineries, boosting the Provincial crude-oil capacity to 111,700 barrels per calendar year and the cracking capacity to 37,780 barrels per calendar year. The storage capacities were increased at four refineries, bringing the total to 10,859,700 barrels.

Gas-processing Plants

A substantial increase in capacity was completed at the Westcoast Transmission Co. Ltd. Clarke Lake plant during 1968.

Sulphur Plants

No changes were made at the sulphur plant located at Taylor.

Tables 32, 33, 34, 35, and 36 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.

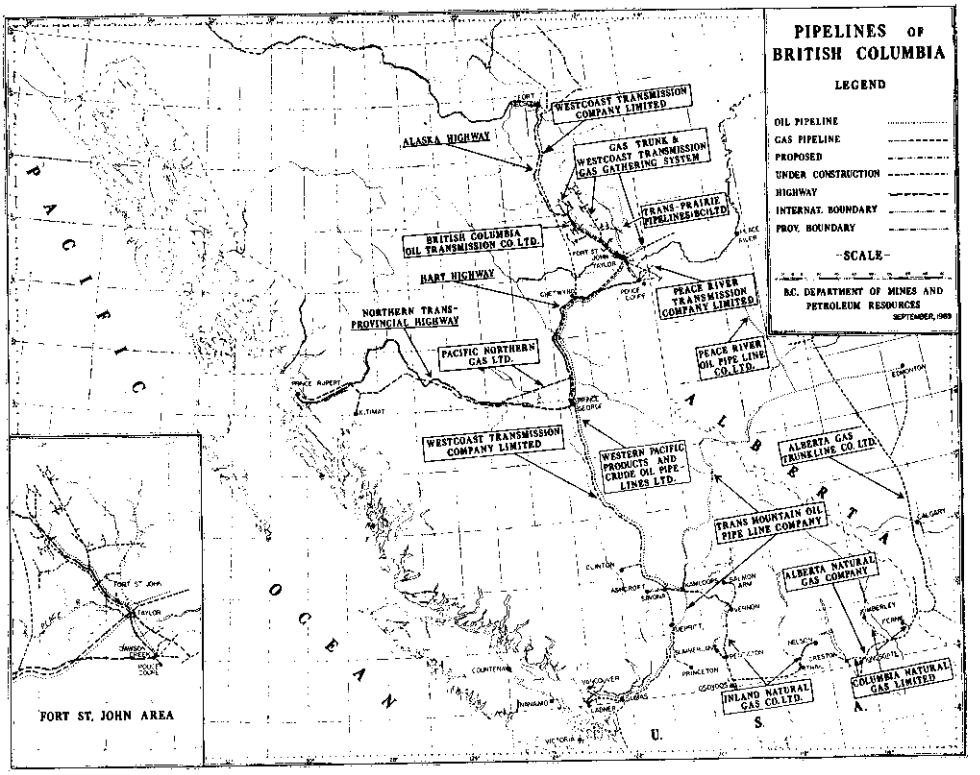


Figure 40. Petroleum and natural-gas pipe-lines.

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 1968, 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.
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 1968. 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 1968 a composite volume was compiled giving all non-confidential well information to 8 a.m., January 1, 1968. The data contained in previously published volumes were consolidated and expanded to include the releasable information for the 1967 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, British Columbia.

TABLE 15.—GEOPHYSICAL EXPLORATION, 1968

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 Survey	Number of Seismic Crews	Number of Crew-weeks
January			
Alcon Petroleums Ltd.	94-I-11, -12	1	1.5
Amerada Petroleum Corporation	94-O-6, -7, -11	1	4
Atlantic Richfield Company	94-I-10, -15, -16; 94-P-1, -2	1	4
Canadian Fina Oil Ltd.	94-G-16	1	3.4
Canadian Pacific Oil & Gas Ltd.	94-A-1, -2	1	4
French Petroleum Company of Canada	94-O-5, -6	1	3.5
Imperial Oil Enterprises Ltd.	94-J-9, -10	1	4
Pacific Petroleums Ltd.	94-P-3, -4, -5	1	1.4
	94-I-12	1	3
	94-G-10	1	1
	94-P-6, -7, -14	1	3
	94-P-1, -8; 94-I-9, -10, -15, -16	1	3
Pan American Petroleum Corp.	94-P-15	1	1.3
	94-I-1	1	0.2
	94-I-6	1	1.0
	Tp. 77, 78, R. 16, 17, W. of 6th M.	1	1.0
Texaco N.F.A.	94-I-6, -7, -9, -16	1	2
Tenneco Oil & Minerals Ltd.	94-P-2; 94-I-15	1	3.7
Union Oil Company of Canada Ltd.	94-I-4, -5; 94-J-1, -8	1	4.5
Western Decalta Petroleums Ltd.	94-I-8	1	1
February			
Amerada Petroleum Corporation	94-O-7, -8	1	4
Atlantic Richfield Company	94-I-1, -7, -8, -9, -10	1	4
Canadian Fina Oil Ltd.	94-G-9, -16	1	1
Canadian Pacific Oil & Gas Ltd.	94-A-2; 93-P-15	1	4
Forest Oil Corporation	94-I-1, -8	1	0.6
	94-O-3; 94-J-14	1	0.7
	94-J-15	1	1.6
French Petroleum Company of Canada	94-O-11, -12, -13, -14	1	4
Gulf Oil Canada Ltd.	93-P	1	4
Hudson's Bay Oil & Gas Co. Ltd.	94-P-14	1	2
Monsanto Oils Ltd.	94-A-13; 94-H-4	1	2
Pacific Petroleums Ltd.	94-P-14, -15	1	4
	94-P-16	1	2
	94-P-4	1	2
	94-P-1, -8; 94-I-9, -10, -15, -16	1	4
Pan American Petroleum Corp.	94-I-1, -7	1	1.1
	94-I-10, -15	1	0.2
	94-O-9	1	0.9
Texaco N.F.A.	94-P-2, -15	1	4
Tenneco Oil & Minerals Ltd.	94-P-2, -14, -15; 94-I-10, -11, -15	1	4.3
Texaco Exploration Co.	94-O-3, -16	1	2

TABLE 15.—GEOPHYSICAL EXPLORATION, 1968—*Continued*

Seismic Surveys—Continued

Company	Location of Survey	Number of Seismic Crews	Number of Crew-weeks
March			
Amerada Petroleum Corporation	94-O-2, -7, -8	1	4
Atlantic Richfield Co.	94-I-9, -15, -16	1	3
Canadian Pacific Oil & Gas Ltd.	93-P-15	1	1
	94-P-6	1	3
French Petroleum Company of Canada	94-P-7	1	2.5
	94-O-14	1	1
Gulf Oil Canada Ltd.	93-P	1	2
Mesa Petroleum Co.	94-G-8	1	2
Northern Oil Explorers Ltd.	94-O-2, -7, -10	1	3
Pacific Petroleums Ltd.	94-P-1, -8; 94-I-9, -10, -15, -16	1	2
	94-P-14, -15	1	1
	94-J-1	1	1
Pan American Petroleum Corp.	94-O-1, -8, -9; 94-D-4; 94-P-5	1	1.8
	94-I-6, -7, -10	1	1.3
Sinclair Canada Oil Company	94-P-10, -11	1	3
Tenneco Oil & Minerals Ltd.	94-I-10, -11, -13, -14	1	2.8
Texaco Exploration	94-O-15, -16	1	4
Texaco N.F.A.	94-P-1, -16; 94-I-6, -7, -10, -11	1	4
April			
Northern Oil Explorers Ltd.	94-O-2, -7, -10	1	2
Texaco N.F.A.	94-I-7	1	1
May			
Canadian Pacific Oil & Gas Ltd.	93-P-15, -16	1	1
June			
Canadian Pacific Oil & Gas Ltd.	93-P-15, -16; 94-A-1	1	4
July			
Pan American Petroleum Corp.	94-N-16	1	2
	93-P-10	1	3
August			
Pan American Petroleum Corp.	93-P-10	1	3
September			
French Petroleum Company of Canada	94-N-15	1	1
Imperial Oil Enterprises Ltd.	82-G-2	1	3.4
Pan American Petroleum Corp.	93-P-10	1	2
	94-N-16	1	0.5
October			
Canadian Pacific Oil & Gas Ltd.	94-G	1	3
Imperial Oil Enterprises Ltd.	82-G-2	1	0.6
Pan American Petroleum Corp.	94-G-9, -10, -15	1	3
	94-N-16	1	0.5
	Tp. 78, 79, 80, R. 22, 23, W. of 6th M.	1	3
Shell Canada Ltd.	82-G-10	1	0.3
November			
Bow Valley Exploration	94-A-1	1	1
Canadian Pacific Oil & Gas Ltd.	94-A; 94-B	1	1
	94-G	1	2
Central-Del Rio Oils Ltd.	94-A-6	1	0.5
French Petroleum Company of Canada	93-P-15	1	2
Kilroy Canadian Oil Corporation	94-I-14	1	1
Midwest Oil Corporation	94-H-2	1	0.8
Monsanto Oils Ltd.	94-A-6	1	1
Pan American Petroleum Corp.	94-G-9, -10, -15	1	3
	Tp. 78, 79, 80, R. 22, 23, W. of 6th M.	1	3
Texas Gulf Sulphur Co.	93-O-9[1]	1[1]	2
December			
Central-Del Rio Oils Ltd.	93-P-8	1	0.5
Monsanto Oils Ltd.	94-A-8	1	1
Pacific Petroleums Ltd.	94-P-4	1	1
Pan American Petroleum Corp.	94-G-9, -10, -15	1	3
Union Oil Company of Canada Ltd.	Tp. 83, 84, R. 18, 19, W. of 6th M.	1	2

[1] Seismic refraction.

TABLE 15.—GEOPHYSICAL EXPLORATION, 1968—*Continued*

Gravity Surveys

Company	Location of Survey	Number of Crews	Number of Crew-weeks
September			
Texas Gulf Sulphur Co.	93-O-9, -10	1	2

Magnetometer Surveys

October			
Placid Oil Company	82-G-5	1	1

Aeromagnetic Surveys

Company	Location of Survey	Distance Surveyed
February		
Offshore Oil & Gas Corp. Ltd.	92-L	305 line-miles.

TABLE 16.—SURFACE GEOLOGICAL EXPLORATION, 1968

Company	Location of Survey	Number of Geologists	Two-man Party-weeks
June			
Atlantic Richfield Co.	94-N-10, -15, -16	3	3
July			
Canadian Pacific Oil & Gas Ltd.	94-J, K, N	6	9
Placid Oil Company	82-G-5	1	1
Pan American Petroleum Corp.	94-N-7	2	1.5
Dome Petroleum Ltd.	104-A	5	2.5
August			
Canadian Pacific Oil & Gas Ltd.	94-J, K, N	6	12
Dome Petroleum Ltd.	104-A	5	10
September			
Canadian Pacific Oil & Gas Ltd.	94-J, K, N	3	3
Dome Petroleum Ltd.	104-A	5	2.5
November			
Pan American Petroleum Corp.	93-B	2	1.5

TABLE 17.—PROJECT AND INDIVIDUAL WELL M.P.R. DATA AT DECEMBER 31, 1968

Field	Pool	Well or Project	Well Authorization No.	M.P.R., S.T.B./D.	Project Data							
					Reference Plan	Area (Acres)	Cumulative Injection		Number of Wells			
							M.B.W.	MM S.C.F.	Producers		Injectors	
									Oil	Gas	Water	Gas
Aitken Creek	Gething	Union project	----	874	1	1,212	----	5,443	9	3	----	1
Beatton River	Halfway	Triad et al Beatton d-41-K/94-H-2	869	Suspended.	----	----	----	----	----	----	----	----
		Triad project	----	2,270	2	1,201	11,628	----	11	----	4	----
Beatton River West	Bluesky-Gething	Triad West Beatton River d-38-K/94-H-2	538	Suspended.	----	----	----	----	----	----	----	----
		Triad West Beatton River d-39-K/94-H-2	408	47	----	----	----	----	----	----	----	----
		Triad W Beatton a-40-K/94-H-2	1604	116	----	----	----	----	----	----	----	----
		Triad West Beatton River d-48-K/94-H-2	441	Suspended.	----	----	----	----	----	----	----	----
		Triad W Beatton d-49-K/94-H-2	1327	Water injector[1].	----	----	----	----	----	----	----	----
		Triad West Beatton River d-57-K/94-H-2	515	78	----	----	----	----	----	----	----	----
		Triad W Beatton d-58-K/94-H-2	1398	30	----	----	----	----	----	----	----	----
		Triad West Beatton River d-59-K/94-H-2	512	Suspended.	----	----	----	----	----	----	----	----
		Whitehall Cdn-Sup W Beatton d-12-L/94-H-2	2014	95	----	----	----	----	----	----	----	----
		Whitehall et al W Beatton d-21-L/94-H-2	1408	104	----	----	----	----	----	----	----	----
		Whitehall Cdn-Sup W Beatton d-22-L/94-H-2	2304	75	----	----	----	----	----	----	----	----
		Pool total	----	547	----	----	4,153	----	----	----	1[1]	----
Beaverdam	Halfway	Tenn Beaverdam d-38-L/94-A-16	1653	Suspended.	----	----	----	----	----	----	----	----
Blueberry	Mississippian	Decalta Blueberry d-57-D/94-A-13	1333	97	----	----	----	----	----	----	----	----
		Pacific project	----	4,600	3	4,005	----	833	18	----	1[2]	1[1]
		Pool total	----	4,697	----	----	----	833	----	----	----	----
Boundary Lake	Cadomin	Pacific Boundary 8-15-85-14	270	79	----	----	----	----	----	----	----	----
	Boundary Lake	Imp Pac Boundary 8-32-84-13	991	Suspended.	----	----	----	----	----	----	----	----
		Decalta Boundary 14-32-85-13	361	Suspended.	----	----	----	----	----	----	----	----
		Imperial Pac Boundary 11-10-85-14	227	Suspended.	----	----	----	----	----	----	----	----
		Imp Pac Boundary 6-15-85-14	1368	134	----	----	----	----	----	----	----	----
		Texaco NFA Boundary 6-29-86-13	1720	Suspended.	----	----	----	----	----	----	----	----
		Texaco NFA Boundary 16-30-86-13	1482	20	----	----	----	----	----	----	----	----
		Dome project, 1	----	2,429	4	1,793	5,163	----	25	----	7	----
		Dome project, 2	----	733	4	652	1,732	----	6	----	2	----
		Imperial Unit 1	----	19,090	4	25,754	28,834	----	129	----	30	----
		Texaco Unit 2	----	11,221	4	14,833	20,620	----	92	----	15	----
		Pool total	----	33,627	----	----	----	----	----	----	----	----

	Halfway	Texaco NFA Boundary 8-30-85-13	1097	56	----	----	----	----	----	----	----	----
		Pacific Boundary Lake 11-14-85-14	667	101	----	----	----	----	----	----	----	----
		Sun Boundary Lake 6-23-85-14	646	83	----	----	----	----	----	----	----	----
		Amerada Boundary A6-24-85-14	1454	99	----	----	----	----	----	----	----	----
		Amerada Boundary 16-24-85-14	736	96	----	----	----	----	----	----	----	----
		Texaco NFA Boundary 16-25-85-14	1144	Suspended.	----	----	----	----	----	----	----	----
		Pool total	----	435	----	----	----	----	----	----	----	----
		Field total	----	34,141	----	----	----	----	----	----	----	----
Bulrush	Halfway	Union project	----	389	6	1,172	----	844	4	----	----	2
Bulrush East	Halfway	Dome Provo Co-op Bulrush d-5-K/94-A-16	1843	41	----	----	----	----	----	----	----	----
Charlie Lake	Gething	Imp Pac Charlie 13-5-84-18	269	Suspended.	----	----	----	----	----	----	----	----
Crush	Halfway	Union et al Crush d-28-F/94-A-16	2096	Suspended.	----	----	----	----	----	----	----	----
		Union et al Crush d-29-F/94-A-16	2288	177	----	----	----	----	----	----	----	----
		Union HB Sinclair Crush d-38-F/94-A-16	2253	29	----	----	----	----	----	----	----	----
		Union HB Sinclair Crush d-39-F/94-A-16	2214	198	----	----	----	----	----	----	----	----
		Union HB Sinc Crush d-49-F/94-A-16	2220	122	----	----	----	----	----	----	----	----
		Union HB Crush d-59-F/94-A-16	2342	201	----	----	----	----	----	----	----	----
		Union HB Crush b-68-F/94-A-16	2355	25	----	----	----	----	----	----	----	----
		Union HB Crush b-58-F/94-A-16	2364	13	----	----	----	----	----	----	----	----
		Pool total	----	765	----	----	----	----	----	----	----	----
Currant	Halfway	Union HB Currant d-28-C/94-A-16	1768	Suspended.	----	----	----	----	----	----	----	----
		Pacific Unit No. 1	----	627	8	702	414	----	6	----	1	----
Fort St. John	Charlie Lake	Pacific Ft St John 3-14-83-18 (9)	34	46	----	----	----	----	----	----	----	----
		Pacific Ft St John 10-14-83-18 (76)	214	14	----	----	----	----	----	----	----	----
		Imp Pac Ft St John 9-19-83-18 (45)	171	Suspended.	----	----	----	----	----	----	----	----
		Pacific Ft St John 1-23-83-18 (81)	225	23	----	----	----	----	----	----	----	----
		Pacific Ft St John 9-23-83-18 (78)	216	65	----	----	----	----	----	----	----	----
		Pool total	----	148	----	----	----	----	----	----	----	----
Halfway	Halfway	West Nat et al Halfway 14-11-87-25	1986	24	----	----	----	----	----	----	----	----
Inga	Baldonnel	Hunt Sands Pac Imp Inga 7-16-86-23	933	Suspended.	----	----	----	----	----	----	----	----
	Inga	Pan Am Inga 6-5-86-23	2351	102	----	----	----	----	----	----	----	----
		Murphy et al Inga 16-7-86-23	2299	53	----	----	----	----	----	----	----	----
		Pan Am Inga 6-8-86-23	2340	146	----	----	----	----	----	----	----	----
		Shenandoah et al Inga 6-17-86-23	2213	77	----	----	----	----	----	----	----	----
		Whitehall et al Inga 6-18-86-23	2407	38	----	----	----	----	----	----	----	----
		Shenandoah et al Inga 16-18-86-23	2270	37	----	----	----	----	----	----	----	----
		Pan Am Inga 6-19-86-23	2188	54	----	----	----	----	----	----	----	----
		Pan Am Inga 6-20-86-23	2251	94	----	----	----	----	----	----	----	----
		Sun Inga 6-30-86-23	2328	49	----	----	----	----	----	----	----	----
		Decalta Pem Suptst Inga 6-31-86-23	2206	Suspended.	----	----	----	----	----	----	----	----
		Murphy et al Inga 16-24-86-24	2298	44	----	----	----	----	----	----	----	----
		Whitehall CTO Inga 16-25-86-24	2224	83	----	----	----	----	----	----	----	----
		West Nat et al Inga 16-35-86-24	2166	23	----	----	----	----	----	----	----	----
		Dome Numac Inga 6-36-86-24	2198	102	----	----	----	----	----	----	----	----

[1] Suspended. [2] Disposal into Mississippian.

TABLE 17.—PROJECT AND INDIVIDUAL WELL M.P.R. DATA AT DECEMBER 31, 1968—*Continued*

Field	Pool	Well or Project	Well Authorization No.	M.P.R., S.T.B./D.	Project Data							
					Reference Plan	Area (Acres)	Cumulative Injection		Number of Wells			
							M.B.W.	MM S.C.F.	Producers		Injectors	
									Oil	Gas	Water	Gas
Inga	Inga	Tenn Inga 16-36-86-24	2151	54	----	----	----	----	----	----	----	----
		Decalta Pem Suptst Inga 6-5-87-23	2191	75	----	----	----	----	----	----	----	----
		Tenn Inga 16-6-87-23	2180	84	----	----	----	----	----	----	----	----
		Tenn Inga 6-7-87-23	2145	54	----	----	----	----	----	----	----	----
		Tenn Inga 16-7-87-23	2122	47	----	----	----	----	----	----	----	----
		Pacific Inga 6-8-87-23	2202	34	----	----	----	----	----	----	----	----
		Dome Numac Inga 6-18-87-23	2189	63	----	----	----	----	----	----	----	----
		IOE Pac Inga 6-19-87-23	2169	55	----	----	----	----	----	----	----	----
		IOE Pac Inga 16-19-87-23	2360	49	----	----	----	----	----	----	----	----
		IOE Pac Inga A6-30-87-23	2194	39	----	----	----	----	----	----	----	----
		Texaco Inga 16-13-87-24	2255	112	----	----	----	----	----	----	----	----
		Texaco Inga 16-24-87-24	2274	109	----	----	----	----	----	----	----	----
		Texaco Inga 6-25-87-24	2294	Suspended.	----	----	----	----	----	----	----	----
		Texaco Inga 16-25-87-24	2209	98	----	----	----	----	----	----	----	----
		Cdn-Sup Whitehall Inga 6-20-88-23	2393	31	----	----	----	----	----	----	----	----
		Canadian Superior Unit 1	----	4,199[3]	9	9,723	*Nil*	----	29	----	3	----
		Pool total	----	6,005	----	----	*Nil*	----	----	----	----	----
Milligan Creek	Halfway	Union HB Milligan b-65-G/94-H-2	1493	157	----	----	----	----	----	----	----	----
		Union Unit 1	----	10,000	12	2,588	24,838	3,336	21	----	8	1
		Pool total	----	10,157	----	----	24,838	3,336	----	----	----	----
Nettle	Bluesky-Gething	Union KCL ROC Nettle d-67-A/94-H-7	1321	Suspended.	----	----	----	----	----	----	----	----
		Union KCL ROC Nettle d-68-A/94-H-7	1879	74	----	----	----	----	----	----	----	----
		Union KCL ARCo Nettle d-69-A/94-H-7	2018	Suspended.	----	----	----	----	----	----	----	----
		Pool total	----	74	----	----	----	----	----	----	----	----
Nig	Baldonnel	Texaco NFA Nig d-87-A/94-H-4	2152	165	----	----	----	----	----	----	----	----
Osprey	Halfway	Baysel SR CanDel Osprey d-93-G/94-A-15	1658	Suspended.	----	----	----	----	----	----	----	----
		Baysel SR CanDel Osprey d-94-G/94-A-15	2347	19	----	----	----	----	----	----	----	----
		Pacific SR CanDel Osprey d-4-J/94-A-15	1610	49	----	----	----	----	----	----	----	----
		Pool total	----	68	----	----	----	----	----	----	----	----
Peejay	Halfway	Decalta Ranger Peejay d-51-D/94-A-16	2023	35	----	----	----	----	----	----	----	----
		Texcan Texaco Peejay d-61-D/94-A-16	1683	Suspended.	----	----	----	----	----	----	----	----

		Pacific SR CanDel Peejay d-71-H/94-A-15	1851	Suspended.								
		Pacific SR West Cdn Peejay d-33-I/94-A-15	725	5								
		Pacific Unit 1		4,430	15	3,800	9,832		23		6	
		Union Unit 2		8,229	15	5,982	9,166		34		8	
		Pacific Unit 3		5,404	15	4,380	5,929		22		7	
		Pacific Sinclair project		3,046	15	1,430	2,220		8		1	
		Tenneco project		1,806	15	1,048	1,166		5		1	
		Pool total		22,955								
Peejay West	Halfway	Pacific SR CanDel W Peejay d-44-G/94-A-15	1008	Suspended.								
		Pacific SR West Cdn W Peejay d-54-G/94-A-15	956	Suspended.								
Rigel	Dunlevy	Monsanto IOE Fina Rigel 8-18-87-16	1651	Suspended.								
		Monsanto IOE Fina Rigel 6-19-87-16	1692	117								
		Monsanto IOE Fina Rigel 11-19-87-16	1616	149								
		Monsanto Rigel 16-19-87-16	1781	71								
		Monsanto Rigel 6-13-87-17	1555	242								
		Monsanto Rigel 6-23-87-17	1942	139								
		Monsanto Rigel 6-31-87-17	1714	72								
		Pool total		790								
Stoddart	Belloy	Uno-Tex et al Stoddart 6-31-85-19	2218	58								
		Uno-Tex et al Stoddart 10-31-85-19	1519	82								
		Uno-Tex Triad Stoddart A11-5-86-19	1983	Suspended.								
		Pool total		140								
Weasel	Halfway	Pacific SR CanDel Weasel d-82-J/94-A-15	2055	178								
		Pacific Sinclair Weasel d-30-A/94-H-2	1631	297								
		Dome Provo Weasel d-2-B/94-H-2	1734	56								
		Tenneco Unit 1		2,551	16	2,128	905	1,101	11		3	1
		Pacific Unit 2		1,296[4]	16	1,053	*Nil*		(4)		(4)	
		Pacific Sinclair Weasel b-93-J/94-A-15	2349	34								
		Pacific SR CanDel Weasel d-94-J/94-A-15	1761	429								
		Dome Provo Weasel d-3-B/94-H-2	1726	78								
		Pacific SR CanDel Weasel d-4-B/94-H-2	1748	217								
		Pacific SR CanDel Weasel d-A5-B/94-H-2	1805	14								
		Pacific Sinclair Weasel d-13-B/94-H-2	1644	49								
		CanDel SR Weasel d-14-B/94-H-2	1713	221								
		CanDel SR Weasel d-15-B/94-H-2	1709	41								
		Pacific Sinclair Weasel b-23-B/94-H-2	1977	20								
		Pool total		4,185			905	1,101				
Wildmint	Halfway	Pacific SR CanDel Wildmint d-84-I/94-A-15	1566	Suspended.								
		Tenn Wildmint d-93-I/94-A-15	1947	Suspended.								
		Texcan Wildmint d-94-I/94-A-15	1289	167								
		Tenn Wildmint d-95-I/94-A-15	1191	47								
		Tenn Wildmint d-2-A/94-H-2	1211	Suspended.								

[3] This is a primary project M.P.R., since water injection had not commenced at year-end. Following start of injection, M.P.R. will be 7,064 B.O.P.D.
[4] Individual well M.P.R.s were still in effect at December 31, 1968. The project M.P.R. becomes effective following start of water injection (4 injectors).

TABLE 17.—PROJECT AND INDIVIDUAL WELL M.P.R. DATA AT DECEMBER 31, 1968—*Continued*

Field	Pool	Well or Project	Well Authorization No.	M.P.R., S.T.B./D.	Project Data							
					Reference Plan	Area (Acres)	Cumulative Injection		Number of Wells			
							M.B.W.	MM S.C.F.	Producers		Injectors	
									Oil	Gas	Water	Gas
Wildmint	Halfway	Tenn Wildmint d-5-A/94-H-2	1121	Suspended.								
		Tenn Wildmint d-6-A/94-H-2	1184	Suspended.								
		Tenn Wildmint d-7-A/94-H-2	1750	Suspended.								
		CIGOL Wildmint d-13-A/94-H-2	1567	Suspended.								
		Union HB Wildmint d-15-A/94-H-2	984	Suspended.								
		Husky Colo Wildmint d-16-A/94-H-2	1304	Suspended.								
		Husky Colo Wildmint b-23-A/94-H-2	1206	Suspended.								
		Union HB Wildmint d-26-A/94-H-2	963	Suspended.								
		Union project		3,665	17	1,708	8,150	9,479	13		4	2
		Pool total		3,879			8,150	9,479				
Willow	Bluesky-Gething	Union HB Willow d-20-H/94-H-2	449	122								
Wolf	Halfway	Pacific Sinclair Wolf d-82-B/94-A-15	1916	195								
		Baysel Sinclair Wolf b-92-B/94-A-15	1972	37								
		Baysel Sinclair Wolf d-93-B/94-A-15	1815	142								
		Frontier Pembina Wolf d-14-G/94-A-15	2062	Suspended.								
		Pool total		374								
Other areas	Bluesky-Gething	Union HB BA Ladyfern d-48-H/94-H-1	1433	Suspended.								
		Pacific et al Wargen d-37-C/94-H-6	2324	Suspended.								
	Charlie Lake	JBA Moberly 10-15-82-22	2019	58								
		Monsanto Bear Flat 7-16-84-20	2352	63								
		Texaco N Pine 6-15-85-18	2264	50								
		Pool total		171								
	Inga	Murphy Pembina Inga 16-31-85-23	2404	95								
		Murphy et al Inga 16-6-86-23	2395	67								
		Pool total		162								
	Halfway	Pacific SR CanDel Ptarmigan d-90-I/94-A-15	1531	Suspended.								
		Union et al Spruce d-62-E/94-A-16	2323	Suspended.								
		Tenn Cdn Sup Bulrush d-65-F/94-A-16	1869	Suspended.								
		Cankee Terrebonne Woodrush d-47-H/94-H-2	1840	Suspended.								
		Other areas total		333								

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Airport—							
Cadomin	Pacific Airport 8-32-83-17	27	7-68	1,316	0.753	762	2,000
Baldonnel	Pacific Airport 9-32-83-17	287	7-68	1,168	0.500	1,855	Suspended.
Halfway	Pacific Airport 12-34-83-17	35	7-57	1,796	1.000	1,400	Suspended.
Field total		-----	-----	-----	-----	-----	2,000
Beg—							
Baldonnel	Pacific Imperial Beg c-24-B/94-G-1	1359	5-65	1,505	0.500	1,400	Suspended.
	Pacific Imperial Beg d-35-B/94-G-1	1154	7-68	1,241	0.500	2,239	2,000
	Pacific Imperial Beg d-46-B/94-G-1	806	7-68	1,252	0.500	2,033	2,000
	Pacific Imperial Beg d-57-B/94-G-1	1095	5-65	1,650	0.860	2,680	Suspended.
	Pacific et al Beg a-21-F/94-G-1	711	7-65	1,632	0.500	658	Suspended.
	Pacific et al Beg b-42-F/94-G-1	748	12-66	1,524	0.925	1,535	Suspended.
	Pacific et al Beg d-64-F/94-G-1	733	7-68	1,294	1.000	4,951	2,000
	Pacific et al Beg b-84-F/94-G-1	741	7-68	1,381	1.000	3,961	2,000
	Pacific et al Beg b-95-F/94-G-1	747	7-68	1,263	1.000	4,037	2,000
	Pacific et al Beg d-10-G/94-G-1	541	8-68	1,220	1.000	2,952	2,000
	Pacific et al Beg b-6-K/94-G-1	740	7-68	1,381	1.000	2,197	2,000
	Pacific et al Beg b-17-K/94-G-1	539	7-68	1,274	0.661	3,943	2,000
	Pacific et al Beg a-28-K/94-G-1	749	7-68	1,408	0.500	3,415	2,000
	Pacific et al Beg b-59-K/94-G-1	786	-----	-----	-----	-----	-----
	Pacific et al Beg b-82-L/94-G-1	1132	8-68	1,073	0.577	1,897	2,000
	Pacific Pan Am Dome Beg a-4-D/94-G-8	766	8-68	908	0.625	15,600	4,533
	Pacific Pan Am Dome Beg d-15-D/94-G-8	855	6-63	1,332	0.600	3,600	Suspended.
Baldonnel total		-----	-----	-----	-----	-----	24,533
Halfway	Richfield Sohio Beg d-13-B/94-G-1	1268	9-68	955	0.500	5,400	2,000
	Pacific Imperial Beg c-24-B/94-G-1	1359	7-68	1,169	0.500	3,995	2,000
	Pacific Imperial Beg d-35-B/94-G-1	1154	7-68	1,096	0.725	6,332	2,001
	Pacific Imperial Beg d-46-B/94-G-1	806	7-68	1,126	0.725	8,577	2,690
	Pacific Imperial Beg d-57-B/94-G-1	1095	7-68	1,223	0.550	11,800	3,076
	Richfield Sohio Beg d-77-B/94-G1	1233	11-63	1,816	0.537	2,030	Suspended.
	Pacific et al Beg b-88-B/94-G-1	1350	8-68	1,280	0.610	5,224	2,000
	Pacific et al Beg b-A99-B/94-G-1	739	7-68	1,031	0.664	3,614	2,000
	Pacific et al Beg a-21-F/94-G-1	711	8-68	1,239	0.500	4,088	2,000
	Pacific et al Beg b-42-F/94-G-1	748	8-61	1,536	0.842	2,100	Suspended.
	Pacific et al Beg d-64-F/94-G-1	733	7-68	933	1.000	4,208	2,000
	Pacific et al Beg b-84-F/94-G-1	741	7-68	1,092	0.508	1,918	2,000
	Pacific et al Beg b-95-F/94-G-1	747	7-68	1,107	0.500	2,459	2,000
	Pacific et al Beg d-10-G/94-G-1	541	8-68	1,161	0.531	5,929	2,000

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Buick Creek—*Continued*							
Dunlevy	Texaco NFA Buick Creek c-79-J/94-A-11	110	6-68	609	0.700	2,355	2,000
	Texaco NFA Buick Creek d-83-J/94-A-11	96	9-68	475	0.839	11,600	5,670
	Texaco NFA Buick d-93-J/94-A-11	728	5-68	495	0.965	9,000	5,234
	Texaco NFA Buick Creek c-10-A/94-A-14	65	5-68	932	0.506	187	2,000
	Pacific Buick Creek b-4-B/94-A-14	457	6-68	714	0.931	2,234	2,000
	Texaco NFA Buick b-10-B/94-A-14	1179	6-68	689	0.862	1,475	2,000
	Pacific Buick Creek c-14-B/94-A-14	469	6-68	769	0.869	2,191	2,000
	Sun Buick c-16-B/94-A-14	744	6-68	820	0.767	2,240	2,000
	Sun Buick d-19-B/94-A-14	756	6-68	736	1.000	2,300	2,000
	Texaco NFA Buick c-40-B/94-A-14	1213	6-68	718	0.940	620	2,000
	Sun Buick d-11-C/94-A-14	818	6-68	689	0.900	7,900	3,282
	Sun et al Buick c-32-C/94-A-14	1360	6-68	600	0.966	15,400	7,053
Dunlevy total		----	----	----	----	----	46,380
Charlie Lake	Texaco NFA Buick Creek d-83-J/94-A-11	96	6-66	490	0.700	1,500	Suspended.
Field total		----	----	----	----	----	46,380
Buick Creek East—							
Bluesky-Gething	Texaco NFA E Buick d-98-L/94-A-10	1088	----	----	----	----	----
Dunlevy	Texaco NFA E Buick c-80-D/94-A-15	1087	7-66	1,045	0.500	750	Suspended.
	Texaco NFA E Buick c-98-L/94-A-10	1088	8-68	851	0.560	1,375	2,000
	Texaco NFA E Buick a-31-A/94-A-14	295	8-68	929	0.595	16,600	4,420
	Whitehall E Buick c-34-A/94-A-14	1336	7-68	721	0.712	1,540	2,000
	Texaco NFA E Buick b-A46-A/94-A-14	1508	8-68	752	0.630	490	2,000
	Whitehall E Buick b-62-A/94-A-14	1303	7-68	928	1.000	3,900	2,000
	Texaco NFA E Buick d-93-A/94-A-14	1346	10-68	1,212	0.694	4,000	2,000
	Mic Mac et al E Buick d-17-D/94-A-15	1286	9-68	939	0.870	4,320	2,000
	Texaco NFA E Buick c-18-D/94-A-15	1185	8-68	840	0.600	3,450	2,000
	Texaco NFA E Buick c-80-D/94-A-15	1087	8-68	816	0.920	5,400	2,000
Dunlevy total		----	----	----	----	----	20,420
Field total		----	----	----	----	----	20,420
Buick Creek North—							
Bluesky-Gething	Pacific West Prod N Buick c-22-F/94-A-14	1753	6-67	1,015	0.604	6,888	2,000
	Pacific West Prod N Buick b-44-F/94-A-14	1799	----	----	----	----	----
Bluesky-Gething total		----	----	----	----	----	2,000
Dunlevy	Pacific West Prod N Buick a-81-C/94-A-14	2069	6-68	1,106	0.759	10,000	2,622
	Texaco NFA N Buick d-91-C/94-A-14	2174	5-68	1,123	0.713	10,800	2,783
	Pacific West Prod N Buick b-2-F/94-A-14	2026	8-68	1,094	0.700	3,488	2,000

Boundary Lake—							
Bluesky-Gething	Pacific Boundary 8-15-85-14	270	9-62	1,068	0.687	830	Suspended.
	Texaco NFA Boundary 8-23-86-14	1125	-----	-----	-----	-----	-----
Gething	Pacific Boundary Lake A16-4-85-14	655	6-61	988	0.839	4,700	Suspended.
	Pacific Boundary 12-10-85-14	352	6-68	859	0.839	8,127	2,805
Gething total	-----	-----	-----	-----	-----	-----	2,805
Dunlevy	Amerada Boundary 8-5-85-14	799	10-61	1,468	0.822	11,200	Suspended.
Baldonnel	Texaco NFA Boundary 6-30-85-13	1137	5-68	826	0.605	2,400	2,000
	Pacific Boundary Lake 11-14-85-14	667	5-53	1,245	0.674	1,650	Suspended.
	Pacific Boundary 8-15-85-14	270	5-66	1,231	0.725	3,352	Suspended.
	Sun Boundary Lake 8-23-85-14	652	6-68	992	0.727	9,900	2,950
	Texaco NFA Boundary Lake 6-25-85-14	687	5-68	1,009	0.850	3,650	2,000
Baldonnel total	-----	-----	-----	-----	-----	-----	6,950
Basal Boundary Lake	Pac et al Boundary 14-4-85-14	1964	6-68	1,145	0.550	2,037	2,000
Halfway	Texaco NFA Boundary 16-31-86-13	836	-----	-----	-----	-----	-----
	Huber et al Boundary 6-4-87-13	1501	11-64	1,569	0.900	360	Suspended.
Halfway total	-----	-----	-----	-----	-----	-----	-----
Field total	-----	-----	-----	-----	-----	-----	11,755
Boundary Lake North—Halfway	Texaco NFA N Boundary 7-3-87-14	1395	-----	-----	-----	-----	-----
	Texaco NFA N Boundary 6-8-87-14	1529	-----	-----	-----	-----	-----
	Texaco NFA N Boundary 10-9-87-14	1451	12-64	1,553	0.905	25,000	Suspended.
	Texaco NFA N Boundary 7-15-87-14	1881	3-66	1,556	0.850	2,300	Suspended.
Bubbles—							
Baldonnel	Dome Basco Bubbles b-19-A/94-G-8	464	6-68	927	0.518	2,759	2,000
	Dome Provo Bubbles c-20-A/94-G-8	526	6-68	1,017	0.500	690	Suspended.
	Dome Basco Bubbles b-50-A/94-G-8	506	-----	-----	-----	-----	-----
	McCoy Dome Bubbles d-42-B/94-G-8	791	6-68	1,274	0.500	2,410	Suspended.
	McCoy Dome Bubbles b-A62-B/94-G-8	674	6-68	1,048	0.591	3,390	2,000
Baldonnel project	Pacific Sunray Imp Bubbles b-22-I/94-G-1	467	-----	-----	-----	-----	-----
	Pacific Imperial Bubbles b-33-I/94-G-1	451	7-68	932	0.754	13,402	4,417
	Pacific Imperial Bubbles b-44-I/94-G-1	466	7-68	850	0.884	14,700	5,991
	Pacific Sunray Imp Bubbles d-55-I/94-G-1	479	-----	-----	-----	-----	-----
	Pacific Imperial Bubbles b-66-I/94-G-1	480	7-68	893	0.686	4,460	2,000
	Pacific Imperial Bubbles d-77-I/94-G-1	478	7-68	916	0.500	3,013	2,000
	Pacific Imperial Bubbles d-88-I/94-G-1	462	7-68	921	0.925	24,250	9,726
	Pacific Dome et al Bubbles d-99-I/94-G-1	615	7-68	927	0.500	1,763	2,000
Baldonnel project P.R.L.	-----	-----	-----	-----	-----	-----	26,134
Baldonnel and field total	-----	-----	-----	-----	-----	-----	30,134
Buick Creek—							
Dunlevy	Texaco NFA Buick a-63-I/94-A-11	1348	-----	-----	-----	-----	-----
	Decalta et al Buick d-73-I/94-A-11	1344	-----	-----	-----	-----	-----
	Pacific Buick a-85-I/94-A-11	1323	6-68	965	0.818	8,878	2,619
	Texaco NFA Buick d-96-I/94-A-11	787	6-68	949	0.740	15,600	4,522
	Texaco NFA Buick Creek d-98-I/94-A-11	45	6-68	903	0.980	5,000	2,000

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Clarke Lake—*Continued*							
Slave Point project	West Nat et al Clarke c-47-J/94-J-10	211	.....	.....	.....	.....	.....
	West Nat et al Clarke a-52-J/94-J-10	856	8-66	2,842	0.582	22,600	.....
	Pacific et al Clarke a-55-J/94-J-10	1966	9-66	2,894	0.554	150,000	.....
	West Nat Imp Clarke Lake c-8-D/94-J-16	503	8-67	2,822	0.625	53,000	.....
Slave Point project P.R.L.	.....	.....	.....	.....	.....	.....	400,000
Slave Point and field total	.....	.....	.....	.....	.....	.....	436,154
Clarke Lake South—Slave Point	West Nat IOE S Clarke d-29-K/94-J-9	1274	1-64	2,860	0.500	145,000	Suspended.[2]
	Pacific IOE S Clarke c-50-K/94-J-9	1913	6-66	2,864	0.781	16,000	.....[2]
Dawson Creek—							
Dunvegan	Horizon Dawson B3-22-79-15	2216	.....	.....	.....	.....	.....
Cadotte	Pacific Sc Dawson Ck 7-11-79-15	302	6-67	540	0.900	805	Suspended.
Farrell Creek—							
Charlie Lake	CanDel et al Farrell a-30-L/94-A-5	2165	1-68	2,427	0.575	975	2,000
	CanDel et al Farrell a-41-I/94-B-8	2089	1-68	2,468	0.646	650	2,000
Charlie Lake total	.....	.....	.....	.....	.....	.....	4,000
Halfway	Ft St John Petroleums Farrell a-9-L/94-A-5	176	11-61	2,341	0.839	5,600	Suspended.
	CanDel et al Farrell a-30-L/94-A-5	2165	.....	.....	.....	.....	.....
	CanDel et al Farrell a-41-I/94-B-8	2089	12-67	2,034	0.595	1,850	2,000
Halfway total	.....	.....	.....	.....	.....	.....	2,000
Field total	.....	.....	.....	.....	.....	.....	6,000
Fort St. John—							
Cadomin	Pacific Ft St John A3-29-83-18	75	7-53	1,338	1.000	29,000	Suspended.
	Pacific Ft St John A9-19-83-18	190	.....	.....	.....	.....	.....
Baldonnel	Pacific Ft St John 14-15-83-18	32	10-66	1,002	0.700	3,171	Suspended.
	Pacific Ft St John 16-8-83-18	233	5-67	676	0.820	2,557	Suspended.
	Pacific Ft St John 9-14-83-18	204	.....	.....	.....	.....	.....
	Pacific Ft St John 13-14-83-18	194	10-66	899	0.993	2,238	Suspended.
	Pacific Ft St John A6-16-83-18	212	6-68	674	0.733	2,118	2,000
	Pacific Ft St John 6-17-83-18	210	6-68	655	0.851	4,940	2,327
	Pacific Ft St John 8-20-83-18	170	6-68	602	0.850	3,420	2,000
	Pacific Ft St John B14-21-83-18	193	6-68	623	0.625	3,262	2,000
	Pacific Ft St John 14-22-83-18	76	6-68	671	0.782	4,600	2,000
	Pacific Ft St John 13-23-83-18	82	6-68	731	0.726	4,522	2,000
	Pacific Ft St John C3-29-83-18	186	6-68	704	0.565	2,942	2,000
	Pacific Ft St John 4-32-83-18	67	6-68	1,014	1.000	631	2,000
Baldonnel total	.....	.....	.....	.....	.....	.....	16,327

	Pacific West Prod N Buick c-22-F/94-A-14	1753	6-67	1,024	0.604	5,353	Suspended.
	Pacific West Prod N Buick d-15-J/94-A-15	1799	.....	.....	.....	.....	.....
	Pacific West Prod N Buick b-86-F/94-A-14	1830	6-66	1,261	0.500	1,340	Suspended.
Dunlevy total		.....	.....	.....	.....	.....	7,405
Field total		.....	.....	.....	.....	.....	9,405
Buick Creek West—							
Gething	Pacific West Buick Creek c-2-E/94-A-14	239	.....	.....	.....	.....	.....
Dunlevy	Pacific West Buick Creek d-95-K/94-A-11	99	6-68	419	0.790	4,800	2,340
	Pacific West Buick Creek c-5-C/94-A-14	264	6-68	416	0.906	3,312	2,119
	Pacific West Buick Creek c-14-C/94-A-14	95	7-62	546	0.975	5,100	Suspended.
	Pacific West Buick Creek d-17-C/94-A-14	384	6-68	421	0.687	15,803	5,945
	Pacific West Buick Creek b-78-C/94-A-14	89	6-68	866	0.712	4,193	2,000
	Pacific West Buick Creek c-80-C/94-A-14	261	.....	.....	.....	.....	.....
	Pacific West Buick Creek d-89-C/94-A-14	268	6-68	797	1.000	1,941	2,000
	Pacific West Buick Creek b-91-D/94-A-14	255	6-68	610	1.000	2,192	2,000
	Pacific West Buick Creek c-2-E/94-A-14	239	6-68	597	0.686	5,046	2,000
Dunlevy total		.....	.....	.....	.....	.....	18,404
Baldonnel	Pacific West Buick Creek d-58-C/94-A-14	249	.....	.....	.....	.....	.....
	Pacific West Buick Creek a-78-C/94-A-14	644	6-68	808	0.699	2,301	2,000
Baldonnel total		.....	.....	.....	.....	.....	2,000
Halfway	Pacific West Buick Creek b-23-E/94-A-14	86	7-62	699	0.712	2,450	Suspended.
Field total		.....	.....	.....	.....	.....	20,404
Clarke Lake—							
Slave Point	Marathon Clarke a-65-G/94-J-10	1528	8-68	2,823	0.570	10,400	2,607
	Cankee Cdn-Sup Clarke d-72-G/94-J-10	2176	10-67	2,851	0.649	120,000	30,000
	Pacific Apache Clarke b-76-G/94-J-10	1071	11-68	2,804	0.674	12,800	3,547
Slave Point project	Pacific Imp Clarke c-56-L/94-J-9	1833	8-67	2,830	0.552	172,000	.....
	West Nat Imp Clarke Lake d-88-L/94-J-9	344	8-67	2,774	0.748	143,000	.....
	West Nat Imp Clarke Lake d-91-L/94-J-9	585	1-63	2,908	0.543	12,000	.....
	West Nat Imp Clarke Lake c-94-L/94-J-9	397	8-67	2,760	0.593	60,000	.....
	Pacific et al Clarke c-54-F/94-J-10	1932	.....	.....	.....	.....	.....
	Pacific Apache Clarke a-61-F/94-J-10	1578	8-67	2,844	0.616	141,000	.....
	Pacific et al Clarke d-69-H/94-J-10	1866	3-66	2,906	0.500	40,500	.....
	Pacific et al Clarke b-18-I/94-J-10	2316	.....	.....	.....	.....	.....
	Pacific et al Clarke c-20-I/94-J-10	2107	3-68	2,818	0.535	43,250	.....
	Pacific et al Clarke c-38-I/94-J-10	1933	.....	.....	.....	.....	.....
	Pacific et al Clarke c-69-I/94-J-10	2249	.....	.....	.....	.....	.....
	West Nat et al Clarke b-70-I/94-J-10	688	7-67	2,773	0.635	47,900	.....
	West Nat et al Clarke c-78-I/94-J-10	505	8-67	2,768	0.500	116,000	.....
	Pacific Imp Clarke c-85-I/94-J-10	2310	.....	.....	.....	.....	.....
	Pacific Imperial Clarke c-92-I/94-J-10	1554	8-67	2,761	0.500	215,000	.....
	Pacific et al Clarke b-22-J/94-J-10	1796	.....	.....	.....	.....	.....
	Pacific et al Clarke c-43-J/94-J-10	2239	3-68	2,786	0.588	39,000	.....
	Pacific et al Clarke b-46-J/94-J-10	2162	3-68	2,800	0.550	17,500	.....

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Highway—							
Dunlevy	West Nat et al Highway b-3-I/94-B-16	168	7-68	1,134	0.869	750	2,000
Baldonnel	Pacific Highway b-25-I/94-B-16	112	8-58	1,653	1.000	6,600	Suspended.
	Pacific Highway a-47-I/94-B-16	180	11-57	1,680	0.754	3,600	Suspended.
	Pacific Highway a-69-I/94-B-16	274	11-57	1,691	0.812	3,150	Suspended.
	Pacific Highway a-90-I/94-B-16	229	11-64	1,388	0.535	920	Suspended.
Mississippian	Pacific Highway a-90-I/94-B-16	229	7-66	880	0.553	6,885	Suspended.
Field total							2,000
Inga—Baldonnel	Pacific Inga 6-29-86-23	2327	7-68	1,789	0.864	9,000	(3)
	Pacific Inga 6-32-86-23	2401	12-68	1,778	0.687	3,780	(3)
	Pacific Inga 6-4-87-23	2412	-----	-----	-----	-----	-----
Jeans West—Charlie Lake	Amarillo Cabot W Jeans b-82-J/94-A-12	2241	-----	-----	-----	-----	(3)
	West Nat et al W Jeans b-10-A/94-A-13	470	9-60	2,245	0.824	2,650	(3)
	Amarillo et al W Jeans a-5-B/94-A-13	2320	-----	-----	-----	-----	(3)
	West Nat et al W Jeans a-22-B/94-A-13	412	5-59	2,239	1.000	5,050	(3)
Jedney—							
Gething	Pacific Imperial Jedney a-95-C/94-G-8	1366	10-63	1,142	0.531	13,600	Suspended.
Baldonnel	Pacific Imperial Jedney c-78-H/94-G-1	1129	6-63	1,484	0.726	1,450	2,000
	Pacific Imperial Jedney b-99-H/94-G-1	1054	8-68	1,093	0.535	3,500	2,000
	Pacific Imperial Jedney c-100-H/94-G-1	1082	8-68	1,247	0.500	2,760	2,000
	Pacific Sunray Imp Jedney b-44-J/94-G-1	492	-----	-----	-----	-----	-----
	Pacific Imperial Jedney b-66-J/94-G-1	475	8-68	1,155	0.839	7,200	2,244
	Pacific et al Jedney b-68-J/94-G-1	498	6-66	1,358	0.685	584	Suspended.
	Pacific Imperial Jedney d-77-J/94-G-1	484	8-68	963	0.532	1,954	2,000
	Pacific et al Jedney b-88-J/94-G-1	427	8-68	879	0.818	19,500	7,133
	Pacific Imp Jedney d-99-J/94-G-1	382	7-67	1,077	0.531	2,207	2,000
	Pacific Imperial Jedney b-10-B/94-G-8	473	8-68	944	0.766	18,000	5,956
	Pacific Imp Jedney d-19-B/94-G-8	2171	-----	-----	-----	-----	-----
	Pacific Imperial Jedney b-30-B/94-G-8	460	8-68	976	0.588	3,792	2,000
	Pacific Imperial Jedney d-31-C/94-G-8	1178	8-68	1,311	0.931	2,944	2,000
	Pacific Imperial Jedney d-44-C/94-G-8	1375	8-68	1,342	0.685	4,500	2,000
	Pacific Imperial Jedney d-53-C/94-G-8	820	8-68	1,372	0.880	2,063	2,000
	Pacific Imperial Jedney b-73-C/94-G-8	868	8-68	1,237	0.500	2,432	2,000
	Pacific et al Jedney c-86-C/94-G-8	778	8-68	1,209	0.500	2,128	2,000
	Pacific et al Jedney d-97-C/94-G-8	651	8-68	1,190	0.595	11,470	3,037
	Pacific Pan Am Dome Jedney c-8-F/94-G-8	1152	7-67	1,317	0.594	1,253	Suspended.
	Pacific Pan Am Dome Jedney b-28-F/94-G-8	944	8-68	1,291	0.500	2,074	2,000
	Skelly Jedney a-39-F/94-G-8	1334	10-68	1,208	0.651	3,500	2,000
	Pacific et al Jedney b-50-F/94-G-8	1907	-----	-----	-----	-----	-----
Baldonnel total							44,370

Charlie Lake	Pacific Ft St John B3-29-83-18	179	.....	.....	.....	.....	.....
Halfway	Pacific Ft St John 1-20-83-18	74	6-68	525	0.839	2,162	2,000
	Pacific Ft St John 2-21-83-18	172	6-68	524	0.818	2,348	2,000
	Pacific Ft St John A14-21-83-18	178	6-68	510	0.916	2,800	2,209
	Pacific Ft St John A14-22-83-18	192	5-66	683	1.000	125	Suspended.
	Pacific Ft St John B3-29-83-18	179	6-68	565	0.856	2,805	2,000
	Pacific Ft St John 10-30-83-18	181	6-68	560	0.868	860	2,000
	Pacific et al Ft St John 11-34-83-19	2138	.....	.....	.....	.....	.....
Halfway total	.....	.....	.....	.....	.....	.....	10,209
Belloy	Pacific Ft St John 14-21-83-18	29	6-68	667	0.624	1,477	2,000
	Pacific Ft St John 3-29-83-17	58	6-68	575	0.542	3,302	2,000
Belloy total	.....	.....	.....	.....	.....	.....	4,000
Field total	.....	.....	.....	.....	.....	.....	30,536
Fort St. John Southeast—							
Cadomin	Pac Ft St John SE 10-31-82-17	220	5-66	960	0.854	897	Suspended.
Baldonnel	Pac Ft St John SE 13-2-83-17	213	6-68	756	0.766	3,101	2,000
	Pac Ft St John SE A4-10-83-17	184	7-68	1,095	0.500	2,316	2,000
Baldonnel total	.....	.....	.....	.....	.....	.....	4,000
Halfway	Pac Ft St John SE 10-33-82-17	60	10-56	1,945	1.000	9,000	Suspended.
	Pacific Ft St John SE 7-3-83-17	174	8-58	1,427	1.000	3,814	Suspended.
	Pac Ft St John SE 16-3-83-17	197	11-68	563	0.795	7,350	3,647
	Pac Ft St John SE A10-4-83-17	191	6-68	814	0.649	2,129	2,000
	Pac Ft St John SE 7-5-83-17	202	6-57	2,108	1.000	2,050	Suspended.
	Pac Ft St John SE A10-10-83-17	320	5-64	843	0.845	2,675	Suspended.
Halfway total	.....	.....	.....	.....	.....	.....	5,647
Belloy	Pac Ft St John SE 11-32-82-17	201	11-68	492	0.745	5,512	3,019
	Pac Ft St John SE 10-4-83-17	173	6-68	943	0.810	7,689	3,798
	Pacific Ft St John SE 8-5-83-17	52	10-53	2,805	1.000	4,980	Suspended.
	Pacific Ft St John SE 4-9-83-17	166	5-67	1,033	1.000	6,000	4,124
	Pac Ft St John SE 4-10-83-17	42	7-61	1,661	0.500	5,700	Suspended.
	Pac Ft St John SE 10-10-83-17	219	6-68	823	0.726	1,456	2,000
Belloy total	.....	.....	.....	.....	.....	.....	12,941
Field total	.....	.....	.....	.....	.....	.....	22,588
Gundy Creek—							
Baldonnel	West Nat Gundy Creek b-69-A/94-B-16	253	4-59	1,618	1.000	5,000	Suspended.
	West Nat East Gundy Creek a-76-A/94-B-16	291	.....	.....	.....	.....	.....
	West Nat Gundy Creek c-80-A/94-B-16	83	.....	.....	.....	.....	.....
	West Nat Gundy Creek d-2-G/94-B-16	367	8-62	1,707	0.636	2,250	Suspended.
Charlie Lake	West Nat Gundy Creek b-69-A/94-B-16	253	4-59	1,845	1.000	8,300	Suspended.
Halfway—							
Baldonnel	West Nat et al Halfway 11-35-86-25	351	10-58	1,639	0.678	8,200	Suspended.
	West Nat et al Halfway 5-1-87-25	107	7-68	1,222	1.000	1,723	2,000
Baldonnel total	.....	.....	.....	.....	.....	.....	2,000
Halfway	West Nat et al Halfway 8-11-87-25	182	8-63	1,968	0.781	720	Suspended.
Field total	.....	.....	.....	.....	.....	.....	2,000

[2] Part of Clarke Lake project P.R.L.

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Kobes-Townsend—*Continued*							
Mississippian	Pacific Kobes a-99-A/94-B-9	314	9-68	1,583	0.869	8,250	2,000
	Pacific Townsend a-20-H/94-B-9	164	8-65	1,378	0.700	497	Suspended.
Mississippian total		------	------	------	------	------	2,000
Field total		------	------	------	------	------	18,000[4]
Kotcho Lake—Slave Point	West Nat Kotcho Lake d-39-J/94-I-14	532	------	------	------	------	------
	West Nat Kotcho d-54-K/94-I-14	879	------	------	------	------	------
	West Nat Kotcho Lake c-67-K/94-I-14	404	2-60	2,562	0.853	825,000	Suspended.
	Pacific Kotcho b-86-K/94-I-14	2097	3-67	2,553	0.623	100,000	Suspended.
	Pacific Kotcho b-44-C/94-P-3	562	4-60	2,566	0.565	105,000	26,250
	West Nat Kotcho d-12-C/94-P-3	1147	------	------	------	------	------
Slave Point and field total		------	------	------	------	------	26,250
Laprise Creek—Baldonnel project	Dome Basco Laprise Creek a-81-A/94-G-8	490	6-68	1,320	0.500	4,111	------
	Dome Provo Laprise Creek d-91-A/94-G-8	653	6-68	1,243	0.500	1,646	------
	Dome Provo Laprise Creek b-2-H/94-G-8	483	6-68	1,258	0.720	9,524	------
	Dome Provo Laprise d-4-H/94-G-8	1852	6-68	1,178	0.500	3,753	------
	Dome Basco Laprise Creek d-13-H/94-G-8	474	6-68	1,260	0.500	5,558	------
	Dome Provo Laprise Creek a-25-H/94-G-8	654	6-68	1,184	0.500	1,672	------
	Dome Provo Laprise Creek a-33-H/94-G-8	666	6-68	1,274	0.615	5,389	------
	Dome Basco Laprise Ck a-35-H/94-G-8	327	6-68	1,260	0.544	7,938	------
	Dome Provo Laprise a-46-H/94-G-8	665	6-68	1,304	0.645	3,266	------
	Dome Provo Laprise a-52-H/94-G-8	1445	7-68	1,268	0.500	3,518	------
	Dome Provo Laprise a-81-H/94-G-8	837	7-68	1,289	0.500	4,662	------
	Dome Provo Laprise d-91-H/94-G-8	809	7-68	1,247	0.579	7,136	------
	Dome Provo Laprise c-92-H/94-G-8	1056	7-68	1,177	0.578	2,761	------
	Tenn Monsanto Laprise b-28-C/94-H-5	1388	------	------	------	------	------
	Dome Laprise d-37-C/94-H-5	1392	6-68	1,376	0.668	390	------
	Tenn Monsanto Laprise d-79-C/94-H-5	1371	7-65	1,532	0.720	6,600	------
	Pacific Imp Laprise b-90-C/94-H-5	1970	7-68	1,272	0.740	9,800	------
	Pacific Imp Laprise b-100-C/94-H-5	1999	7-68	1,392	0.783	17,200	------
	Amerada Laprise d-33-D/94-H-5	1282	------	------	------	------	------
	Amerada Laprise d-55-D/94-H-5	1468	6-68	1,295	0.662	12,751	------
	Amerada Laprise d-77-D/94-H-5	1378	6-68	1,381	0.521	5,085	------
	Pacific IOE Laprise a-85-D/94-H-5	1948	7-68	1,332	0.500	5,250	------
	Amerada Laprise d-95-D/94-H-5	1477	6-68	1,440	0.500	1,142	------
	Pacific IOE Laprise d-3-E/94-H-5	1979	------	------	------	------	------
	Amerada Laprise a-7-E/94-H-5	1337	11-63	1,286	0.500	5,300	------
	Pacific IOE Laprise d-11-E/94-H-5	1364	------	------	------	------	------

Halfway	Pacific Imperial Jedney c-56-H/94-G-1	1183	8-68	1,416	0.500	2,169	2,000
	Pacific Imperial Jedney b-68-H/94-G-1	1256	8-68	1,073	0.500	3,232	2,000
	Pacific Imperial Jedney c-78-H/94-G-1	1129	8-68	1,147	0.853	4,750	2,000
	Pacific Imperial Jedney b-99-H/94-G-1	1054	8-68	1,065	0.726	12,500	3,871
	Pacific Imperial Jedney c-100-H/94-G-1	1082	8-68	1,194	0.738	11,700	3,486
	Pacific Imperial Jedney a-65-J/94-G-1	461	8-68	1,219	0.543	4,599	2,000
	Pacific Imperial Jedney b-66-J/94-G-1	475	8-68	1,106	0.649	9,196	2,608
	Pacific Imperial Jedney d-77-J/94-G-1	484	8-68	1,006	0.869	13,582	5,015
	Pacific Imp Jedney d-99-J/94-G-1	382	8-68	1,025	0.740	7,184	2,293
	Pacific Imp Jedney d-19-B/94-G-8	2171	.....	.....	.....	.....	.....
	Pacific Imperial Jedney d-31-C/94-G-8	1178	7-67	1,044	0.500	4,973	2,000[1]
	Pacific Imperial Jedney d-42-C/94-G-8	453	8-68	1,015	0.684	3,443	2,000
	Pacific Imperial Jedney d-44-C/94-G-8	1375	.....	.....	.....	.....	.....
	Pacific Imperial Jedney d-53-C/94-G-8	820	8-68	925	0.587	3,074	2,000
	Pacific Imperial Jedney b-73-C/94-G-8	868	8-68	923	0.588	3,905	2,000
	Pacific Imperial Jedney b-84-C/94-G-8	691	8-68	811	0.500	2,940	2,000
	Pacific et al Jedney c-86-C/94-G-8	778	8-68	876	0.649	2,770	2,000
	Pacific Imperial Jedney a-95-C/94-G-8	1366	8-67	1,438	0.500	2,099	Suspended.
	Pacific et al Jedney d-97-C/94-G-8	651	8-68	885	0.742	3,975	2,000
	Pacific et al Jedney a-17-F/94-G-8	779	8-68	978	0.837	4,290	2,000
	Pacific Pan Am Dome b-28-F/94-G-8	944	8-68	826	0.554	2,909	2,000
	Skelly Jedney a-39-F/94-G-8	1334	10-68	1,114	0.683	1,600	2,000
	Pacific et al Jedney b-50-F/94-G-8	1907	.....	.....	.....	.....	.....
Halfway total		.....	.....	.....	.....	.....	45,273
Field total		.....	.....	.....	.....	.....	89,643
Jedney West—							
Baldonnel	Pacific et al W Jedney b-84-K/94-G-1	1081	8-68	1,339	0.500	990	Suspended.
Halfway	Pacific et al W Jedney b-84-K/94-G-1	1081	8-68	1,041	0.500	1,036	Suspended.
	Pacific et al W Jedney b-6-C/94-G-8	1276	6-65	924	0.500	644	Suspended.
Kobes-Townsend—							
Dunlevy	Pacific Kobes b-82-I/94-B-8	496	9-68	979	1.000	687	2,000
	Pacific Kobes a-3-A/94-B-9	372	9-68	998	0.704	1,970	2,000
	Pacific Kobes b-24-A/94-B-9	489	9-68	1,005	1.000	754	2,000
Dunlevy total		.....	.....	.....	.....	.....	6,000
Charlie Lake	Pacific Kobes c-73-I/94-B-8	299	7-67	1,564	0.500	1,663	2,000
	Pacific Kobes d-94-I/94-B-8	141	9-68	1,056	0.824	2,543	2,000
	Pacific Kobes b-35-A/94-B-9	177	9-68	1,339	0.564	1,664	2,000
	Pacific Kobes a-99-A/94-B-9	314	8-68	1,265	0.500	553	2,000
	Pacific Townsend d-21-C/94-B-9	251	9-68	1,187	0.864	1,248	2,000
Charlie Lake total		.....	.....	.....	.....	.....	10,000
Halfway	Pacific Kobes d-94-I/94-B-8	141	8-68	1,952	0.627	9,850	G.E.P.
	Pacific Kobes b-35-A/94-B-9	177	8-68	1,933	0.588	6,141	G.E.P.
Halfway Pool total		.....	.....	.....	.....	.....	G.E.P.

[1] Interim. [3] Not available.

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Nig Creek—*Continued*							
Baldonnel project	Texaco NFA Nig a-77-B/94-H-4	1762	6-67	1,412	0.742	17,000	.....
	Texaco NFA Nig Creek a-79-B/94-H-4	61	7-67	1,378	0.814	17,600	.....
	Texaco NFA Nig c-90-B/94-H-4	1161	6-68	1,203	0.713	9,600	.....
	Texaco NFA Nig Creek a-1-G/94-H-4	456	6-68	1,257	0.559	7,000	.....
	Texaco NFA Nig Creek b-2-G/94-H-4	447	7-68	1,262	0.693	25,700	.....
	Texaco NFA Nig a-6-G/94-H-4	1740	7-67	1,383	0.570	10,500	.....
	Texaco NFA Nig a-8-G/94-H-4	967	8-68	1,352	0.800	33,500	.....
	Texaco NFA Nig Creek a-12-G/94-H-4	131	8-68	1,196	0.744	12,000	.....
	Texaco NFA Nig c-14-G/94-H-4	2178	10-67	1,375	0.670	400	.....
	Texaco NFA Nig b-44-G/94-H-4	852	10-67	1,489	0.530	365	.....
	Texaco NFA Nig c-6-H/94-H-4	1654	8-68	1,186	0.793	6,087	.....
	Texaco NFA Nig c-14-H/94-H-4	1707	9-67	1,169	0.631	3,500	.....
	Texaco NFA Nig c-33-H/94-H-4	1742	7-67	1,176	0.645	12,000	.....
	Texaco NFA Nig b-41-H/94-H-4	1976	10-68	1,343	1.000	430	.....
Baldonnel project P.R.L.	.....	.....	.....	.....	.....	.....	80,300[1]
Baldonnel and field total	.....	.....	.....	.....	.....	.....	90,546
North Pine—Charlie Lake	Pacific et al N Pine 6-24-85-18	1994	11-67	1,926	0.654	9,400	2,350
	Pacific et al N Pine 6-27-85-18	1958	9-66	1,959	0.625	28,200	Suspended.
Charlie Lake and field total	.....	.....	.....	.....	.....	.....	2,350
Parkland—Wabamun project	Pacific Imp Parkland 10-28-81-15	1153	6-68	3,729	0.781	9,450	.....
	Pacific Imp Parkland 6-29-81-15	153	6-68	3,152	0.679	26,173	.....
Wabamun project and field total	.....	.....	.....	.....	.....	.....	20,000
Petitot River—Slave Point	West Nat Petitot b-90-K/94-P-12	722	.....	.....	.....	.....	.....
	West Nat Petitot River b-1-D/94-P-13	533	2-60	2,795	0.802	185,000	Suspended.
	West Nat Petitot River d-24-D/94-P-13	403	.....	.....	.....	.....	.....
Red Creek—Charlie Lake	Pacific Red Creek 5-27-85-21	93	5-65	1,267	1.000	3,308	Suspended.
Halfway	Pacific Red Creek 5-27-85-21	93	7-65	1,437	1.000	2,434	Suspended.
Rigel—Dunlevy	Denison Rigel 6-31-87-16	1372	8-65	916	0.765	4,050	Suspended.
	Monsanto Rigel 14-23-87-17	1973	.....	.....	.....	.....	.....
	IOE Fina Rigel 16-24-87-17	1739	.....	.....	.....	.....	.....
	Monsanto IOE Fina Rigel 11-26-87-17	1486	.....	.....	.....	.....	Suspended.
	Wintershall Rigel 10-34-87-17	1365	8-68	1,014	0.560	9,100	2,333
	Pacific Rigel 6-35-87-17	1293	6-68	985	1.000	4,093	2,000
	Monsanto Rigel 6-36-87-17	1354	8-68	1,073	0.602	11,700	3,036
	Whitehall Rigel 11-18-88-16	1234	.....	.....	.....	.....	.....
	Amarillo Cabot Rigel 7-30-88-16	2258	.....	.....	.....	.....	.....

	Pacific Imperial Laprise a-22-E/94-H-5	715	7-68	1,297	0.554	4,011	.....
	Pacific Imperial Laprise c-24-E/94-H-5	1511	7-68	1,255	0.594	2,130	.....
	Pacific IOE Laprise a-29-E/94-H-5	1938	.....	.....	.....	.....	.....
	Dome Provo Laprise b-30-E/94-H-5	1837	7-68	1,261	0.649	11,750	.....
	Pacific Imperial Laprise a-33-E/94-H-5	690	7-68	1,167	0.810	13,000	.....
	Dome Provo Laprise c-40-E/94-H-5	1251	7-68	1,281	0.770	15,418	.....
	Pacific Imperial Laprise b-44-E/94-H-5	659	7-68	1,152	0.775	12,537	.....
	Pacific Imperial Laprise a-46-E/94-H-5	678	7-68	1,229	0.509	6,500	.....
	Pacific Imperial Laprise a-49-E/94-H-5	1488	7-68	1,274	0.726	13,800	.....
	Pacific Imperial Laprise d-55-E/94-H-5	670	7-68	1,213	0.713	11,400	.....
	Pacific Imperial Laprise c-56-E/94-H-5	650	7-68	1,256	0.577	6,000	.....
	Pacific Imperial Laprise d-68-E/94-H-5	516	7-68	1,255	0.661	7,000	.....
	Dome Provo Laprise c-70-E/94-H-5	1225	7-68	1,273	0.510	6,551	.....
	Pacific Imperial Laprise c-78-E/94-H-5	551	7-68	1,257	0.700	6,870	.....
	Pacific Imperial Laprise a-99-E/94-H-5	1341	7-68	1,293	0.767	12,500	.....
Baldonnel project and field total		.....	.....	.....	.....	.....	G.E.P.
Laprise Creek West—Baldonnel	Dome CDP C&E W Laprise c-71-G/94-G-8	1015	.....	.....	.....	.....	Suspended.
	Dome CDP C&E W Laprise c-82-G/94-G-8	873	6-67	970	0.618	2,695	Suspended.
Milligan Creek—Halfway	Whitehall et al Milligan d-75-G/94-H-2	689	.....	.....	.....	.....	.....
Montney—							
Bluesky-Gething	Pac Sunray Montney 16-32-86-19	119	9-58	1,123	1.000	814	Suspended.
Charlie Lake	Pac Sunray Montney 14-36-86-19	104	7-58	1,116	1.000	2,200	Suspended.
Halfway	Pac White Rose Sec Montney 6-5-87-18	801	6-68	1,309	0.529	1,621	2,000
	Pac Sunray Montney 14-31-86-19	289	7-61	1,185	0.932	2,250	Suspended.
Halfway total		.....	.....	.....	.....	.....	2,000
Field total		.....	.....	.....	.....	.....	2,000
Nettle—Halfway	Union KCL ROC Nettle d-58-A/94-H-7	1411	.....	.....	.....	.....	.....
Nig Creek—							
Baldonnel	Whitehall ARCo Nig a-87-J/94-A-13	2244	.....	.....	.....	.....	.....
	West Nat Nig a-3-B/94-H-4	1373	6-67	1,384	0.520	1,500	Suspended.
	Pacific Nig b-4-B/94-H-4	1728	7-68	1,309	0.637	3,349	2,000
	Whitehall Nig b-6-B/94-H-4	1613	7-68	1,427	0.841	8,200	2,246
	Monsanto Nig d-13-B/94-H-4	1004	8-68	1,346	0.591	2,920	2,000
	Monsanto Nig a-21-B/94-H-4	1475	8-68	1,345	0.716	6,250	2,000
	Texaco NFA Nig d-33-B/94-H-4	2157	9-67	1,190	0.662	530	Suspended.
	Dome Provo Nig d-35-B/94-H-4	1139	7-68	1,366	0.595	5,420	2,000
	Tenn Monsanto Nig c-A32-C/94-H-4	1484	.....	.....	.....	.....	.....
Baldonnel project	Texaco NFA Nig a-69-A/94-H-4	819[5]	7-68	1,508	1.000	1,570	2,000
	Texaco NFA Nig d-15-B/94-H-4	1180[5]	8-68	1,359	0.787	8,600	2,386
	Texaco NFA Nig c-36-B/94-H-4	729[5]	8-68	1,355	0.660	5,700	2,000
	Texaco NFA Nig Creek b-70-B/94-H-4	383[5]	7-68	1,359	0.532	8,200	2,075
	Texaco NFA Nig d-71-B/94-H-4	790	8-68	1,335	1.000	3,400	.....
	Texaco NFA Nig d-75-B/94-H-4	1681	6-67	1,413	0.630	8,000	.....

[4] Excluding Halfway Zone G.E.P.
[5] Restricted to individual well P.R.L.

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Weasel—							
Baldonnel	Sinclair Pacific Weasel d-93-J/94-A-15	1790	12-65	1,113	0.675	6,050	Suspended.
Halfway	Tenn Ashland Weasel d-27-B/94-H-2	1703	10-65	1,248	0.754	1,070	Suspended.
Willow—Halfway	Union HB Willow d-11-G/94-H-2	1292	------	------	------	------	------
	Union HB Willow b-10-H/94-H-2	830	------	------	------	------	------
Yoyo—							
Charlie Lake	Uno-Tex et al Yoyo c-34-I/94-I-13	2229	2-68	2,838	0.640	92,000	Suspended.
Pine Point	Placid Frontier Yoyo d-A15-I/94-I-13	1895	3-67	2,883	0.845	132,000	Suspended.
	West Nat et al Yoyo b-29-I/94-I-13	1230	1-64	2,921	0.577	3,500	Suspended.
	West Nat Yoyo b-98-E/94-I-14	1405	2-67	2,887	0.628	60,000	Suspended.
	Pacific Yoyo a-2-L/94-I-14	2271	3-68	2,904	0.525	65,000	Suspended.
	Pacific Yoyo d-7-L/94-I-14	2035	2-67	2,909	0.660	115,000	28,750
	Placid Frontier Yoyo b-10-L/94-I-14	1569	3-65	3,021	0.643	63,000	Suspended.
	Frontier Yoyo c-18-L/94-I-14	1431	1-68	2,921	0.644	258,000	64,500
	West Nat et al Yoyo b-24-L/94-I-14	1313	1-64	2,908	0.600	146,000	Suspended.
	Tenn Altair Yoyo a-47-L/94-I-14	1831	------	------	------	------	------
	Cankee Uno-Tex Yoyo a-49-L/94-I-14	2068	3-68	2,928	0.662	145,000	Suspended.
Pine Point total		------	------	------	------	------	93,250
Field total		------	------	------	------	------	93,250
Other areas—							
Cadotte	Pacific Sunrise 11-31-78-16	19	------	------	------	------	------
	Pacific Sunrise 10-7-79-16	15	------	------	------	------	------
	Pacific Sunrise 10-9-79-16	17	------	------	------	------	------
	Westcoast Pouce Coupe 8-18-80-13 (6)	------	------	------	------	------	------
	Westcoast Pouce Coupe 6-30-80-13 (1)	------	------	------	------	------	------
Notikewin	Westcoast Kiskatinaw 8-30-80-14 (5)	------	------	------	------	------	------
Bluesky-Gething	Tenn Osborn 6-23-88-16	1275	------	------	------	------	------
	Sinclair Pacific Beavertail d-71-C/94-A-15	1893	------	------	------	------	------
	Sinclair Pacific Beavertail d-73-C/94-A-15	1915	------	------	------	------	------
	Texaco NFA Junction b-9-F/94-A-15	300	------	------	------	------	------
	Imp Fina Altares a-83-A/94-B-8	410	1-60	1,237	0.629	22,000	Suspended.
	Union HB Willow d-29-H/94-H-2	1878	------	------	------	------	------
	Union HB Woodrush b-56-H/94-H-2	1889	------	------	------	------	------
	Triad BP Pickell Creek c-88-I/94-H-3	695	------	------	------	------	------
	Triad BP Birley d-17-A/94-H-6	987	------	------	------	------	------
	Imp Pac Sunray Wargen c-58-C/94-H-6	641	10-60	1,132	0.668	14,500	Suspended.
	Texaco NFA Silver c-52-K/94-H-6	571	------	------	------	------	------
	Pan Am Dome Silver d-81-L/94-H-6	2406	------	------	------	------	------
	Tenn Cdn Sup Dahl d-53-J/94-H-7	1849	------	------	------	------	------

	Imp Fina Rigel 8-1-88-17	1312					
	Imp Fina Rigel 6-3-88-17	1187	8-67	938	0.562	18,500	4,815
	Imp Fina Rigel 6-8-88-17	1208	8-68	1,067	0.675	2,600	2,000
	Imp Fina Rigel 6-10-88-17	1090	8-67	988	0.595	10,000	2,630
	Whitehall Rigel 6-14-88-17	1149					
	Whitehall Rigel 6-15-88-17	1148	9-68	978	0.669	33,000	9,071
	Imp Fina Rigel 6-16-88-17	1168					
	Imp et al Rigel 7-19-88-17	1107	8-67	1,088	0.631	18,200	4,755
	IOE Fina Rigel 10-25-88-17	2127	12-67	1,143	0.631	2,250	Suspended.
	Imp Fina Rigel 4-27-88-17	130	8-67	1,011	0.636	5,700	2,000
	Imp Fina Rigel 6-28-88-17	1385					
	Imp et al Rigel 6-30-88-17	1032	8-67	1,089	0.738	20,800	5,642
	Imp Fina Rigel 11-3-88-18	1593					
	IOE Fina Rigel 11-11-88-18	1494	8-67	1,113	0.591	20,500	5,253
	Imp et al Rigel 7-13-88-18	1978	7-68	1,054	0.688	16,000	4,287
	Imp Fina Rigel 10-14-88-18	1465	8-68	1,088	0.663	8,600	2,469
	Richfield et al Rigel 10-19-88-18	1381					
	Imp et al Rigel 6-21-88-18	1118	8-68	1,088	0.924	11,700	4,151
	Imp et al Rigel 7-23-88-18	1163	8-68	1,090	0.693	5,250	2,000
	Sun Rigel 10-24-88-18	1324	6-68	1,064	0.675	6,814	2,000
	Imp et al Rigel 6-27-88-18	828	8-68	996	0.626	9,700	3,200
	Texaco NFA Rigel 10-29-88-18	1222	2-63	1,166	0.620	4,850	Suspended.
	Texaco NFA Rigel 9-31-88-18	195	7-68	875	0.962	11,000	3,908
	Richfield N Rigel a-27-I/94-A-10	1620					
	ARCo Rigel d-33-I/94-A-10	1763					
	IOE Fina Rigel d-57-I/94-A-10	1537	1-65	1,198	0.500	10,250	2,563
	Imp IOE Fina Rigel a-21-J/94-A-10	2054	8-68	1,115	0.688	16,000	4,345
	Imp et al Rigel b-22-K/94-A-10	1003					
	Texaco NFA Rigel a-28-K/94-A-10	1370	7-68	960	0.660	1,700	2,000
Dunlevy and field total							74,460
Stoddart—Belloy	Uno-Tex Stoddart 11-34-85-19	1959					
	Pacific et al Stoddart 10-35-85-19	2182	12-67	2,233	0.875	14,100	3,525
	Pacific Stoddart 11-2-86-19	2155	12-67	2,150	0.705	18,800	4,700
	Dome Provo Stoddart 11-8-86-19	1902	7-68	1,414	0.649	5,857	2,000
	Pacific Stoddart 6-10-86-19	2078					
	Jeff Lake Altair Stoddart 6-11-86-19	1841	6-68	2,099	0.754	54,000	13,794
	Pacific et al Stoddart 11-16-86-19	1473	6-68	1,677	0.630	3,040	2,000
	Whitehall Stoddart 6-17-86-19	1770	6-68	1,468	1.000	3,700	2,000
	Pacific et al Stoddart 10-1-86-20	438					
	Pacific Stoddart 2-13-86-20	262	7-68	1,550	1.000	5,250	2,053
	Pacific Stoddart 4-24-86-20	244	6-68	1,544	0.894	13,500	4,815
Belloy and field total							34,887
Stoddart West—Belloy	Pacific W Stoddart 11-10-86-20	1190	6-68	1,199	0.625	5,454	Suspended.

[1] Interim.

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Other areas—*Continued*							
Charlie Lake	Pacific et al Pingel 13-17-81-17	36	.....	.....	.....	.....	.....
	Pacific Pingel Creek 5-26-81-18	66	.....	.....	.....	.....	.....
	Champlin Two Rivers 10-5-83-16	2064	6-68	1,797	1.130	3,800	2,000
	CEGO et al Flatrock 10-27-84-16	1954	6-67	1,659	0.837	2,630	Suspended.
	Pacific et al Siphon 11-27-86-16	444	.....	.....	.....	.....	.....
	West Nat et al Lookout d-42-J/94-A-12	2000	.....	.....	.....	.....	.....
	Richfield-Prespatou Crk d-59-A/94-H-3	240	.....	.....	.....	.....	.....
	Ashland CK Tb Wargen d-19-B/94-H-6	2119	.....	.....	.....	.....	.....
	Texaco NFA Redeye d-69-I/94-H-6	1549	.....	.....	.....	.....	.....
Charlie Lake total		.....	.....	.....	.....	.....	2,000
Boundary Lake	Texaco NFA La Garde 10-29-87-15	1194	3-63	1,693	0.793	23,280	Suspended.
Halfway	Home W Ft St John 10-27-83-19	2391	.....	.....	.....	.....	.....
	Pacific Wilder 13-1-84-20	47	12-53	2,035	0.780	5,500	Suspended.
	Champlin et al Two Rivers 6-9-83-16	2139	.....	.....	.....	.....	.....
	Texaco NFA Osborn 13-26-88-16	160	.....	.....	.....	.....	.....
	Cankee CIGOL Melanie d-68-K/94-A-9	1859	.....	.....	.....	.....	.....
	Sinclair Pacific Mink d-8-A/94-A-15	1564	.....	.....	.....	.....	.....
	Sinclair Pacific Beavertail d-71-C/94-A-15	1893	.....	.....	.....	.....	.....
	Dome et al W Peejay d-31-G/94-A-15	1927	.....	.....	.....	.....	.....
	Baysel SR CanDel Osprey d-83-G/94-A-15	2071	.....	.....	.....	.....	.....
	Pacific SR CanDel Beaverdam d-71-I/94-A-15	2101	4-67	1,323	0.794	4,400	Suspended.
	Pacific SR CanDel W Dede b-45-K/94-A-15	1271	3-63	1,411	0.700	5,600	Suspended.
	Sinclair et al Graham c-53-D/94-B-9	238	.....	.....	.....	.....	.....
	Texaco NFA Cameron River d-43-H/94-B-10	433	.....	.....	.....	.....	.....
	Sinclair Pac Julienne Creek b-39-D/94-G-1	658	6-61	2,323	0.911	4,000	Suspended.
	Sinclair Julienne Ck a-50-D/94-G-1	304	9-58	2,237	1.000	7,000	Suspended.
	Pac Imp N Bubbles d-95-B/94-G-8	750	8-61	1,470	0.589	2,500	Suspended.
	Pacific Imperial N Bubbles d-6-G/94-G-8	1055	.....	.....	.....	.....	.....
	Texaco Tepee d-99-G/94-G-8	1432	.....	.....	.....	.....	.....
	Mesa et al Prophet d-97-D/94-G-15	2160	.....	.....	.....	.....	.....
	Fina Tommy Lakes a-29-A/94-G-16	566	3-60	768	0.554	2,850	Suspended.
	Ashland Cankee Tb Snowberry b-57-D/94-H-1	1892	.....	.....	.....	.....	.....
	Sun Texaco W Willow d-95-B/94-H-2	1775	.....	.....	.....	.....	.....
	Richfield et al Big Arrow c-71-F/94-H-2	159	.....	.....	.....	.....	.....
	Union et al W Milligan c-50-G/94-H-2	1266	3-63	1,256	0.717	14,000	Suspended.
	Union HB Bluebell d-22-H/94-H-2	2296	.....	.....	.....	.....	.....
	KCL et al Woodrush d-83-H/94-H-2	2115	.....	.....	.....	.....	.....
	CDR Sun Evergreen b-43-J/94-H-2	2056	.....	.....	.....	.....	.....

Gething	Texcan N Nancy d-46-I/94-A-15	1905	.....	.....	.....	.....	.....
	Union HB Beaverdam d-64-L/94-A-16	1825	.....	.....	.....	.....	.....
	Union ROC Firebird d-89-D/94-H-2	707	3-63	1,114	0.825	14,000	Suspended.
Dunlevy	Texaco NFA N La Garde 10-12-88-16	1192	2-63	1,335	0.660	3,270	Suspended.
	Gray Oil PRP NW Grizzly c-25-A/94-I-15	1396	3-64	2,695	0.675	9,300	Suspended.
	Texaco NFA E Osborn a-45-J/94-A-9	1257	.....	.....	.....	.....	.....
	Union Fireweed d-53-G/94-A-13	497	.....	.....	.....	.....	.....
	IOE Fina Rigel c-60-J/94-A-10	2400	.....	.....	.....	.....	.....
	IOE Fina Rigel a-89-J/94-A-10	2354	.....	.....	.....	.....	.....
	CDR Union E Fireweed d-55-H/94-A-13	1201	.....	.....	.....	.....	.....
	Union Birch d-99-E/94-A-14	1630	.....	.....	.....	.....	.....
	HB-BA-Union Lime c-80-C/94-H-1	122	.....	.....	.....	.....	.....
Baldonnel	Westcoast Pingel 13-11-81-17 (8)	4	.....	.....	.....	.....	.....
	Pacific Ft St John 12-7-84-18 (19)	62	7-53	1,563	0.770	2,100	Suspended.
	Pacific Ft St John 1-15-84-19 (5)	30	.....	.....	.....	.....	.....
	Apache et al Wilder 7-2-84-20	1940	.....	.....	.....	.....	.....
	Sinclair Bear Ck 11-18-84-20	243	.....	.....	.....	.....	.....
	Champlin et al Two Rivers 6-9-83-16	2139	.....	.....	.....	.....	.....
	White Rose Sec Montney 10-29-86-18	1130	9-62	1,520	0.669	1,640	Suspended.
	Pacific West Prod E Siphon 6-4-87-15	1865	.....	.....	.....	.....	.....
	Texaco NFA LaGarde 7-21-87-15	145	.....	.....	.....	.....	.....
	Tenn Osborn 6-35-87-15	1200	11-63	1,665	0.754	1,250	Suspended.
	Texaco NFA E Osborn 6-33-88-14	1319	.....	.....	.....	.....	.....
	TGS Falls c-32-F/93-O-9	2230	.....	.....	.....	.....	.....
	Hunt Sands Sun Falls c-18-G/93-O-9	1028	.....	.....	.....	.....	.....
	Triad BP Sukunka a-43-B/93-P-5	1517	9-65	4,601	0.637	120,000	Suspended.
	West Nat et al Alexander d-45-K/94-A-12	2366	.....	.....	.....	.....	.....
	CDR Fireweed d-31-G/94-A-13	1384	.....	.....	.....	.....	.....
	FJP Union Birch b-62-I/94-A-13	834	.....	.....	.....	.....	.....
	Whitehall Numac Nig a-49-J/94-A-13	2012	1-67	1,578	1.000	1,100	Suspended.
	Altair Sarcee C&E Zeke c-34-L/94-A-14	1332	.....	.....	.....	.....	.....
	Texaco NFA Cameron River b-49-L/94-B-9	120	.....	.....	.....	.....	.....
	Security Cypress a-65-C/94-B-15	1339	8-63	1,960	0.669	11,200	Suspended.
	Security Cypress d-87-C/94-B-15	1326	6-63	1,953	0.625	25,000	Suspended.
	Security Cypress a-28-F/94-B-15	737	11-61	1,990	0.537	30,000	Suspended.
	FPC Richfield Daiber c-56-D/94-B-16	432	.....	.....	.....	.....	.....
	FPC Richfield Daiber c-76-D/94-B-16	386	1-59	2,017	0.810	6,600	Suspended.
	Sinclair Pac Julienne Creek b-39-D/94-G-1	658	.....	.....	.....	.....	.....
	Sinclair Julienne Ck a-50-D/94-G-1	304	8-66	2,016	1.000	4,950	Suspended.
	Sinclair et al N Julienne c-54-H/94-G-2	757	.....	.....	.....	.....	.....
	Pan Am Dome Sikanni b-43-B/94-G-7	1335	9-63	1,726	0.832	5,500	Suspended.
	Union ARCo Firebird d-43-D/94-H-2	2060	.....	.....	.....	.....	.....
	Union HB Alder c-39-I/94-H-2	721	.....	.....	.....	.....	.....
	Fargo Nig Creek c-19-C/94-H-4	92	.....	.....	.....	.....	.....
	Tenn Monsanto Nig d-39-C/94-H-4	1448	.....	.....	.....	.....	.....
	Pacific Sunray Imp Sojer a-61-L/94-H-4	472	.....	.....	.....	.....	.....
	Champlin Bass Martin c-91-B/94-H-5	2245	.....	.....	.....	.....	.....

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Author-ization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Other areas—*Continued*							
Slave Point	IOE E Clarke b-6-A/94-J-16	1576	3-67	3,146	0.685	([3])	Suspended.
	Pan Am A-1 Cam Lake a-31-I/94-O-16	594	——	——	——	——	——
	SOBC Helmet b-49-G/94-P-7	1279	——	——	——	——	——
	Tenn FPC Tooga d-18-K/94-P-2	2066	——	——	——	——	——
	West Nat Kathy b-30-F/94-P-3	677	2-61	2,561	0.573	148,000	Suspended.
	Placid Louise c-80-L/94-P-3	1570	——	——	——	——	——
	West Nat Cabin b-40-A/94-P-5	1245	3-63	2,607	0.761	28,900	Suspended.
	West Nat Cabin a-19-G/94-P-5	1406	2-64	2,645	0.554	31,200	Suspended.
	Pacific Cabin a-49-G/94-P-5	2058	——	——	——	——	——
	Texaco NFA Tsea b-68-K/94-P-5	704	3-62	2,646	0.628	76,650	Suspended.
	Texaco NFA Tsea b-99-K/94-P-5	1426	3-64	2,734	0.523	12,600	Suspended.
	Midwest Chevron Peggo d-65-A/94-P-7	2276	——	——	——	——	——
	Pan Am et al Dilly a-30-K/94-P-12	877	3-62	2,766	1.000	14,700	Suspended.
	CanDel Barnwell HB Hoss b-82-G/94-P-14	2234	——	——	——	——	——
Sulphur Point	Socony Mobil Swat b-50-F/94-I-5	1835	——	——	——	——	——
Pine Point	Socony Mobil S Sierra a-98-K/94-I-11	1814	2-67	3,623	1.000	188,000	Suspended.
	Socony Mobil Sierra c-78-C/94-I-14	1602	2-68	3,450	0.662	610,000	Suspended.
	Socony Mobil Sierra c-91-D/94-I-14	1659	2-67	3,460	0.507	71,700	Suspended.
	Pan Am A-1 Komie a-51-A/94-O-8	527	——	——	——	——	——
	Texaco NFA-Missle d-54-A/94-O-9	2232	3-68	3,728	0.550	3,972	Suspended.
	Pan Am IOE Hostli d-48-J/94-P-8	2287	——	——	——	——	——
	Chevron N Helmet a-54-B/94-P-10	2108	——	——	——	——	——
Nahanni	Pan Am Beaver c-27-K/94-N-16	2313	——	——	——	——	——
	Pan Am Beaver c-45-K/94-N-16	2116	12-67	5,837	0.754	85,000	Suspended.
	Pan Am Beaver River d-73-K/94-N-16	682	3-62	5,672	0.653	85,000	Suspended.

[3] Not available.

	CDR Sun Evergreen d-54-J/94-H-2	1918	.....	.....	.....	.....	.....
	Triad BP Pickell b-84-I/94-H-3	908	.....	.....	.....	.....	.....
	Triad BP Birley a-5-A/94-H-6	724	.....	.....	.....	.....	.....
	Lobitos Black d-57-F/94-H-6	1315	.....	.....	.....	.....	.....
Permo-Carboniferous	Texaco NFA East Osborn a-33-J/94-A-9	322	.....	.....	.....	.....	.....
	Pacific Town c-69-J/94-B-16	315	.....	.....	.....	.....	.....
	Mesa et al Moose Lick b-8-K/94-G-2	2185	1-68	2,784	0.625	15,300	Suspended.
	BA HB W Pocketknife d-33-I/94-G-6	1393	8-64	2,054	0.789	121,083	Suspended.
Belloy	FPC Kilkerran 12-13-78-14	154	8-66	3,473	1.000	1,450	Suspended.
	IOE Pac Parkland 10-26-81-16	1355	9-64	2,945	0.500	3,650	Suspended.
	Pacific Alcon Parkland 7-27-81-16	2250	8-68	2,976	0.825	7,900	Suspended.
	Pacific Two Rivers 2-27-82-16	135	.....	.....	.....	.....	.....
	Amerada Pac Ft St John W 11-17-83-19	697	.....	.....	.....	.....	.....
	Pacific et al Stoddart 6-29-85-18	2262	.....	.....	.....	.....	.....
	Pacific Red Creek 6-7-85-20	102	.....	.....	.....	.....	.....
	Apache Pac W Stoddart 11-30-86-20	2199	7-68	2,439	0.615	12,423	Suspended.
	Apache et al W Stoddart 7-5-87-20	2338	.....	.....	.....	.....	.....
Kiskatinaw	Sinclair et al Doe 6-16-81-14	230	.....	.....	.....	.....	.....
Mississippian	West Nat et al Jeans a-57-A/94-A-13	507	9-60	2,472	0.625	2,050	Suspended.
	West Nat et al E Jeans c-A1-H/94-A-13	455	.....	.....	.....	.....	.....
	Sinclair et al Lily d-12-K/94-G-2	385	5-59	2,598	1.000	21,800	Suspended.
	HB Pacific Pocketknife c-37-L/94-G-7	468	7-60	1,727	0.642	26,600	Suspended.
	Mesa et al Prophet d-97-D/94-G-15	2160	.....	.....	.....	.....	.....
	West Nat Bougie Creek a-49-I/94-G-15	138	.....	.....	.....	.....	.....
	Dome et al Imp Slave c-10-I/94-H-11	2225	3-68	2,684	0.500	1,400	Suspended.
	Union IOE Bigfoot d-27-C/94-I-4	508	.....	.....	.....	.....	.....
	ROCK Pan Am Shekilie d-73-K/94-I-9	2110	.....	.....	.....	.....	.....
	Sohio C&E Ekwan a-55-G/94-I-10	897	.....	.....	.....	.....	.....
	Texaco NFA Walrus b-86-L/94-I-16	947	.....	.....	.....	.....	.....
	Pacific S Ft Nelson b-96-B/94-J-10	348	5-58	1,051	0.599	2,350	Suspended.
	Pacific North Kotcho c-93-C/94-P-3	579	.....	.....	.....	.....	.....
	Texaco NFA Judy c-53-D/94-P-6	717	.....	.....	.....	.....	.....
Slave Point	HB Imperial Union Paddy b-49-B/94-H-16	129	8-55	3,114	1.000	8,250	Suspended.
	IOE Junior c-3-C/94-I-11	1249	3-63	2,696	0.500	4,700	Suspended.
	Imp Junior c-98-C/94-I-11	926	3-62	2,714	0.500	90,000	Suspended.
	Pacific Gunnel c-95-L/94-I-12	1239	.....	.....	.....	.....	.....
	West Nat et al Yoyo a-74-H/94-I-13	887	3-62	2,686	0.791	185,000	Suspended.
	Pacific Sinclair Shekilie b-46-A/94-I-16	2038	.....	.....	.....	.....	.....
	Pacific Shekilie b-24-A/94-I-16	1816	.....	.....	.....	.....	.....
	Atlantic Tees c-15-J/94-I-6	1542	.....	.....	.....	.....	.....
	Pacific Tenaka b-7-C/94-J-7	2217	.....	.....	.....	.....	.....
	Triad Sohio Pac Jackfish a-30-K/94-J-8	999	.....	.....	.....	.....	.....
	BA Shell Klua Creek a-50-C/94-J-9	157	.....	.....	.....	.....	.....
	West Nat Imp Clarke Lake b-78-J/94-J-9	700	.....	.....	.....	.....	.....
	Pacific et al Milo c-43-E/94-J-10	2260	.....	.....	.....	.....	.....

TABLE 20.—OILFIELD RESERVOIR DATA

Field	Pool	Rock Type	Age	Trapping	Producing Mechanism	Pool Area (Acres)	Net Pay (Feet)	Porosity (%)	Water Saturation (%)	Permeability (Md.)	Shrinkage (S.T.B./R.B.)	Initial Reservoir Pressure (Psig.)	Reservoir Temperature (° F.)	Initial Solution G.O.R. (S.C.F./S.T.B.)	Formation Depth (Feet S.S.)
Aitken Creek	Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	Depletion and gas cap	1,062	17.10	12.00	18.0	3,340	0.77	1,534	140	(1)	1,280
Beatton River	Halfway	Sandstone	Triassic	Structural-stratigraphic	Waterflood	1,201	12.50	21.50	27.0	288	0.86	1,177	129	285	1,145
Beatton River West	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	Depletion and gas cap	2,069	9.00	15.20	31.4	65	0.80	1,017	120	398	876
Beaverdam	Halfway	Sandstone	Triassic	Stratigraphic	Depletion	(1)	24.00	12.90	13.0	16	0.83	1,286	127	308	1,350
Blueberry	Dunlevy	Sandstone	Lower Cretaceous	Stratigraphic	Depletion	(1)	10.40	6.70	55.0	(1)	0.75	.....	130	(1)	1,200
	Debolt	Carbonate	Mississippian	Structural-stratigraphic	Gas cap and partial water	4,148	38.50	10.50	16.6	31	0.76	2,700	165	614	4,030
Boundary Lake	Cadomin	Sandstone	Lower Cretaceous	Structural	Water	489	7.00	20.00	41.0	75	0.80	1,460	116	(1)	1,350
	Boundary Lake	Carbonate	Triassic	Structural-stratigraphic	Waterflood	48,490	11.70	18.30	10.9	45	0.80	1,786	110	485	1,750
	Halfway	Sandstone	Triassic	Structural	Water and partial gas cap	1,141	11.60	13.00	26.0	14	0.82	1,685	125	(1)	2,050
Buick Creek East	Dunlevy	Sandstone	Lower Cretaceous	Structural	Depletion	(1)	31.00	9.70	18.0	(1)	0.75	(1)	124	108	1,225
Buick Creek West	Dunlevy	Sandstone	Lower Cretaceous	Structural	Depletion	1,718	15.70	13.00	30.0	(1)	0.93	1,173	126	108	1,214
Bulrush	Halfway	Sandstone	Triassic	Stratigraphic	Depletion and gas cap	1,483	5.50	16.60	11.0	212	0.83	1,336	130	299	1,350
Bulrush East	Halfway	Sandstone	Triassic	Stratigraphic	Depletion	(1)	6.20	15.00	12.0	(1)	0.83	1,335	130	299	1,290
Charlie Lake	Gething	Sandstone	Lower Cretaceous	Stratigraphic	Depletion	(1)	13.00	19.00	7.0	(1)	0.83	1,097	116	(1)	1,020
Crush	Halfway	Sandstone	Triassic	Structural-stratigraphic	Depletion	2,214	6.90	17.80	10.0	250	0.84	(1)	142	376	1,406
Currant	Halfway	Sandstone	Triassic	Stratigraphic	Waterflood	1,750	6.30	16.20	15.0	81	0.83	1,398	128	308	1,555
Fort St. John	Charlie Lake	Sandstone	Triassic	Stratigraphic	Gas cap	1,319	3.30	14.00	23.0	570	0.77	1,939	125	575	2,325
	Belloy	Carbonate	Permian	Structural-stratigraphic	Depletion	(1)	21.00	10.00	25.0	23	0.75	2,770	155	(1)	4,160
Halfway	Inga	Sandstone	Triassic	Stratigraphic	Depletion	(1)	5.00	10.00	11.0	(1)	0.75	2,112	115	(1)	2,241
Inga	Inga	Sandstone	Triassic	Structural-stratigraphic	Depletion and gas cap	27,083	6.65	12.80	20.0	200	0.77	2,294	140	683	2,465
Milligan Creek	Halfway	Sandstone	Triassic	Structural-stratigraphic	Waterflood	2,936	18.90	22.70	13.9	23	0.89	1,184	132	222	1,200
Moberly Lake	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	Depletion	76.4	5.00	14.00	9.0	(1)	0.75	2,290	130	700	2,233
Nettle	Bluesky-Gething	Sandstone	Lower Cretaceous	Stratigraphic	Depletion and gas cap	494	3.60	15.30	40.7	127	0.80	960	127	398	700

TABLE 19.—HYDROCARBON AND BY-PRODUCTS RESERVES, DECEMBER, 31, 1968

	Crude Oil, M S.T.B.		Raw Gas, B S.C.F.		Established			
	Proved	Probable	Proved	Probable	Residue Gas, B S.C.F.	Residue Gas (Basis 1,000 B.T.U./S.C.F.) B S.C.F.	Natural-gas Liquids, M S.T.B.	Sulphur M L.T.
Original hydrocarbon in place	1,244,904	50,630	11,319.0	384.0	.....	.....	.....	.....
			Established					
Ultimate recovery	381,425	99,357	10,220.3		8,947.6	9,334.8	159,724	3,486
Cumulative production to December 31, 1968	108,470	.....	1,569.4		1,406.9	1,514.9	41,206	689
Reserves at December 31, 1968	272,954	99,357	8,650.9		7,540.7	7,819.9	118,519	2,797
Revisions in 1968	−17,304	+86,063	−133.4		−89.7	−66.7	+7,379	−137
Drilling in 1968	+15,945	+1,531	+274.4		+240.2	+253.2	+5,208	+258
Production in 1968	22,150	.....	260.4		231.7	240.9	5,301	53
Reserves at December 31, 1967	296,464	11,763	8,770.3		7,621.9	7,874.2	111,203	2,729

NOTES:

M S.T.B.=Thousands of stock-tank barrels, where one barrel contains 34.97 imperial gallons.

B S.C.F.=Billions of standard cubic feet at 14.65 psia. and 60° F.

M L.T.=Thousands of long tons.

Associated gas reserves are included for pools in which a conservation scheme is in operation.

The production data shown above for residue gas, natural-gas liquids, and sulphur are based on theoretical volumes produced with the raw gas and are derived from gas-analysis data. The actual volume of gas delivered to transmission-lines in 1968 was 224.2 B S.C.F., and actually extracted quantities of natural-gas liquid and sulphur were 1,888,598 barrels and 46,668 long tons respectively.

TABLE 21.—GASFIELD RESERVOIR DATA

Field	Pool	Rock Type	Age	Trapping	Pool Area (Acres)	Net Pay (Feet)	Porosity (%)	Water Saturation (%)	Permeability (Md.)	Compressibility Factor	Specific Gravity	Reservoir Pressure (Psig.)	
												Original	Current
Airport	Cadomin	Sandstone	Lower Cretaceous	Stratigraphic	(1)	23	18	40	(1)	0.870	0.581	1,432	(1)
	Baldonnel	Carbonate	Triassic	Stratigraphic	(1)	10	10	38	(1)	0.825	0.661	1,614	(1)
	Halfway	Sandstone	Triassic	Stratigraphic	(1)	13	10	25	(1)	0.825	0.623	2,039	(1)
Beaver River area (d-27-K, d-45-K, d-73-K/94-N-16)	Nahanni	Carbonate	Devonian	Structural	(1)	(1)	(1)	(1)	(1)	1.095	0.634	5,804	(1)
Beg	Baldonnel	Carbonate	Triassic	Structural	12,936	32	8	21	65	0.840	0.652	1,630	(1)
	Halfway	Sandstone	Triassic	Structural	16,410	36	10	35	(1)	0.839	(1)	1,820	(1)
Beg West	Baldonnel	Carbonate	Triassic	Structural	1,645	98	8	23	23	0.848	0.653	1,674	(1)
Bernadet	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	13	8	15	(1)	0.838	0.644	1,193	(1)
Blueberry	Dunlevy	Sandstone	Lower Cretaceous	Structural	(1)	16	11	33	10	0.852	0.659	1,363	(1)
	Baldonnel	Carbonate	Triassic	Structural	(1)	16	10	37	38	0.837	0.673	1,611	(1)
	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	(1)	31	10	30	(1)	0.658	0.802	2,073	(1)
Blueberry East	Baldonnel	Carbonate	Triassic	Structural	(1)	(1)	(1)	(1)	(1)	0.824	0.675	1,888	(1)
	Debolt	Carbonate	Mississippian	Structural	(1)	17	12	31	(1)	0.875	0.615	2,680	(1)
Blueberry West	Dunlevy	Sandstone	Lower Cretaceous	Structural	(1)	9	10	25	62	0.850	0.658	1,424	(1)
	Baldonnel	Carbonate	Triassic	Structural	(1)	16	9	23	84	0.824	0.646	1,715	(1)
Boundary Lake	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	19	13	39	(1)	0.863	0.622	1,141	(1)
	Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	57	17	16	(1)	0.847	0.641	1,371	(1)
	Baldonnel	Carbonate	Triassic	Structural	2,506	20	14	34	(1)	0.799	0.677	1,447	(1)
	Boundary Lake Zone	Carbonate	Triassic	Structural	(1)	5	20	6	133	0.810	0.683	1,701	(1)
	Halfway	Sandstone	Triassic	Structural	(1)	23	10	38	(1)	0.838	0.631	1,555	(1)
Boundary Lake North	Halfway	Sandstone	Triassic	Stratigraphic	5,711	46	17	30	57	0.845	0.657	1,566	(1)
Bubbles	Baldonnel	Carbonate	Triassic	Structural	7,399	51	10	17	33	0.842	0.663	1,598	(1)
Bubbles North area (d-95-B, d-6-G/94-G-8)	Halfway	Sandstone	Triassic	Stratigraphic	1,222	37	8	24	(1)	0.860	0.663	1,618	(1)
Buick Creek	Dunlevy	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	25	13	28	140	0.836	0.659	1,290	(1)
	Baldonnel	Carbonate	Triassic	Stratigraphic	(1)	28	8	25	(1)	0.830	(1)	1,400	(1)
	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	(1)	6	13	33	(1)	0.859	0.613	1,554	(1)
Buick Creek East	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	701	10	10	47	(1)	0.865	0.637	1,092	(1)

Nig Creek	Baldonnel	Carbonate	Triassic	Stratigraphic	Depletion and gas cap	1,624	13.50	9.00	40.0	(1)	0.79	1,533	125	490	1,350
Osprey	Halfway	Sandstone	Triassic	Stratigraphic	Depletion	1,178	4.80	8.10	16.0	67	0.85	1,432	(1)	298	1,535
Parkland area (10-26 and 7-27-81-16)	Belloy	Carbonate	Permian	Structural-stratigraphic	Depletion and gas cap	2,542	19.10	5.80	35.4	(1)	0.75	2,930	153	(1)	4,658
Peejay	Halfway	Sandstone	Triassic	Stratigraphic	Waterflood	21,421	10.00	15.37	21.0	106	0.83	1,382	130	308	1,514
Peejay West	Halfway	Sandstone	Triassic	Stratigraphic	Depletion	984	6.00	24.90	34.2	82	0.83	1,425	131	308	1,600
Rigel	Dunlevy	Sandstone	Lower Cretaceous	Stratigraphic	Depletion	(1)	9.00	13.00	42.0	330	0.87	1,288	120	267	(1)
Stoddart	Belloy	Carbonate	Permian	Structural-stratigraphic	Depletion	1,921	8.50	10.30	42.6	8	0.85	2,453	155	300	3,800
Weasel	Halfway	Sandstone	Triassic	Stratigraphic	Waterflood	6,254	11.40	16.30	27.5	400	0.87	1,284	132	298	1,270
Wildmint	Halfway	Sandstone	Triassic	Structural-stratigraphic	Waterflood	2,381	9.80	18.10	18.0	202	0.88	1,226	132	260	1,270
Willow	Bluesky-Gething	Sandstone	Lower Cretaceous	Stratigraphic	Depletion	218	4.00	34.00	16.0	150	0.89	987	132	216	820
Wolf	Halfway	Sandstone	Triassic	Structural-stratigraphic	Depletion	666	8.00	17.30	37.6	218	0.83	1,446	143	308	1,684

[1] Not available.

TABLE 21.—GASFIELD RESERVOIR DATA—*Continued*

Field	Pool	Rock Type	Age	Trapping	Pool Area (Acres)	Net Pay (Feet)	Porosity (%)	Water Saturation (%)	Permeability (Md.)	Compressibility Factor	Specific Gravity	Reservoir Pressure (Psig.)	
												Original	Current
Highway	Dunlevy	Sandstone	Lower Cretaceous	Structural	(1)	14	9	25	85	0.857	0.669	1,348	(1)
	Baldonnel	Carbonate	Triassic	Structural	3,980	5	10	25	124	0.832	0.675	1,643	(1)
	Debolt	Carbonate	Mississippian	Structural	3,540	13	10	25	105	0.903	0.609	3,122	(1)
Inga	Baldonnel	Carbonate	Triassic	Structural	3,527	16	11	25	(1)	0.785	0.689	1,790	(1)
Jedney	Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	10	11	24	(1)	0.870	0.663	1,125	(1)
	Baldonnel	Carbonate	Triassic	Structural	(1)	60	10	10	34	0.849	0.693	1,590	(1)
	Halfway	Sandstone	Triassic	Structural	13,661	56	10	20	16	0.842	0.673	1,633	(1)
Jedney West	Baldonnel	Carbonate	Triassic	Structural	(1)	11	9	64	(1)	0.850	0.693	1,622	(1)
	Halfway	Sandstone	Triassic	Structural	2,864	35	8	45	(1)	0.839	0.673	1,768	(1)
Julienne area (b-39-D, a-50-D/94-G-1)	Baldonnel	Carbonate	Triassic	Structural-stratigraphic	1,403	19	12	25	(1)	0.825	0.656	2,024	(1)
Kobes-Townsend	Dunlevy	Sandstone	Lower Cretaceous	Structural	(1)	26	13	20	18	0.782	0.651	1,488	(1)
	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	(1)	12	11	29	(1)	0.820	0.629	2,470	(1)
	Halfway	Sandstone	Triassic	Structural-stratigraphic	2,925	24	8	28	5	0.823	0.638	2,641	(1)
	Belloy	Carbonate	Permian	Structural-stratigraphic	224	8	13	19	(1)	0.803	0.695	2,686	(1)
	Debolt	Carbonate	Mississippian	Structural-stratigraphic	(1)	21	5	16	10	0.841	0.647	3,025	(1)
Kotcho Lake	Slave Point	Carbonate	Devonian	Stratigraphic	4,606	19	10	8	46	0.920	0.670	2,548	(1)
Laprise Creek	Baldonnel	Carbonate	Triassic	Structural-stratigraphic	37,613	66	10	19	(1)	0.844	0.676	1,528	(1)
Laprise Creek West	Baldonnel	Carbonate	Triassic	Structural-stratigraphic	(1)	44	10	23	48	0.845	0.694	1,326	(1)
Montney	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	6	17	45	(1)	0.843	0.670	1,250	(1)
	Baldonnel	Carbonate	Triassic	Stratigraphic	(1)	46	13	41	(1)	0.835	0.658	1,478	(1)
	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	(1)	5	20	30	(1)	0.830	0.664	1,750	(1)
	Halfway	Sandstone	Triassic	Structural	(1)	15	15	33	67	0.807	0.704	1,849	(1)
Nettle	Halfway	Sandstone	Triassic	Structural	(1)	5	17	11	(1)	0.878	0.635	1,063	(1)
Nig Creek	Baldonnel	Carbonate	Triassic	Structural-stratigraphic	44,722	38	11	24	(1)	0.844	0.677	1,642	(1)
	Halfway	Sandstone	Triassic	Stratigraphic	(1)	26	10	26	(1)	0.787	0.748	1,733	(1)
	Slave Point	Carbonate	Devonian	Stratigraphic	(1)	29	7	30	(1)	0.976	0.762	4,500	(1)

	Dunlevy	Sandstone	Lower Cretaceous	Structural-stratigraphic	7,709	16	11	29	125	0.853	0.649	1,288	(1)
Buick Creek North	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	1,280	9	12	36	(1)	0.833	0.685	1,304	(1)
	Dunlevy	Sandstone	Lower Cretaceous	Structural-stratigraphic	4,088	25	11	29	(1)	0.849	0.670	1,248	(1)
Buick Creek West	Dunlevy	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	37	12	32	165	0.849	0.657	1,302	(1)
	Baldonnel	Carbonate	Triassic	Structural-stratigraphic	(1)	18	11	27	45	0.817	0.698	1,467	(1)
	Halfway	Sandstone	Triassic	Structural	(1)	39	11	31	21	0.782	0.748	1,721	(1)
Cabin area (a-19-G, b-40-A, a-49-G/94-P-5)	Slave Point	Carbonate	Devonian	Stratigraphic	1,202	25	11	15	(1)	0.938	0.651	2,636	(1)
Clarke Lake	Jean Marie	Carbonate	Devonian	Stratigraphic	(1)	78	8	25	(1)	0.909	0.607	1,580	(1)
	Slave Point	Carbonate	Devonian	Stratigraphic	19,672	136	8	17	(1)	0.929	0.671	2,895	(1)
Clarke Lake South	Slave Point	Carbonate	Devonian	Stratigraphic	3,108	52	33	25	(1)	0.928	0.671	2,845	(1)
Cypress area (a-28-F, d-87-C, a-65-C/94-B-15)	Baldonnel	Carbonate	Triassic	Structural	3,196	36	8	27	(1)	0.850	0.584	1,949	(1)
Dawson Creek	Cadotte	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	43	16	25	33	0.922	0.581	679	(1)
Evergreen area (b-43-J, d-54-J/94-H-2)	Halfway	Sandstone	Triassic	Structural	1,400	13	19	17	(1)	0.873	0.640	1,157	(1)
Farrell Creek	Charlie Lake	Sandstone	Triassic	Structural	1,704	3	9	15	13	0.800	0.644	2,568	(1)
	Halfway	Sandstone	Triassic	Structural	1,320	6	9	21	(1)	0.805	0.658	2,322	(1)
Fort St. John	Cadomin	Sandstone	Lower Cretaceous	Structural	2,620	8	12	40	421	0.869	0.581	1,324	(1)
	Baldonnel	Carbonate	Triassic	Structural	(1)	33	12	25	1,212	0.822	0.661	1,603	(1)
	Halfway	Sandstone	Triassic	Structural	(1)	28	11	25	23	0.799	0.680	2,014	(1)
	Belloy	Carbonate	Permian	Structural-stratigraphic	(1)	11	12	25	59	0.830	0.655	2,749	(1)
	Debolt	Carbonate	Mississippian	Stratigraphic	(1)	10	22	25	(1)	0.847	0.671	2,959	(1)
Fort St. John Southeast	Cadomin	Sandstone	Lower Cretaceous	Structural	(1)	32	16	40	64	0.865	0.581	1,389	(1)
	Baldonnel	Carbonate	Triassic	Structural	(1)	12	18	28	30	0.778	0.702	1,634	(1)
	Halfway	Sandstone	Triassic	Structural	(1)	16	10	25	14	0.821	0.693	2,015	(1)
	Belloy	Carbonate	Permian	Structural-stratigraphic	(1)	16	9	25	62	0.842	0.640	2,816	(1)
Gundy Creek	Dunlevy	Sandstone	Lower Cretaceous	Stratigraphic	(1)	8	16	23	(1)	0.820	0.659	1,680	(1)
	Baldonnel	Carbonate	Triassic	Structural	3,864	9	9	20	69	0.850	0.630	1,731	(1)
	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	(1)	10	7	25	(1)	0.826	0.656	2,339	(1)
Halfway	Baldonnel	Carbonate	Triassic	Structural	2,984	31	8	35	6	0.818	0.639	1,642	(1)
	Halfway	Sandstone	Triassic	Structural	(1)	7	16	25	49	0.800	0.649	2,212	(1)

[1] Not available.

TABLE 22.—WELLS DRILLED AND DRILLING, 1968

Well Authorization No.	Well Name	Date Spudded	Date Rig Released	Total Depth	Status at December 31, 1968
2279	Alcon IOE Tees b-86-G	Jan. 23, 1968	Feb. 29, 1968	6,615	Abandoned—dry.
2272	Amarillo et al Antelope d-51-I	Jan. 17, 1968	Jan. 25, 1968	3,660	Abandoned—dry.
2241	Amarillo Cabot W Jeans b-82-J	Dec. 20, 1967	Jan. 9, 1968	5,484	Charlie Lake gas well.
2320	Amarillo et al W Jeans a-5-B	Mar. 20, 1968	Apr. 14, 1968	5,360	Charlie Lake gas well.
2258	Amarillo Cabot Rigel 7-30-88-16	Jan. 3, 1968	Jan. 14, 1968	3,658	Dunlevy gas well.
2371	Apache et al N Cache 10-9-87-21	Sept. 5, 1968	Sept. 26, 1968	6,780	Abandoned—dry.
2392	Apache Snyder b-82-E	Oct. 4, 1968	Oct. 13, 1968	4,160	Abandoned—dry.
2338	Apache et al W Stoddart 7-5-87-20	June 22, 1968	July 14, 1968	6,500	Belloy gas well.
2359	Apache et al W Stoddart 7-7-87-20	Aug. 9, 1968	Aug. 27, 1968	6,600	Abandoned—dry.
2388	Apache Pac W Stoddart 11-32-86-20	Sept. 30, 1968	Oct. 19, 1968	6,335	Abandoned—dry.
2243	Apache Pac W Stoddart 11-24-86-21	Dec. 27, 1967	Jan. 30, 1968	6,610	Abandoned—dry.
2389	Apache Pac Teal 6-9-87-22	Sept. 29, 1968	Nov. 1, 1968	7,117	Abandoned—dry.
2259	Banff et al Beaverskin a-75-G	Jan. 2, 1968	Feb. 23, 1968	7,970	Abandoned—dry.
2306	Banff Aquit Kathleen a-35-E	Feb. 29, 1968	Apr. 1, 1968	7,340	Abandoned—dry.
2317	Banner Triad Elm d-55-C	Mar. 4, 1968	Mar. 13, 1968	3,855	Abandoned—dry.
2347	Baysel SR CanDel Osprey d-94-G	July 6, 1968	July 18, 1968	3,900	Halfway oil well.
2319	CanDel Barnwell HB Hoss d-52-G	Mar. 8, 1968	Apr. 1, 1968	6,472	Abandoned—dry.
2234	CanDel Barnwell Hoss b-82-G	Dec. 24, 1967	Feb. 29, 1968	7,655	Slave Point gas well.
2329	CanDel Barnwell HB Jon a-85-J	Apr. 4, 1968	Dec. 26, 1968	7,832	Abandoned—dry.
2111	Cankee et al Elleh b-88-D	Feb. 25, 1967	Jan. 14, 1968	8,020	Abandoned—dry.
2231	Cdn Sup et al Gutah a-97-G	Dec. 25, 1967	Feb. 14, 1968	9,384	Abandoned—dry.
2393	Cdn-Sup Whitehall Inga 6-20-88-23	Sept. 30, 1968	Oct. 14, 1968	5,412	Inga oil well.
2368	Cdn-Sup Inga 1-36-88-24	Aug. 26, 1968	Sept. 5, 1968	5,330	Water injection well.
2379	Cdn-Sup et al Inga c-16-J	Sept. 12, 1968	Sept. 28, 1968	5,410	Inga oil well.
2326	Cdn-Sup Champlin Peejay d-50-C	Mar. 23, 1968	Apr. 6, 1968	3,960	Abandoned—dry.
2247	Cdn Sup IOE et al Teklo a-34-H	Jan. 15, 1968	Feb. 20, 1968	7,462	Abandoned—dry.
2295	CDR Wargen c-12-G	Feb. 15, 1968	Mar. 4, 1968	4,110	Abandoned—dry.
2245	Champlin Bass Martin c-91-B	Jan. 13, 1968	Feb. 9, 1968	4,541	Baldonnel gas well.
2290	Champlin Bass Martin b-68-G	Feb. 12, 1968	Feb. 24, 1968	4,535	Abandoned—dry.
2267	CIGOL Crush d-40-F	Jan. 8, 1968	Jan. 19, 1968	3,880	Abandoned—dry.
2266	CIGOL Crush d-50-F	Jan. 21, 1968	Jan. 28, 1968	3,802	Abandoned—dry.
2337	CIGOL Spruce d-52-E	May 28, 1968	June 3, 1968	3,835	Abandoned—dry.
2215	Columbian Monkman Pass a-54-G	Nov. 5, 1967	June 21, 1968	14,588	Abandoned—dry.
2291	Cox et al BA Shell Klua b-21-D	Feb. 12, 1968	Mar. 11, 1968	7,339	Abandoned—dry.
2378	CPOG Farmington 11-11-80-17	Sept. 23, 1968	Dec. 29, 1968	13,206	Abandoned—dry.
2307	CPOG Red Creek 2-2-86-22	Mar. 3, 1968	Mar. 26, 1968	5,185	Abandoned—dry.
2414	Davis CDR NFA Osborn 10-35-88-15	Dec. 15, 1968	Dec. 31, 1968	4,120	Abandoned—dry.
2336	Davis Francana Stoddart 6-20-85-19	May 23, 1968	June 17, 1968	6,498	Abandoned—dry.
2303	Decalta et al Beaverskin a-7-C	Feb. 24, 1968	Mar. 30, 1968	7,673	Abandoned—dry.
2434	Dome et al Boudreau 6-10-83-21	Dec. 31, 1968	.....	.....	Drilling.
2421	Dome et al Monias 7-8-82-21	Dec. 7, 1968	Dec. 13, 1968	2,178	Abandoned—junked.

Nig Creek West area (c-19-C, d-39-C/94-H-4)	Baldonnel	Carbonate	Triassic	Stratigraphic	1,448	35	11	25	(1)	0.815	0.693	1,639	(1)
North Pine	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	3,140	5	13	15	(1)	0.790	0.675	1,944	(1)
Parkland	Belloy	Carbonate	Permian	Structural-stratigraphic	2,532	21	7	21	(1)	0.864	0.674	2,933	(1)
	Wabamun	Carbonate	Devonian	Structural-stratigraphic	(1)	(1)	13	16	(1)	1.022	0.623	4,900	(1)
Peejay	Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	17	16	28	(1)	0.869	0.642	1,076	(1)
Petitot River	Slave Point	Carbonate	Devonian	Structural-stratigraphic	3,185	84	7	18	(1)	0.936	0.673	2,775	(1)
Red Creek	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	(1)	6	18	32	(1)	0.838	0.614	1,866	(1)
	Halfway	Sandstone	Triassic	Structural	3,416	19	11	20	18	0.729	0.779	2,021	(1)
Rigel	Bluesky	Sandstone	Lower Cretaceous	Structural-stratigraphic	(1)	7	12	43	(1)	0.863	0.637	1,084	(1)
	Dunlevy	Sandstone	Lower Cretaceous	Structural-stratigraphic	45,699	15	14	27	(1)	0.847	0.654	1,274	(1)
Shekilie area (b-24-A, b-46-A/94-I-16)	Slave Point	Carbonate	Devonian	Stratigraphic	2,520	50	6	33	(1)	0.896	0.649	2,279	(1)
Sierra area (c-78-C, c-91-D/94-I-14)	Pine Point	Carbonate	Devonian	Stratigraphic	3,680	186	7	15	(1)	0.938	0.690	3,556	(1)
Stoddart	Belloy	Carbonate	Permian	Stratigraphic	14,498	13	15	10	(1)	0.805	0.695	2,411	(1)
Stoddart Northwest area (11-30-86-20, 7-5, 7-7-87-20)	Belloy	Carbonate	Permian	Stratigraphic	1,837	23	12	20	(1)	0.824	0.664	2,421	(1)
Stoddart West	Belloy	Carbonate	Permian	Stratigraphic	1,801	7	14	14	24	0.805	0.695	2,411	(1)
Sunrise area (11-31-78-16, 10-7, 10-9-79-16)	Cadotte	Sandstone	Lower Cretaceous	Stratigraphic	1,500	32	20	55	(1)	0.924	0.589	696	(1)
Tsea area (b-68-K, b-99-K/94-P-5)	Slave Point	Carbonate	Devonian	Stratigraphic	2,369	82	8	18	(1)	0.935	0.657	2,704	(1)
Weasel	Baldonnel	Carbonate	Triassic	Structural	1,890	8	14	36	(1)	0.848	0.638	1,104	(1)
	Halfway	Sandstone	Triassic	Structural	(1)	6	9	55	(1)	0.842	0.649	1,301	(1)
Willow	Halfway	Sandstone	Triassic	Structural	1,233	12	19	17	(1)	0.854	0.635	1,226	(1)
Wolf (d-14-G/94-A-15)	Halfway	Sandstone	Triassic	Structural	(1)	5	16	43	(1)	0.829	0.645	1,462	(1)
Yoyo	Slave Point	Carbonate	Devonian	Stratigraphic	(1)	181	10	14	(1)	0.905	0.705	2,672	(1)
	Pine Point	Carbonate	Devonian	Structural-stratigraphic	9,679	136	8	15	(1)	0.928	0.704	2,900	(1)

[1] Not available.

TABLE 22.—WELLS DRILLED AND DRILLING, 1968—*Continued*

Well Authorization No.	Well Name	Date Spudded	Date Rig Released	Total Depth	Status at December 31, 1968
2299	Murphy et al Inga 16-7-86-23	Mar. 15, 1968	Apr. 4, 1968	5,485	Inga oil well.
2285	Pacific SR CanDel Akue d-18-B	Feb. 8, 1968	Mar. 29, 1968	10,110	Abandoned—dry.
2425	Pacific Cabin d-67-B	Dec. 20, 1968	.....	.....	Drilling.
2252	Pacific IOE Cache 13-16-86-22	Dec. 29, 1967	Jan. 24, 1968	5,781	Abandoned—dry.
2316	Pacific et al Clarke b-18-I	Mar. 6, 1968	Apr. 2, 1968	6,450	Slave Point gas well.
2249	Pacific et al Clarke c-69-I	Feb. 3, 1968	Apr. 4, 1968	8,470	Slave Point gas well. Abandoned—dry. Whipstocked hole.
2310	Pacific Imp Clarke c-85-I	Mar. 3, 1968	Mar. 31, 1968	6,465	Slave Point gas well.
2239	Pacific et al Clarke c-43-J	Dec. 23, 1967	Jan. 29, 1968	6,424	Slave Point gas well.
2240	Pacific Imp Clarke b-69-L	Dec. 20, 1967	Jan. 28, 1968	7,095	Water disposal.
2318	Pacific SR CanDel Heron d-70-I	Mar. 5, 1968	Mar. 14, 1968	3,810	Abandoned—dry.
2327	Pacific Inga 6-29-86-23	May 26, 1968	June 14, 1968	4,950	Baldonnel gas well.
2401	Pacific Inga 6-32-86-23	Oct. 22, 1968	Nov. 7, 1968	4,865	Baldonnel gas well.
2412	Pacific Inga 6-4-87-23	Nov. 20, 1968	Dec. 13, 1968	5,130	Baldonnel gas well.
2301	Pacific SR CanDel Kestrel d-42-J	Feb. 20, 1968	Mar. 3, 1968	3,800	Abandoned—dry.
2260	Pacific et al Milo c-43-E	Jan. 8, 1968	Feb. 25, 1968	7,131	Slave Point gas well.
2250	Pacific Alcon Parkland 7-27-81-16	Dec. 30, 1967	Mar. 4, 1968	7,320	Belloy gas well.
2426	Pacific et al Peejay b-47-E	Dec. 19, 1968	.....	.....	Drilling.
2280	Pacific Sinclair Peejay b-42-H	Feb. 1, 1968	Feb. 12, 1968	3,950	Halfway oil well.
2257	Pacific Peggo b-83-D	Jan. 11, 1968	Feb. 21, 1968	6,844	Abandoned—dry.
2262	Pacific et al Stoddart 6-29-85-18	Jan. 3, 1968	Jan. 22, 1968	6,004	Belloy gas well.
2324	Pacific et al Wargen d-37-C	Mar. 19, 1968	Mar. 30, 1968	3,720	Bluesky-Gething oil well.
2394	Pacific et al Weasel b-3-B	Oct. 4, 1968	Oct. 13, 1968	3,868	Water injection.
2399	Pacific et al Weasel b-13-B	Oct. 14, 1968	Oct. 22, 1968	3,849	Water injection.
2349	Pacific Sinc Weasel b-93-J	July 24, 1968	July 31, 1968	3,872	Halfway oil well.
2271	Pacific Yoyo a-2-L	Jan. 21, 1968	Mar. 13, 1968	8,089	Pine Point gas well.
2313	Pan Am Beaver c-27-K	Mar. 15, 1968	Nov. 18, 1968	13,900	Nahanni gas well.
2237	Pan Am Coplin 6-9-86-23	Dec. 23, 1967	Jan. 23, 1968	5,350	Abandoned—dry.
2302	Pan Am Coplin 16-19-86-23	Feb. 26, 1968	Mar. 17, 1968	5,416	Abandoned—dry.
2251	Pan Am Coplin 6-20-86-23	Jan. 1, 1968	Jan. 17, 1968	5,100	Inga oil well.
2289	Pan Am Coplin 6-21-86-23	Feb. 11, 1968	Feb. 24, 1968	4,916	Abandoned—dry.
2406	Pan Am Dome Silver d-81-L	Nov. 2, 1968	Dec. 10, 1968	4,030	Bluesky-Gething gas well.
2361	Pan Am Inga 6-32-85-23	July 26, 1968	Aug. 11, 1968	5,400	Abandoned—dry.
2351	Pan Am Inga 6-5-86-23	Feb. 13, 1968	Feb. 21, 1968	5,240	Inga oil well.
2398	Pan Am Inga 16-5-86-23	Oct. 8, 1968	Oct. 26, 1968	4,900	Abandoned—dry.
2340	Pan Am Inga 6-8-86-23	June 9, 1968	June 23, 1968	5,225	Inga oil well.
2287	Pan Am IOE Hostli d-48-J	Feb. 15, 1968	Mar. 23, 1968	6,646	Pine Point gas well.
2256	Pan Am Nettle d-93-B	Dec. 31, 1967	Jan. 13, 1968	3,960	Abandoned—dry.
2268	Pan Am Paulsen a-41-J	Jan. 6, 1968	Feb. 10, 1968	6,814	Abandoned—dry.
2424	Pan Am Redeye c-89-A	Dec. 19, 1968	Dec. 27, 1968	3,680	Abandoned—dry.
2242	Penzl JBA Moberly 14-15-82-21	Jan. 10, 1968	Apr. 12, 1968	9,393	Abandoned—dry.

2428	Dome et al Monias A7-8-82-21	Dec. 14, 1968	----------	----------	Drilling.
2225	Dome et al Imp Slave d-10-I	Dec. 11, 1967	Mar. 5, 1968	9,750	Mississippian gas well.
2348	Dome Stoddart 10-3-86-19	July 3, 1968	July 21, 1968	6,199	Abandoned—dry.
2275	Forest et al Bivouac c-94-I	Jan. 20, 1968	Mar. 10, 1968	7,695	Abandoned—dry.
2357	French JR et al Flatrock 11-9-85-15	July 23, 1968	Aug. 8, 1968	4,780	Abandoned—dry.
2350	Gage et al Mallard 6-28-85-20	July 6, 1968	Aug. 2, 1968	6,514	Abandoned—dry.
2223	Garvey CIGOL W Beatton d-32-L	Feb. 9, 1968	Feb. 19, 1968	3,471	Abandoned—dry.
2435	Guyer et al W Blueberry a-7-L	Dec. 28, 1968	----------	----------	Drilling.
2265	HB Union Cautley c-57-G	Jan. 14, 1968	Feb. 15, 1968	8,788	Abandoned—dry.
2391	Home W Ft St John 10-27-83-19	Sept. 25, 1968	Oct. 17, 1968	4,961	Halfway gas well.
2405	Homestead et al Two Rivers 6-16-83-16	Oct. 27, 1968	Nov. 12, 1968	4,845	Abandoned—dry.
2292	Huber Del Norte et al Yeka a-56-D	Feb. 19, 1968	Mar. 11, 1968	5,983	Abandoned—dry.
2339	Hunt Sands Pac Inga 16-17-86-23	June 25, 1968	July 10, 1968	4,833	Abandoned—dry.
2343	Husky IOE Quintette a-70-C	June 24, 1968	Dec. 11, 1968	9,717	Abandoned—dry.
2227	IOE et al Flatrock 5-20-84-15	Dec. 11, 1967	Jan. 10, 1968	6,660	Abandoned—dry.
2360	IOE Pac Inga 16-19-87-23	Aug. 1, 1968	Aug. 15, 1968	5,492	Inga oil well.
2335	IOE Pac Laprise b-66-E	May 27, 1968	Aug. 6, 1968	11,003	Abandoned—dry.
2432	IOE Fina Rigel 6-21-88-16	Dec. 23, 1968	----------	----------	Drilling.
2402	IOE et al Rigel d-51-J	Oct. 13, 1968	Oct. 24, 1968	3,700	Abandoned—dry.
2400	IOE Fina Rigel c-60-J	Oct. 20, 1968	Oct. 31, 1968	3,570	Dunlevy gas well.
2354	IOE Fina Rigel a-89-J	July 22, 1968	Aug. 4, 1968	3,630	Dunlevy gas well.
2410	JBA Moberly 6-15-82-22	Nov. 6, 1968	Nov. 22, 1968	4,452	Abandoned—dry.
2356	Jeff Lake Oxy Cecil 10-29-84-17	July 22, 1968	Aug. 13, 1968	6,179	Abandoned—dry.
2431	Marathon LL&E Bigfoot a-26-C	Dec. 26, 1968	----------	----------	Drilling.
2408	Mesa et al Altares c-61-G	Oct. 30, 1968	----------	----------	Drilling.
2325	Mesa CPOG Altares c-72-G	Mar. 23, 1968	May 14, 1968	6,725	Abandoned—junked.
2204	Mest et al Altares d-93-G	Nov. 30, 1967	Feb. 19, 1968	6,751	Abandoned.
2420	Mest et al Blueberry b-18-K	Dec. 30, 1968	----------	----------	Drilling.
2345	Mesa et al Coffee 11-10-85-20	June 23, 1968	July 13, 1968	6,636	Abandoned—dry.
2372	Mesa et al Coplin 6-2-85-23	Sept. 30, 1968	Oct. 19, 1968	5,120	Abandoned—dry.
2222	Mesa et al Dogrib a-A69-I	Nov. 23, 1967	Jan. 17, 1968	7,640	Abandoned—dry.
2362	Mesa et al Flatrock 14-13-85-16	Aug. 10, 1968	Aug. 22, 1968	5,012	Abandoned—dry.
2413	Mesa et al Mooselick a-29-K	Dec. 2, 1968	----------	----------	Drilling.
2160	Mesa et al Prophet c-97-D	Aug. 17, 1967	Feb. 5, 1968	11,087	Multiple Halfway-Mississippian gas well.
2353	Mesa et al Wilder 10-30-85-20	July 18, 1968	Aug. 7, 1968	6,800	Abandoned—dry.
2276	Midwest Chevron Peggo d-65-A	Jan. 23, 1968	Mar. 19, 1968	8,090	Slave Point gas well.
2396	Monsanto Gose Bear Flat 6-10-84-20	Oct. 20, 1968	Nov. 5, 1968	4,660	Abandoned—dry.
2411	Monsanto Bear Flat 6-16-84-20	Nov. 13, 1968	Nov. 29, 1968	4,613	Charlie Lake oil well.
2352	Monsanto Bear Flat 7-16-84-20	July 18, 1968	Aug. 17, 1968	6,859	Charlie Lake oil well.
2397	Monsanto Grewatsch d-40-J	Nov. 3, 1968	Nov. 12, 1968	4,370	Abandoned—dry.
2233	Mosbacher Cox Pacific Etsho d-79-E	Feb. 18, 1967	Jan. 26, 1968	8,370	Abandoned—dry.
2298	Murphy et al Coplin 16-24-86-24	Feb. 23, 1968	Mar 23, 1968	5,825	Inga oil well.
2427	Murphy Pembina Inga 6-31-85-23	Dec. 20, 1968	----------	----------	Drilling.
2404	Murphy Pembina Inga 16-31-85-23	Oct. 23, 1968	Nov. 6, 1968	5,328	Inga oil well.
2416	Murphy et al Inga 6-6-86-23	Nov. 29, 1968	Dec. 15, 1968	5,695	Inga oil well.
2395	Murphy et al Inga 16-6-86-23	Sept. 29, 1968	Oct. 17, 1968	5,656	Inga oil well.

TABLE 22.—WELLS DRILLED AND DRILLING, 1968—*Continued*

Well Authorization No.	Well Name	Date Spudded	Date Rig Released	Total Depth	Status at December 31, 1968
2308	Union et al Crush d-19-F	Mar. 1, 1968	Mar. 16, 1968	3,923	Abandoned.
2403	Union et al Crush b-28-F	Oct. 27, 1968	Nov. 3, 1968	3,880	Abandoned—dry.
2288	Union et al Crush d-29-F	Feb. 4, 1968	Feb. 12, 1968	3,886	Halfway oil well.
2253	Union HB Sinclair Crush d-38-F	Dec. 28, 1967	Jan. 7, 1968	3,920	Halfway oil well.
2364	Union HB Crush b-58-F	Aug. 8, 1968	Aug. 17, 1968	3,880	Halfway oil well.
2342	Union HB Crush d-59-F	June 8, 1968	June 16, 1968	3,850	Halfway oil well.
2355	Union HB Crush b-68-F	July 22, 1968	Aug. 2, 1968	3,860	Halfway oil well.
2386	Union HB Crush d-69-F	Sept. 14, 1968	Sept. 22, 1968	3,770	Halfway oil well.
2235	Union HB Doig d-33-D	Dec. 20, 1967	Jan. 2, 1968	4,033	Abandoned—dry.
2261	Union et al Donis d-32-F	Jan. 4, 1968	Jan. 16, 1968	3,915	Abandoned—dry.
2278	Union BA Laurel d-25-D	Feb. 13, 1968	Feb. 21, 1968	3,713	Abandoned—dry.
2269	Union et al E Milligan d-69-H	Jan. 10, 1968	Jan. 18, 1968	3,755	Abandoned—dry.
2277	Union Moose b-79-K	Jan. 22, 1968	Feb. 1, 1968	3,788	Abandoned—dry.
2273	Union et al Sam d-67-F	Jan. 18, 1968	Jan. 27, 1968	3,814	Abandoned—dry.
2323	Union et al Spruce d-62-E	Mar. 14, 1968	Mar. 23, 1968	3,919	Halfway oil well.
2333	Uno-Tex Cankee Stoddart 10-25-85-19	May 23, 1968	June 12, 1968	6,280	Abandoned—dry.
2229	Uno-Tex et al Yoyo c-34-I	Dec. 13, 1967	Jan. 21, 1968	7,300	Pine Point gas well.
2236	UOHL Cabin d-17-G	Dec. 18, 1967	Jan. 15, 1968	7,588	Abandoned—dry.
2293	UOHL et al Cheves b-58-L	Feb. 14, 1968	.....	.....	Drilling.
2332	WECo JBA Halfway 16-10-87-25	May 21, 1968	June 23, 1968	5,580	Abandoned.
2314	WECo JBA Halfway 6-22-87-25	Mar. 10, 1968	Apr. 7, 1968	5,342	Abandoned—dry.
2344	West Nat Aitken d-37-L	June 22, 1968	July 3, 1968	4,435	Abandoned—dry.
2366	West Nat et al Alexander d-45-K	Aug. 23, 1968	Sept. 14, 1968	6,080	Baldonnel gas well.
2358	West Nat et al E Blueberry d-28-C	July 24, 1968	Aug. 18, 1968	5,319	Abandoned—dry.
2367	West Nat et al Inga 6-25-86-24	Aug. 28, 1968	Sept. 13, 1968	5,480	Abandoned—dry.
2422	Whitehall Cdn-Sup W Beatton d-13-L	Dec. 12, 1968	Dec. 22, 1968	3,442	Bluesky-Gething oil well.
2304	Whitehall Cdn-Sup W Beatton d-22-L	Feb. 22, 1968	Mar. 1, 1968	3,450	Bluesky-Gething oil well.
2407	Whitehall et al Inga 6-18-86-23	Nov. 9, 1968	Nov. 22, 1968	5,295	Inga oil well.
2244	Whitehall ARCo Nig a-87-J	Dec. 24, 1967	Jan. 16, 1968	4,373	Baldonnel gas well.
2363	Whitehall et al N Pine 11-10-86-18	Aug. 4, 1968	Aug. 13, 1968	4,553	Abandoned—dry.

2415	Security Cypress d-99-C	Nov. 23, 1968	----------	------	Drilling.
2270	Shenandoah et al Coplin 6-18-86-23	Jan. 16, 1968	Feb. 8, 1968	5,510	Inga oil well.
2387	Sinclair et al Beg b-A17-K	Oct. 3, 1968	Nov. 10, 1968	7,175	Halfway gas well.
2328	Sun Inga 6-30-86-23	May 26, 1968	June 8, 1968	5,445	Inga oil well.
2322	Tenn Texcan Cardinal d-67-I	Mar. 16, 1968	Mar. 24, 1968	3,800	Abandoned—dry.
2341	Tenn N Pine 10-23-85-18	June 7, 1968	June 21, 1968	4,330	Abandoned—dry.
2334	Tenn N Pine 7-33-85-18	May 15, 1968	May 24, 1968	4,520	Abandoned.
2263	Tenn Tooga d-79-K	Jan. 28, 1968	Mar. 17, 1968	7,684	Abandoned—dry.
2346	Tenn et al Weasel a-24-B	June 24, 1968	July 4, 1968	3,875	Injection well.
2221	Texaco Bernadet 6-28-87-24	Dec. 4, 1967	Jan. 2, 1968	5,855	Abandoned—dry.
2382	Texaco et al Boundary 11-18-85-13	Oct. 28, 1968	Nov. 5, 1968	4,315	Boundary Lake oil well.
2380	Texaco et al Boundary 5-19-85-13	Oct. 10, 1968	Oct. 26, 1968	4,306	Boundary Lake oil well.
2377	Texaco et al Boundary 5-30-85-13	Sept. 27, 1968	Oct. 3, 1968	4,290	Boundary Lake oil well.
2376	Texaco et al Boundary 7-30-85-13	Oct. 4, 1968	Oct. 10, 1968	4,300	Boundary Lake oil well.
2374	Texaco et al Boundary 5-31-85-13	Sept. 7, 1968	Sept. 13, 1968	4,381	Boundary Lake oil well.
2381	Texaco et al Boundary 11-13-85-14	Oct. 8, 1968	Oct. 14, 1968	4,280	Boundary Lake oil well.
2373	Texaco et al Boundary 10-22-85-14	Sept. 6, 1968	Sept. 14, 1968	4,436	Boundary Lake oil well.
2383	Texaco et al Boundary 4-23-85-14	Sept. 28, 1968	Oct. 6, 1968	4,325	Boundary Lake oil well.
2385	Texaco et al Boundary 12-23-85-14	Sept. 15, 1968	Sept. 24, 1968	4,375	Boundary Lake oil well.
2370	Texaco et al Boundary 7-27-85-14	Aug. 28, 1968	Sept. 5, 1968	4,341	Boundary Lake oil well.
2248	Texaco NFA W Boundary 6-36-85-15	Dec. 28, 1967	Jan. 15, 1968	4,710	Abandoned—dry.
2369	Texaco et al Boundary 7-6-86-13	Aug. 29, 1968	Sept. 5, 1968	4,375	Boundary Lake oil well.
2384	Texaco et al Boundary 7-19-86-13	Oct. 16, 1968	Oct. 22, 1968	4,304	Boundary Lake oil well.
2375	Texaco et al Boundary 7-1-86-14	Sept. 14, 1968	Sept. 21, 1968	4,440	Boundary Lake oil well.
2390	Texaco NFA Boundary 14-3-86-14	Oct. 24, 1968	Nov. 2, 1968	4,430	Abandoned—dry.
2305	Texaco Texcan Cache 6-1-87-23	Feb. 26, 1968	Mar. 18, 1968	5,604	Abandoned—dry.
2309	Texaco ARCo Halfway 16-4-87-25	Mar. 4, 1968	Mar. 26, 1968	5,290	Abandoned—dry.
2283	Texaco NFA Hay b-62-G	Jan. 30, 1968	Mar. 7, 1968	7,800	Abandoned—dry.
2255	Texaco S Inga 16-13-87-24	Jan. 8, 1968	Jan. 25, 1968	5,245	Inga oil well.
2274	Texaco S Inga 16-24-87-24	Jan. 28, 1968	Feb. 12, 1968	5,255	Inga oil well.
2294	Texaco S Inga 6-25-87-24	Feb. 15, 1968	Mar. 7, 1968	5,455	Charlie Lake oil well.
2321	Texaco Texcan Inga 6-36-87-24	Mar. 10, 1968	Mar. 30, 1968	5,410	Abandoned—dry.
2282	Texaco NFA Kahntah a-85-B	Feb. 2, 1968	Apr. 13, 1968	8,609	Abandoned—dry.
2300	Texaco NFA LaGarde 6-4-88-15	Feb. 25, 1968	Mar. 11, 1968	4,230	Abandoned—dry.
2254	Texaco NFA Midwinter a-32-G	Jan. 5, 1968	Feb. 4, 1968	7,500	Abandoned—dry.
2232	Texaco NFA Missle d-54-A	Dec. 14, 1967	Feb. 29, 1968	8,730	Pine Point gas well.
2264	Texaco N Pine 6-15-85-18	Jan. 9, 1968	Jan. 24, 1968	4,340	Charlie Lake oil well.
2284	Texaco NFA N Tsea c-48-C	Feb. 4, 1968	Feb. 16, 1968	1,760	Abandoned—junked.
2297	Texaco NFA N Tsea c-A48-C	Feb. 17, 1968	Mar. 19, 1968	7,091	Finished drilling.
2312	Texcan N Cache 6-31-87-21	Mar. 12, 1968	Mar. 26, 1968	5,213	Abandoned—dry.
2423	Texcan N Cache 6-28-88-22	Dec. 12, 1968	----------	------	Drilling.
2230	TGS Falls c-32-F	Dec. 11, 1967	May 10, 1968	12,506	Baldonnel gas well.
2281	TGS et al Narraway c-76-C	Feb. 16, 1968	Dec. 16, 1968	9,378	Abandoned—dry.
2228	Triad BPX IOE S Taylor 8-18-82-16	Dec. 9, 1967	Jan. 14, 1968	6,327	Abandoned—dry.
2315	Union et al Beaverdam d-15-L	Mar. 3, 1968	Mar. 12, 1968	3,890	Abandoned—dry.
2296	Union HB Bluebell d-22-H	Feb. 23, 1968	Mar. 2, 1968	3,725	Halfway gas well.

TABLE 23.—OILFIELDS AND GASFIELDS DESIGNATED AS AT DECEMBER 31, 1968—*Continued*

Field	Date Designated	Date(s) Revised	Field Location	Pool(s)	Number of Wells Capable of Production	Discovery Well(s)	Pool(s) Discovered
Boundary Lake North	Jan. 1, 1965	Apr. 1, 1966	Tp. 87, R. 14, W. of 6th M.	10	4	Texaco NFA N Boundary 7-3-87-14, gas	10
Bubbles	Nov. 24, 1959	Feb. 15, 1960 May 27, 1960 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 Jan. 1, 1961 July 1, 1961 Oct. 1, 1961 Jan. 1, 1963 July 1, 1963 Oct. 1, 1963 Jan. 1, 1965	N.T.S. 94-A-11, 94-A-14	5, 7	18	Texaco NFA Buick Creek d-98-I (1), gas Texaco NFA Buick Creek d-83-J (4), gas	5 7
Buick Creek East	Jan. 1, 1963	Apr. 1, 1963 Oct. 1, 1963 July 1, 1964 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 Decalta et al E Buick c-74-A, oil Texaco NFA E Buick a-31-A, gas	2 5 5
Buick Creek North	Apr. 1, 1967		N.T.S. 94-A-11	2, 5	8	Pacific West Prod N Buick c-22-F, gas	2, 5
Buick Creek West	Feb. 7, 1958	Jan. 6, 1959 Feb. 15, 1960 Jan. 1, 1963	N.T.S. 94-A-11, 94-A-14	3, 5, 6, 10	15	Pacific West Buick Creek c-2-E (6), gas Pacific W Buick Creek c-83-K (13A), oil Pacific West Buick Creek b-78-C (2), gas Pacific West Buick Creek d-58-C (8), gas Pacific West Buick Creek b-23-E (1), gas	3 5 5 6 10
Bulrush	July 1, 1964	Apr. 1, 1967	N.T.S. 94-A-16	10	4	Union HB Sinclair Bulrush d-78-F, oil	10
Bulrush East	Apr. 1, 1967		N.T.S. 94-A-16	10	1	Dome Provo Co-op E Bulrush d-5-K, oil	10
Charlie Lake	Jan. 1, 1961		Tp. 84, R. 18, W. of 6th M.	3	1	Imp Pac Charlie 13-5-84-18, oil	3
Clarke Lake	Feb. 15, 1960	May 27, 1960 Jan. 1, 1961 Apr. 1, 1962 Apr. 1, 1965 Apr. 1, 1966 Jan. 1, 1967 Apr. 1, 1967 July 1, 1967 July 1, 1968	N.T.S. 94-J-9, 94-J-10, 94-J-15, 94-J-16	14	25	West Nat et al Clarke Lake c-47-J, gas	14
Clarke Lake South	Oct. 1, 1968		N.T.S. 94-J-9	14	2	West Nat IOE S Clarke d-29-K, gas	14
Crush	Apr. 1, 1968	July 1, 1968 Oct. 1, 1968	N.T.S. 94-A-16	10	9	Union et al Crush d-28-F, oil	10
Currant	Oct. 1, 1965		N.T.S. 94-A-9, 94-A-16	10	10	Sinclair et al Currant d-17-C, oil	10
Dawson Creek	Feb. 7, 1958		Tp. 79, R. 15, W. of 6th M.	1	2	Pac Sc Dawson Ck 1-15-79-15 (1), gas	1

TABLE 23.—OILFIELDS AND GASFIELDS DESIGNATED AS AT DECEMBER 31, 1968

Field	Date Designated	Date(s) Revised	Field Location	Pool(s)	Number of Wells Capable of Production	Discovery Well(s)	Pool(s) Discovered
Airport	Oct. 1, 1968		Tp. 83, R. 17, W. of 6th M.	4, 6, 10	3	Pacific Airport 8-32-83-17, gas	4
						Pacific Airport 12-34-83-17, gas	10
						Pacific Airport 9-32-83-17, gas	6
Aitken Creek	Feb. 15, 1960	Jan. 1, 1961 Oct. 1, 1963	N.T.S. 94-A-13	3	8	Union Aitken Creek b-42-L, oil	3
Beatton River	Aug. 7, 1959	Jan. 1, 1962	N.T.S. 94-H-2	10	13	Triad Beatton River b-38-J, oil	10
Beatton River West	Aug. 7, 1959	Jan. 1, 1962 Oct. 1, 1964	N.T.S. 94-H-2	2	10	Triad West Beatton River d-39-K, oil	2
Beaverdam	Apr. 1, 1966		N.T.S. 94-A-16	10	3	Tenn Beaverdam d-38-L, oil	10
Beg	July 1, 1961	Jan. 1, 1962 Apr. 1, 1962 July 1, 1962 Apr. 1, 1963 Apr. 1, 1964	N.T.S. 94-B-16, 94-G-1, 94-G-8	6, 10	34	Pacific et al Beg b-17-K, gas	6
						Pacific et al Beg d-10-G, gas	10
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 Feb. 15, 1960 May 27, 1960 Oct. 1, 1961 Jan. 1, 1963	N.T.S. 94-A-12, 94-A-13, Tp. 88, R. 25, W. of 6th M.	5, 6, 7, 10, 12	32	West Nat et al Blueberry b-22-D, gas	10
						West Nat et al Blueberry c-32-D (2), gas	5
						West Nat et al Blueberry d-87-D (1), gas	6
						West Nat et al Blueberry a-61-L, gas	7
						West Nat et al Blueberry d-82-L (11), oil	12
Blueberry East	Dec. 22, 1958		N.T.S. 94-A-13	6, 10, 12	2	West Nat et al E Blueberry b-38-C (7), gas	6, 10
						West Nat et al E Blueberry b-36-C (17), gas	12
Blueberry West	Feb. 7, 1958	July 1, 1961	N.T.S. 94-A-12, 94-B-9, 94-B-16 Tp. 88, R. 25, W. of 6th M.	5, 6	3	West Nat et al W Blueberry d-82-I (9), gas	5
						West Nat et al W Blueberry d-19-L (12), gas	6
Boundary Lake	Oct. 30, 1956	Feb. 7, 1958 Aug. 7, 1959 Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1961 July 1, 1961 Jan. 1, 1962 Apr. 1, 1962 Oct. 1, 1963 Oct. 1, 1964 Jan. 1, 1965 Oct. 1, 1965 Jan. 1, 1966 Apr. 1, 1966	Tp. 84, 85, 86, 87, R. 13, W. of 6th M. Tp. 83, 84, 85, 86, R. 14, W. of 6th M. Tp. 84, R. 15, W. of 6th M.	2, 3, 4, 5, 6, 7, 9, 10	271	Pacific Boundary 8-15-85-14, gas and oil	2, 4, 6
						Pacific Boundary 12-10-85-14, gas	3
						Amerada Boundary 8-5-85-14, gas	5
						Texaco NFA Boundary L 6-6-85-14 (1), oil	9
						Sun Boundary Lake 6-23-85-14, oil	10
						Texaco NFA Boundary 16-31-86-13, gas	10

TABLE 23.—OILFIELDS AND GASFIELDS DESIGNATED AS AT DECEMBER 31, 1968—*Continued*

Field	Date Designated	Date(s) Revised	Field Location	Pool(s)	Number of Wells Capable of Production	Discovery Well(s)	Pool(s) Discovered
Milligan Creek	Feb. 7, 1958	Aug. 7, 1959 Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1962 July 1, 1963	N.T.S. 94-H-2	10	22	Union HB Milligan Creek d-73-G, oil	10
Montney	Feb. 7, 1958	Jan. 6, 1959 Jan. 1, 1962	Tp. 87, R. 18, W. of 6th M. Tp. 86, 87, R. 19, W. of 6th M.	2, 7, 9	4	Pac Sunray Montney 16-32-86-19 (3), gas Pac Sunray Montney 14-36-86-19 (2), gas Pac Sunray Montney 14-31-86-19 (5), gas	2 7 10
Nettle	Apr. 1, 1966	———	N.T.S. 94-H-7	2	5	Union KCL ROC Nettle d-67-A, oil	2
Nig Creek	Aug. 7, 1959	Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1961 Jan. 1, 1962 Apr. 1, 1962 Apr. 1, 1965 July 1, 1965 Apr. 1, 1966	N.T.S. 94-A-13, 94-H-4	6	30	Texaco NFA Nig Creek a-79-B (1), gas	6
North Pine	Oct. 1, 1968	———	Tp. 85, R. 18, W. of 6th M.	7	2	Pacific et al N Pine 6-27-85-18, gas	7
Osprey	Apr. 1, 1966	———	N.T.S. 94-A-15	10	3	Pacific SR CanDel Osprey d-4-J, oil	10
Parkland	Feb. 7, 1958	July 1, 1963	Tp. 81, R. 15, W. of 6th M.	13	2	Pacific Imp Parkland 6-29-81-15, gas	13
Peejay	Feb. 15, 1960	May 27, 1960 Jan. 1, 1961 Jan. 1, 1962 Apr. 1, 1962 July 1, 1965 Oct. 1, 1965 Jan. 1, 1966 Apr. 1, 1966 July 1, 1966 Oct. 1, 1966 Apr. 1, 1967 July 1, 1967 Jan. 1, 1968	N.T.S. 94-A-15, 94-A-16	10	93	Pacific Sinclair Peejay d-39-E, oil	10
Peejay West	Jan. 1, 1963	———	N.T.S. 94-A-15	10	2	Pacific SR West Cdn W Peejay d-54-G, oil	10
Petitot River	Apr. 1, 1961	———	N.T.S. 94-P-12, 94-P-13	14	3	West Nat Petitot River d-24-D, gas	14
Red Creek	Feb. 7, 1958	Aug. 7, 1959 Feb. 15, 1960	Tp. 85, R. 21, W. of 6th M.	7, 10	2	Pacific Red Creek 5-27-85-21 (36), gas	7, 10

Farrell Creek	Jan. 1, 1968		N.T.S. 94-A-15, 94-B-8 Tp. 85, R. 26, W. of 6th M. Tp. 86, R. 26, W. of 6th M.	7, 10	5	Ft St John Petroleum a-9-L, gas 10 CanDel et al Farrell a-41-I, gas 7
Fort St. John	Aug. 22, 1965	Feb. 7, 1958 Feb. 15, 1960 Jan. 1, 1961	Tp. 83, R. 18, W. of 6th M.	4, 6, 7, 10,11	29	Pacific Ft St John A3-29-83-18 (31), gas 4 Pacific Ft St John 14-15-83-18 (7), gas 6 Pacific Ft St John B3-29-83-18, gas 7 Pacific Ft St John 3-14-83-18 (9), oil 7 Pacific Ft St John 1-20-83-18 (30), gas 10 Imp Pac Ft St John 9-19-83-18 (45), oil 11 Pacific Ft St John 14-21-83-18 (4), gas 11
Fort St. John Southeast	Feb. 7, 1958		Tp. 82, 83, R. 17, W. of 6th M.	4, 6, 10, 11	15	Pacific Ft St John SE 10-31-82-17 (80), gas 4 Pacific Ft St John SE A4-10-83-17 (55), gas 6 Pac Ft St John SE 10-33-82-17 (22), gas 10 Pac Ft St John SE 4-10-83-17 (12), gas 11
Gundy Creek	Feb. 7, 1958	Jan. 6, 1959	N.T.S. 94-B-16	6, 7	5	West Nat Gundy Creek b-69-A, gas 7 West Nat Gundy Creek c-80-A, gas 6
Halfway	Dec. 22, 1958		Tp. 86, 87, R. 25, W. of 6th M.	6, 10, 7	4	West Nat et al Halfway 5-1-87-25, gas 6 West Nat et al Halfway 8-11-87-25, gas 10 West Nat et al Halfway 14-11-87-25, oil 7
Highway	Feb. 7, 1958		N.T.S. 94-B-16	5, 6, 12	6	West Nat et al Highway b-3-I (1), gas 5 Pacific Highway b-25-I (1), gas 6 Pacific Highway a-90-I (4), gas 12
Inga	Jan. 1, 1967	Apr. 1, 1968 July 1, 1968 Oct. 1, 1968	Tp. 86, R. 23, 24, W. of 6th M. Tp. 87, R. 23, 24, W. of 6th M. Tp. 88, R. 23, 24, W. of 6th M. N.T.S. 94-A-12	8, 8, 6,6	65	Cdn-Sup et al Inga 10-25-88-24, oil 8 Hunt Sands Pac Imp Inga 7-16-86-23, oil 6
Jeans West	July 1, 1968		N.T.S. 94-A-12, 94-A-13	7, 8	4	West Nat et al W Jeans a-22-B, gas 8 West Nat et al W Jeans b-10-A, gas 7
Jedney	Aug. 7, 1959	Nov. 24, 1959 Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1961 Apr. 1, 1963 Oct. 1, 1963	N.T.S. 94-G-1, 94-G-8	3, 6, 10	46	Pacific Imperial Jedney a-95-C, gas 3 Pacific et al Jedney b-88-J, gas 6 Pacific Imp Jedney d-99-J, gas 10
Jedney West	July 1, 1964		N.T.S. 94-G-1, 94-G-8	6, 10	3	Pacific et al W Jedney b-84-K, gas 6, 10
Kobes-Townsend	Dec. 22, 1958	Feb. 15, 1960	N.T.S. 94-B-8, 94-B-9	5, 7, 10, 12	12	Pacific Kobes a-3-A (4), gas 5 Pacific Kobes d-94-I (1), gas 7, 10 Pacific Townsend a-20-H (A-1), gas 12
Kotcho Lake	Apr. 1, 1962	Apr. 1, 1967	N.T.S. 94-I-14, 94-P-3	14	6	West Nat Kotcho Lake c-67-K, gas 14
Laprise Creek	Feb. 15, 1960	Jan. 1, 1961 Apr. 1, 1961 Apr. 1, 1963 Jan. 1, 1964 Apr. 1, 1964	N.T.S. 94-G-8, 94-H-4, 94-H-5	6	40	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

TABLE 24.—NUMBER OF PRODUCING AND PRODUCIBLE WELLS AT DECEMBER 31, 1968[1]

Field and Pool	Oil Wells		Natural-gas Wells	
	Producing	Producible	Producing	Producible
Airport field—				
Cadomin	.....	.....	1	1
Baldonnel	.....	.....	.....	1
Halfway	.....	.....	.....	1
Field totals	.....	.....	1	3
Aitken Creek field—Gething	5	5	2	3
Beatton River field—Halfway	8	12	.....	1
Beatton River West field—Bluesky-Gething	4	10	.....	.....
Beaverdam field—Halfway	.....	1	.....	2
Beg field—				
Baldonnel	.....	.....	11	17
Halfway	.....	.....	14	17
Field totals	.....	.....	25	34
Beg West field—Baldonnel	.....	.....	2	3
Bernadet field—Bluesky-Gething	.....	.....	1	1
Blueberry field—				
Dunlevy	.....	.....	3	7
Baldonnel	.....	.....	2	3
Charlie Lake	.....	.....	.....	2
Halfway	.....	.....	.....	1
Mississippian	18	19	.....	.....
Field totals	18	19	5	13
Blueberry East field—				
Baldonnel	.....	.....	.....	1
Mississippian	.....	.....	.....	1
Field totals	.....	.....	.....	2
Blueberry West field—				
Dunlevy	.....	.....	2	2
Baldonnel	.....	.....	.....	1
Field totals	.....	.....	2	3
Boundary Lake field—				
Bluesky-Gething	.....	.....	.....	2
Gething	.....	.....	.....	2
Cadomin	.....	1	.....	.....
Dunlevy	.....	.....	.....	1
Baldonnel	.....	.....	3	6
Boundary Lake	235	250	.....	.....
Basal Boundary Lake	.....	.....	1	1
Halfway	4	6	.....	.....
Field totals	239	257	4	14
Boundary Lake North field—Halfway	.....	.....	.....	4
Bubbles field—Baldonnel	.....	.....	8	13
Buick Creek field—				
Dunlevy	.....	.....	15	17
Charlie Lake	.....	.....	.....	1
Field totals	.....	.....	15	18
Buick Creek East field—				
Bluesky-Gething	.....	.....	.....	2
Dunlevy	1	2	8	9
Field totals	1	2	8	11
Buick Creek North field—				
Bluesky-Gething	.....	.....	1	2
Dunlevy	.....	.....	3	6
Field totals	.....	.....	4	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] Each zone of a multiple completion is counted as a well.

Rigel	Oct. 1, 1962	Jan. 1, 1963 Apr. 1, 1963 Jan. 1, 1964 Oct. 1, 1964 Oct. 1, 1965 Jan. 1, 1967 July 1, 1967 July 1, 1968 Oct. 1, 1968	N.T.S. 94-A-10 Tp. 87, 88, R. 16, W. of 6th M. Tp. 87, 88, R. 17, W. of 6th M. Tp. 87, 88, R. 18, W. of 6th M. Tp. 88, R. 19, W. of 6th M.	5	45	Monsanto Rigel 6-13-87-17, oil Imp Fina Rigel 4-27-88-17, gas	5 5
Stoddart	Jan. 6, 1959	Feb. 15, 1960 Apr. 1, 1965 Jan. 1, 1966 Apr. 1, 1967	Tp. 86, R. 19, 20, W. of 6th. M. Tp. 85, R. 20, W. of 6th M.	11	14	Pacific Stoddart 4-24-86-20 (85), gas Uno-Tex et al Stoddart 10-31-85-19, oil	11 11
Stoddart West	Apr. 1, 1964	———	Tp. 86, R. 20, W. of 6th M.	11	1	Pacific W Stoddart 11-10-86-20, gas	11
Weasel	Apr. 1, 1966	Apr. 1, 1967	N.T.S. 94-H-2, 94-A-15	10	26	Tenn Ashland Weasel d-35-B, oil	10
Wildmint	Jan. 1, 1962	July 1, 1962 Jan. 1, 1963 Apr. 1, 1964 Jan. 1, 1966	N.T.S. 94-A-15, 94-H-2	10	28	Union HB Wildmint d-46-A, oil	10
Willow	July 1, 1963	———	N.T.S. 94-H-2	2	3	Union HB Willow d-20-H, oil	2
Wolf	Apr. 1, 1967	———	N.T.S. 94-H-15	10	5	Baysel Sinclair Wolf d-93-B, oil	10
Yoyo	Apr. 1, 1965	Jan. 1, 1967 Jan. 1, 1968	N.T.S. 94-I-13, 94-I-14	14, 15	11	West Nat et al Yoyo b-24-L, gas West Nat et al Yoyo b-29-I, gas	15 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 Inga member sandstone.
9. Triassic Boundary Lake carbonate.
10. Triassic Halfway sandstone.
11. Permian Belloy carbonate.
12. Mississippian Rundle carbonate.
13. Upper Devonian Wabamun carbonate.
14. Middle Devonian Slave Point carbonate.
15. Middle Devonian Pine Point carbonate.

TABLE 18.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1968—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Test Date	Shut-in Subsurface Pressure, Psia.	Reciprocal Slope "n"	A.O.F.P. M S.C.F./D.	P.R.L. M S.C.F./D.
Beg—*Continued*							
Halfway	Pacific et al Beg b-6-K/94-G-1	740	7-68	1,212	0.500	6,006	2,000
	Pacific et al Beg b-A17-K/94-G-1	2387	12-68	1,614	.....	.....	2,000[1]
	Pacific et al Beg b-59-K/94-G-1	786	.....	.....	.....	.....	.....
Halfway total		.....	.....	.....	.....	.....	.....
Field total		.....	.....	.....	.....	.....	29,767
Beg West—Baldonnel		.....	.....	.....	.....	.....	54,300
	Pacific et al W Beg c-84-C/94-G-1	622	7-68	1,145	0.550	1,698	2,000
	Pacific et al W Beg c-58-F/94-G-1	772	.....	.....	.....	.....	.....
	Pacific et al W Beg a-79-F/94-G-1	620	7-68	1,155	0.726	1,919	2,000
Baldonnel and field total		.....	.....	.....	.....	.....	4,000
Bernadet—Bluesky-Gething	West Nat et al Bernadet 8-1-88-25	1106	7-68	322	0.754	309	2,000
Bluesky-Gething and field total		.....	.....	.....	.....	.....	2,000
Blueberry—							
Dunlevy	West Nat et al Blueberry 16-24-88-25	279	7-68	1,203	1.000	1,680	2,000
	West Nat et al Blueberry a-29-K/94-A-12	330	7-63	1,284	0.675	500	Suspended.
	West Nat et al Blueberry d-A50-K/94-A-12	357	8-63	1,121	1.000	640	Suspended.
	West Nat et al Blueberry d-38-K/94-A-12	2146	.....	.....	.....	.....	.....
	West Nat et al Blueberry c-32-D/94-A-13	70	.....	.....	.....	.....	.....
	West Nat et al Blueberry d-A87-D/94-A-13	94	7-68	1,216	0.577	1,747	2,000
	West Nat et al Blueberry d-97-D/94-A-13	581	7-68	887	0.571	2,496	2,000
Dunlevy total		.....	.....	.....	.....	.....	6,000
Baldonnel	West Nat et al Blueberry c-65-D/94-A-13	71	7-65	1,475	0.577	825	Suspended.
	West Nat et al Blueberry d-87-D/94-A-13	64	7-68	1,405	0.577	877	2,000
	West Nat et al Blueberry d-97-D/94-A-13	581	9-60	1,653	1.000	5,600	Suspended.
Baldonnel total		.....	.....	.....	.....	.....	2,000
Charlie Lake	West Nat et al Blueberry a-61-L/94-A-12	525	.....	.....	.....	.....	.....
	West Nat et al Blueberry b-13-D/94-A-13	601	.....	.....	.....	.....	.....
Halfway	West Nat et al Blueberry b-22-D/94-A-13	1946	.....	.....	.....	.....	.....
Field total		.....	.....	.....	.....	.....	8,000
Blueberry East—							
Baldonnel	West Nat et al E Blueberry b-38-C/94-H-13	103	2-67	1,687	0.820	1,740	Suspended.
Mississippian	West Nat et al E Blueberry b-36-C/94-A-13	331	10-58	2,697	1.000	3,200	Suspended.
Blueberry West—							
Dunlevy	West Nat et al W Blueberry 2-20-88-25	278	7-68	578	1.000	205	2,000
	West Nat et al W Blueberry d-82-I/94-B-9	165	7-68	883	1.000	793	2,000
Dunlevy total		.....	.....	.....	.....	.....	4,000
Baldonnel	West Nat et al W Blueberry d-19-L/94-A-12	241	9-62	1,684	0.543	1,425	Suspended.
Field total		.....	.....	.....	.....	.....	4,000

[1] Interim.

TABLE 24.—NUMBER OF PRODUCING AND PRODUCIBLE WELLS AT DECEMBER 31, 1968[1]—*Continued*

Field and Pool	Oil Wells		Natural-gas Wells	
	Producing	Producible	Producing	Producible
Charlie Lake field—Gething	.....	1	.....	.....
Clarke Lake field—Slave Point	.....	.....	21	25
Clarke Lake South field—Slave Point	.....	.....	1	2
Crush field—Halfway	6	9	.....	.....
Currant—Halfway	4	6	.....	4
Dawson Creek field—				
Dunvegan	.....	.....	.....	1
Cadotte	.....	.....	.....	1
Field totals	.....	.....	.....	2
Farrell Creek field—				
Charlie Lake	.....	.....	.....	2
Halfway	.....	.....	.....	3
Field totals	.....	.....	.....	5
Fort St. John field—				
Cadomin	.....	.....	.....	2
Baldonnel	.....	.....	8	12
Charlie Lake	4	4	.....	1
Halfway	.....	.....	6	7
Belloy	.....	1	2	2
Field totals	4	5	16	24
Fort St. John Southeast field—				
Cadomin	.....	.....	.....	1
Baldonnel	.....	.....	2	2
Halfway	.....	.....	2	6
Belloy	.....	.....	4	6
Field totals	.....	.....	8	15
Gundy Creek field—				
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—				
Inga	46	59	.....	2
Baldonnel	.....	1	.....	3
Field totals	46	60	.....	5
Jeans West field—Charlie Lake	.....	.....	.....	4
Jedney field—				
Gething	.....	.....	.....	1
Baldonnel	.....	.....	17	22
Halfway	.....	.....	18	23
Field totals	.....	.....	35	46
Jedney West field—				
Baldonnel	.....	.....	.....	1
Halfway	.....	.....	.....	2
Field totals	.....	.....	.....	3
Kobes-Townsend field—				
Dunlevy	.....	.....	3	3
Charlie Lake	.....	.....	5	5
Halfway	.....	.....	2	2
Mississippian	.....	.....	1	2
Field totals	.....	.....	11	12
Kotcho Lake field—Slave Point	.....	.....	1	6
Laprise Creek field—Baldonnel	.....	.....	32	40

[1] Each zone of a multiple completion is counted as a well.

TABLE 24.—NUMBER OF PRODUCING AND PRODUCIBLE WELLS AT DECEMBER 31, 1968[1]—*Continued*

Field and Pool	Oil Wells		Natural-gas Wells	
	Producing	Producible	Producing	Producible
Laprise Creek West field—Baldonnel	.....	.....	.....	2
Milligan Creek field—Halfway	16	21	.....	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	21	29
North Pine field—Charlie Lake	.....	.....	1	2
Osprey field—Halfway	1	3	.....	.....
Parkland field—Wabamun	.....	.....	2	2
Peejay field—Halfway	80	89	.....	4
Peejay West field—Halfway	.....	2	.....	.....
Petitot River field—Slave Point	.....	.....	.....	3
Red Creek field—				
Charlie Lake	.....	.....	.....	1
Halfway	.....	.....	.....	1
Field totals	.....	.....	.....	2
Rigel field—Dunlevy	3	7	19	38
Stoddart field—Belloy	3	3	9	11
Stoddart West field—Belloy	.....	.....	.....	1
Weasel field—				
Baldonnel	.....	.....	.....	1
Halfway	16	23	.....	2
Field totals	16	23	.....	3
Wildmint field—Halfway	11	26	.....	2
Willow field—				
Bluesky-Gething	1	1	.....	.....
Halfway	.....	.....	.....	2
Field totals	1	1	.....	2
Wolf field—Halfway	3	4	.....	1
Yoyo field—				
Charlie Lake	.....	.....	.....	1
Pine Point	.....	.....	1	10
Field totals	.....	.....	1	11
Other areas—				
Cadotte	.....	.....	.....	5
Notikewin	.....	.....	.....	1
Bluesky-Gething	.....	1	.....	12
Gething	.....	.....	.....	3
Dunlevy	.....	.....	.....	7
Baldonnel	.....	.....	.....	32
Charlie Lake	.....	.....	1	9
Boundary Lake	.....	.....	.....	1
Halfway	.....	3	.....	28
Permo-Carboniferous	.....	.....	.....	3
Belloy	.....	.....	.....	6
Mississippian	.....	.....	.....	12
Kiskatinaw	.....	.....	.....	1
Slave Point	.....	.....	.....	23
Slave Point/Sulphur Point	.....	.....	.....	1
Pine Point	.....	.....	.....	5
Nahanni	.....	.....	.....	1
Confidential	6	8	3	23
Areas totals	6	12	4	173
Totals	479	590	270	646

[1] Each zone of a multiple completion is counted as a well.

TABLE 25.—MONTHLY CRUDE-OIL PRODUCTION BY FIELDS AND POOLS, 1968

(Quantities in barrels.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Aitken Creek—													
Gething	21,971	27,074	31,550	21,195	31,951	24,461	27,112	26,385	25,696	23,523	25,226	29,917	316,061
Gething[1]	2,048	2,304	2,340	2,558	2,380	2,306	2,681	2,551	2,496	1,951	2,552,	2,578	28,745
Field totals	24,019	29,378	33,890	23,753	34,331	26,767	29,793	28,936	28,192	25,474	27,778	32,495	344,806
Beatton River—Halfway	32,866	30,041	33,567	28,393	30,135	36,968	42,099	47,707	47,961	48,571	45,396	53,577	477,281
Beatton River West—Bluesky-Gething	9,638	10,936	9,286	10,558	10,608	16,282	14,128	15,618	15,114	15,698	15,252	7,187	150,305
Blueberry—													
Dunlevy[1]	24	25	23	25	23	24	23	19	22	22	21	24	275
Baldonnel[1]									60	50		45	155
Mississippian	64,182	60,422	61,820	60,048	56,449	56,255	57,331	55,744	55,272	59,927	71,178	55,279	713,907
Field totals	64,206	60,447	61,843	60,073	56,472	56,279	57,354	55,763	55,354	59,999	71,199	55,348	714,337
Boundary Lake—													
Boundary Lake	598,411	578,626	618,459	605,753	646,645	640,944	653,705	662,327	640,581	693,104	689,064	699,891	7,727,510
Halfway	4,577	7,198	6,592	6,483	6,361	6,234	7,985	6,641	8,349	8,448	6,856	4,702	80,426
Field totals	602,988	585,824	625,051	612,236	653,006	647,178	661,690	668,968	648,930	701,552	695,920	704,593	7,807,936
Buick Creek—Dunlevy[1]	1,267	797	1,268	816	991	993	1,845	1,298	1,956	1,491	1,761	1,839	16,322
Buick Creek East—Dunlevy											1,463	1,350	2,813
Bulrush—Halfway	10,582	9,534	12,545	9,214	11,674	11,090	11,030	10,005	8,857	9,424	9,635	8,593	122,183
Bulrush East—Halfway	467	320	393	164	623	416	486	448	290	366	176		4,149
Crush—Halfway	12,362	12,329	13,769	11,265	15,660	17,729	23,115	27,734	21,765	23,128	23,042	25,073	226,971
Currant—Halfway	17,321	16,484	23,402	17,068	19,778	18,978	24,011	23,263	16,771	16,706	18,550	19,797	232,129
Fort St. John—Charlie Lake	1,752	2,132	2,495	1,901	2,215	1,703	1,556	2,166	1,627	2,204	1,948	2,115	23,814
Inga—Inga	89,957	106,584	111,718	79,411	105,293	142,329	123,495	170,301	164,467	169,949	188,039	195,601	1,647,144
Milligan—Halfway	295,937	289,876	319,338	252,994	312,413	300,252	298,225	309,633	276,741	249,955	285,718	278,661	3,469,743
Nig Creek—Baldonnel	1,263	1,391	1,579	149	1,745	1,378	1,447	1,290	1,125	1,470	1,708	1,352	15,897
Osprey—Halfway	773	1,135	1,155	670	2,245	2,434	1,891	1,970	1,888	1,872	1,845	1,582	19,460
Peejay—Halfway	461,260	422,875	444,975	366,595	423,593	458,247	479,096	506,480	462,059	472,567	475,009	485,424	5,458,180
Rigel—Dunlevy	6,480	5,813	4,426	384	6,868	4,861	4,865	4,688	5,416	6,126	4,417	3,368	57,712
Stoddart—Belloy	4,827	3,639	3,616	1,386	4,052	3,408	3,343	3,478	2,986	2,949	2,927	3,016	39,627
Weasel—Halfway	74,189	69,243	83,115	62,206	52,993	44,066	85,116	77,364	75,303	77,813	78,648	83,700	863,756
Wildmint—Halfway	37,123	35,151	34,810	28,735	32,782	28,788	30,234	35,599	35,604	23,572	28,880	34,553	385,831
Willow—Bluesky-Gething	1,659	1,746	2,178	2,018	1,863	1,617	1,829	1,780	1,711	1,514	1,817	1,793	21,525
Wolf—Halfway	4,651	4,208	4,560	4,244	4,837	4,740	4,936	5,096	4,476	5,761	5,407	4,773	57,689
Other areas—													
Belloy[1]							65						65
Charlie Lake[1]											1,658	5,210	6,868
Charlie Lake						1,182							1,182
Confidential		743	1,533	148	2,192	3,536	2,960	5,152	4,522	4,321	3,335	7,616	36,058
Confidential[1]						176	397	1,160					1,733
Area totals		743	1,533	148	2,192	4,894	3,422	6,312	4,522	4,321	4,993	12,826	45,906
Totals—													
Crude	1,752,248	1,697,500	1,826,881	1,570,982	1,782,975	1,827,898	1,899,995	2,000,869	1,878,581	1,918,968	1,985,536	2,008,920	22,151,353
Field condensate	3,339	3,126	3,631	3,399	3,394	3,499	5,011	5,028	4,534	3,514	5,992	9,696	54,163
Total crude and equivalent	1,755,587	1,700,626	1,830,512	1,574,381	1,786,369	1,831,397	1,905,006	2,005,897	1,883,115	1,922,482	1,991,528	2,018,616	22,205,516

[1] Condensate.

TABLE 26.—MONTHLY NATURAL-GAS PRODUCTION BY FIELDS AND POOLS, 1968

(Quantities in M s.c.f.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Airport—													
Cadomin	3,025	2,856	24,722	22,949	11,595	11,862	21,078	19,969	10,057	18,683	17,231	17,848	181,875
Baldonnel						287							287
Field totals	3,025	2,856	24,722	22,949	11,595	12,149	21,078	19,969	10,057	18,683	17,231	17,848	182,162
Aitken Creek—Gething	197,019	213,253	227,010	219,714	222,314	218,534	204,969	225,640	181,086	175,994	238,510	236,851	2,560,894
Beg—													
Baldonnel	421,721	397,874	438,184	391,410	339,556	197,766	163,258	264,418	456,633	412,758	391,175	378,203	4,252,956
Halfway	575,970	527,260	525,194	442,349	391,385	272,763	243,878	430,549	584,632	628,434	557,988	490,972	5,671,374
Field totals	997,691	925,134	963,378	833,759	730,941	470,529	407,136	694,967	1,041,265	1,041,192	949,163	869,175	9,924,330
Beg West—Baldonnel	17,561	28,953	30,708	24,759	25,183	14,726	13,054	17,397	25,901	21,305	21,608	15,157	256,312
Bernadet—Bluesky-Gething	5,622	6,265	3,892		3,464	6,380	5,202	4,671	5,191	6,066	4,396	5,518	56,667
Blueberry—													
Dunlevy	54,133	50,097	51,917	45,597	52,113	52,085	43,621	47,038	46,983	48,259	50,218	52,760	594,821
Baldonnel	55,780	48,104	50,759	50,797	56,811	53,895	48,690	48,562	47,652	50,389	50,469	52,556	614,464
Field totals	109,913	98,201	102,676	96,394	108,924	105,980	92,311	95,600	94,635	98,648	100,687	105,316	1,209,285
Blueberry West—Dunlevy	9,681	7,701	8,541	7,506	6,465	6,223	5,142	4,751	12,164	10,641	9,361	9,828	98,004
Boundary Lake—													
Gething	23,546	26,826	31,636	42,973	47,222	36,294	42,828	50,678	34,364	62,693			399,060
Baldonnel	131,225	114,278	135,655	112,537	123,495	117,370	122,245	95,305	64,548	133,958	144,243	139,820	1,434,679
Basal Boundary	13,962	22,320	20,455	8,648	13,678	22,734	21,891	24,507	15,645	27,710	23,484	21,043	236,077
Field totals	168,733	163,424	187,746	164,158	184,395	176,398	186,964	170,490	114,557	224,361	167,727	160,863	2,069,816
Bubbles—Baldonnel	639,142	628,351	655,904	390,596	508,725	349,334	393,525	624,668	551,594	642,351	605,614	600,375	6,590,179
Buick Creek—Dunlevy	810,688	765,546	718,460	737,882	694,077	650,069	696,317	407,864	706,428	763,539	776,083	813,402	8,540,355
Buick Creek East—Dunlevy	367,097	318,099	338,789	324,744	296,942	248,158	284,820	283,628	238,056	369,510	351,568	358,733	3,780,144
Buick Creek North—													
Bluesky-Gething	58,903	42,874	49,146	51,394	70,425	71,076	520	10,085	51,423		1,976	10,619	418,441
Dunlevy	125,431	180,728	194,314	162,406	125,675	121,019	90,141	49,968	122,239	190,838	180,121	175,289	1,718,169
Field totals	184,334	223,602	243,460	213,800	196,100	192,095	90,661	60,053	173,662	190,838	182,097	185,908	2,136,610
Buick Creek West—													
Dunlevy	359,601	338,615	337,236	245,149	240,530	134,271	178,304	41,548	257,194	233,381	347,916	367,174	3,080,919
Baldonnel	18,533	21,324	21,703	21,730	18,639	14,875	20,532	7,535	21,067	20,334	21,612	20,482	228,366
Field totals	378,134	359,939	358,939	266,879	259,169	149,146	198,836	49,083	278,261	253,715	369,528	387,656	3,309,285
Clarke Lake—Slave Point	7,546,617	7,771,184	8,993,766	8,823,328	7,594,218	7,833,337	6,306,822	7,791,689	8,203,822	9,821,427	10,659,779	12,259,091	103,605,080
Clarke Lake South—Slave Point					275,858	64,289			33,402	130,958	235,488	148,824	888,819
Fort St. John—													
Baldonnel	351,792	305,376	340,600	284,196	182,810	184,824	311,735	319,862	158,762	342,897	301,367	314,233	3,398,454
Halfway	168,264	148,301	183,258	162,177	121,513	163,908	227,136	229,403	162,870	245,936	206,644	237,134	2,256,544
Belloy	65,057	34,084	58,880	47,689	45,663	32,548	37,277	40,855	27,598	46,226	38,600	39,332	513,809
Field totals	585,113	487,761	582,738	494,062	349,986	381,280	576,148	590,120	349,230	635,059	546,611	590,699	6,168,807

Fort St. John Southeast—													
Baldonnel	.....	33,037	46,706	42,207	75,386	70,044	84,414	85,013	24,005	87,962	83,649	75,222	707,645
Halfway	63,058	80,422	80,211	77,940	73,242	48,261	81,298	85,613	25,712	82,003	82,684	93,186	873,630
Belloy	179,907	245,115	238,384	233,534	221,927	175,407	270,654	251,738	90,217	254,431	237,029	233,831	2,632,174
Field totals	242,965	358,574	365,301	353,681	370,555	293,712	436,366	422,364	139,934	424,396	403,362	402,239	4,213,449
Halfway—Baldonnel	21,304	16,998	13,936	4,677	19,311	17,993	15,019	17,210	4,313	16,510	15,870	15,650	178,791
Highway—Dunlevy	14,598	12,945	12,088	11,270	13,003	13,359	13,477	12,005	11,371	14,009	13,101	13,577	154,803
Jedney—													
Baldonnel	1,041,241	959,561	829,020	765,428	715,637	630,313	679,342	836,954	685,960	1,113,851	949,374	1,066,637	10,273,318
Halfway	870,985	825,810	732,883	654,086	611,845	484,469	678,921	655,344	587,158	950,245	903,037	877,978	8,832,761
Field totals	1,912,226	1,785,371	1,561,903	1,419,514	1,327,482	1,114,782	1,358,263	1,492,298	1,273,118	2,064,096	1,852,411	1,944,615	19,106,079
Jedney West—													
Baldonnel	.....	5,417	8,241	5,895	16,755	14,673	11,808	3,619	.....	9,574	.....	.....	75,982
Halfway	.....	4,852	9,419	5,771	16,471	13,654	10,488	2,146	.....	8,605	.....	.....	71,406
Field totals	.....	10,269	17,660	11,666	33,226	28,327	22,296	5,765	.....	18,179	.....	.....	147,388
Kobes Townsend—													
Dunlevy	87,580	70,888	60,560	12,419	38,744	41,415	22,075	50,598	31,228	84,391	83,359	80,115	663,372
Charlie Lake	116,031	104,784	89,200	22,712	83,656	82,721	78,043	74,277	37,821	125,663	377,231	97,491	1,289,630
Halfway	328,449	282,850	319,456	72,617	333,109	338,938	266,339	332,114	158,266	321,879	142,215	330,219	3,226,451
Mississippian	124,563	124,807	121,424	37,943	96,011	74,087	131,954	120,564	50,283	110,946	9,736	122,707	1,125,025
Field totals	656,623	583,329	590,640	145,691	551,520	537,161	498,411	577,553	277,598	642,879	612,541	630,532	6,304,478
Kotcho Lake—Slave Point	.....	34,823	.....	.....	.....	.....	.....	.....	255,963	67,997	85,039	69,791	513,613
Laprise—Baldonnel	2,600,729	2,354,984	2,402,965	2,349,098	2,402,915	1,752,133	1,703,966	1,964,035	2,175,848	2,435,490	2,385,379	2,330,349	26,857,891
Laprise Creek West	5,395	304	.....	.....	1,413	.....	3,559	.....	.....	.....	.....	.....	10,671
Montney—Halfway	22,229	18,395	11,998	17,923	22,936	16,858	10,850	15,186	10,009	10,821	13,746	8,312	179,263
Nig Creek—Baldonnel	1,910,835	1,774,996	1,708,666	1,853,822	1,453,153	1,411,712	1,411,408	1,618,182	1,667,492	1,860,927	1,795,560	1,794,137	20,260,890
North Pine—Charlie Lake	.....	.....	.....	.....	.....	28,436	201,347	71,188	53,035	.....	10,924	43,098	408,028
Parkland—Wabamun	489,956	446,752	295,646	271,665	270,408	339,353	344,364	365,486	201,128	508,065	477,744	460,101	4,470,668
Rigel—Dunlevy	1,622,285	1,457,480	1,226,343	1,200,136	1,092,019	1,088,647	727,594	895,448	1,062,784	1,465,771	1,463,234	1,506,073	14,807,814
Stoddart—Belloy	526,157	470,660	530,000	439,156	461,429	550,972	739,009	661,365	553,154	670,840	695,613	687,121	6,985,476
Stoddart West—Belloy	.....	.....	1,172	1,506	.....	380	.....	.....	.....	.....	.....	.....	3,058
Yoyo—Pine Point	.....	.....	.....	.....	.....	.....	.....	.....	.....	229,108	73,193	26,736	329,037
Other areas—													
Pine Point	.....	.....	17,109	.....	.....	.....	.....	.....	.....	.....	25,513	.....	42,622
Charlie Lake	.....	.....	.....	.....	.....	17,400	.....	.....	.....	.....	.....	96,136	113,536
Confidential	.....	.....	4,150	.....	.....	7,014	46,115	60,641	8,291	.....	1,538	26,424	154,173
Belloy	.....	.....	.....	.....	.....	.....	5,000	.....	.....	.....	.....	.....	5,000
Field totals	.....	.....	21,259	.....	.....	24,414	51,115	60,641	8,291	.....	27,051	122,560	315,331
Totals, all fields	22,045,672	21,326,149	22,200,306	20,700,335	19,487,726	18,096,866	17,020,029	19,219,316	19,713,349	24,833,375	25,160,219	26,820,135	256,623,477

TABLE 27.—SUMMARY OF DRILLING AND PRODUCTION STATISTICS, 1968

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Well authorizations—													
Issued	25	26	17	4	8	7	15	10	24	14	8	22	180
Cancelled													
Wells spudded	32	29	20	2	8	9	13	10	16	25	8	17	189
Rigs operated during month	43	43	44	9	13	15	18	16	13	18	19	21	54[1]
Rigs operating at month's end	25	33	14	6	9	9	12	7	11	13	9	16	
Development footage	62,704	22,072	68,884	29,279	4,520	34,545	22,679	22,177	46,338	58,944	56,338	14,267	442,747
Exploratory outpost footage	70,178	27,923	45,159	5,342	12,506	11,448	22,811	33,497	6,080	13,272	9,525	8,150	265,891
Exploratory wildcat footage	29,811	98,061	89,794	25,342	6,725	14,588	446	30,207	6,780	5,120	13,382	45,991	366,247
Total footage drilled	162,693	148,056	203,837	59,963	23,751	60,581	45,936	85,881	59,198	77,336	79,245	68,408	1,074,885
Wells abandoned	19	15	22	6	2	6	4	10	2	5	7	7	105
Service wells	1						1		1	2			5
Finished drilling wells			1										1
Oil wells completed	4	4	5	1		3	3	4	8	8	4	2	46
Producible oil wells	568	565	566	572	573	575	576	579	585	592	594	590	
Producing oil wells	462	473	466	458	463	469	472	475	479	489	488	479	
Production in barrels	1,752,248	1,697,500	1,826,881	1,570,982	1,782,975	1,827,898	1,899,995	2,000,869	1,878,581	1,918,968	1,985,536	2,008,920	22,151,353
Average daily production	56,524	58,535	58,931	52,366	57,515	60,930	61,290	64,544	62,619	61,902	66,185	64,804	60,523
Gas wells completed	6	6	7	3	1	1	1	1	1	2	3	2	34
Producible gas wells	605	618	622	627	636	635	635	638	638	641	643	646	
Producing gas wells	250	251	257	249	250	246	249	243	257	269	271	270	
Production in M s.c.f.	24,096,691	23,344,920	24,417,638	22,520,280	21,435,756	20,008,437	19,114,178	21,382,315	21,675,029	26,717,884	27,062,759	28,686,886	280,462,773
Average daily production	777,313	804,997	787,666	750,676	691,476	666,948	616,586	689,752	722,501	861,867	902,091	925,383	766,292

[1] Rig operated during 1968.

NOTE.—Each zone of a multiple completion is counted as one well.

TABLE 28.—SUPPLY AND DISPOSITION OF CRUDE OIL AND CONDENSATE/PENTANES PLUS, 1968

(Quantities in barrels.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Available Supply													
British Columbia production—													
Crude	1,752,248	1,697,500	1,826,881	1,570,982	1,782,975	1,827,898	1,899,995	2,000,869	1,878,581	1,918,968	1,985,536	2,008,920	22,151,353
Field condensate	3,339	3,126	3,631	3,399	3,394	3,499	5,011	5,028	4,534	3,514	5,992	9,696	54,163
Plant condensate	90,518	95,568	83,882	77,006	76,010	71,376	63,985	63,175	71,097	89,996	88,840	88,799	960,252
Alberta imports—Crude and equivalent	5,951,933	6,168,602	6,317,484	5,392,651	5,252,295	5,753,906	7,393,802	7,125,741	6,645,894	6,689,888	6,898,252	7,608,249	77,198,697
Totals	7,798,038	7,964,796	8,231,878	7,044,038	7,114,674	7,656,679	9,362,793	9,194,813	8,600,106	8,702,366	8,978,620	9,715,664	100,364,465
Disposition													
Inventory increase/decrease (—)													
Field	375	—4,298	4,204	6,449	—10,216	1,459	—846	5,422	3,314	—1,545	1,023	—3,933	1,408
Plant	—25,831	—5,497	—10,889	3,295	—10,182	—20,451	24,604	—11,093	14,493	2,123	15,716	—13,288	—37,000
British Columbia transporters	—321,958	227,861	324,421	48,490	—171,871	—211,783	50,466	265,285	—247,561	—189,444	—89,667	28,598	—287,163
Miscellaneous—													
Plant fuel													
Pipe-line use	1,369	4,152	2,282	1,830	1,273	1,846	2,343	1,990	2,017	2,095	1,776	5,450	28,423
Field losses and adjustments	—2,169	—215		—1,502	—6,985	—8,813	—5,590	—5,518	—5,134	—7,349	—8,556	—6,492	—58,323
Plant losses and adjustments		5,009				—772	—3,962	—953	—3,355			—1,448	—5,481
Transporters' losses and adjustments	501	4,894	14,378	11,414	—248	23,953	9,722	—28,394	7,638	20,779	2,596	30,208	97,441
Deliveries—													
British Columbia refineries—													
British Columbia crude	1,671,529	1,605,515	1,586,517	1,461,560	1,555,466	1,580,364	1,759,065	1,659,489	1,690,381	1,712,729	1,669,510	1,695,349	19,647,474
Alberta crude	1,754,380	1,670,885	1,772,278	1,724,467	1,708,132	1,573,397	1,610,845	1,521,875	1,709,474	1,789,915	1,727,677	1,886,932	20,450,257
British Columbia condensate	66,318	52,312	36,251	34,216	42,649	52,202	19,187	34,866	25,812	37,445	25,643	38,197	465,098
Export to United States—													
British Columbia crude	100,674	118,096	224,081	207,487	215,011	334,944	267,147	315,219	225,581	300,908	409,988	283,140	3,002,276
Alberta crude	4,506,012	4,258,229	4,233,582	3,509,236	3,751,194	4,290,745	5,609,288	5,401,171	5,143,977	4,988,866	5,173,795	5,709,119	56,575,214
British Columbia condensate	46,573	39,733	46,456	35,594	40,199	36,358	19,590	35,510	29,884	46,563	45,006	61,663	483,129
Field sales	1,175	2,015	803	1,572	350	885	613	1,369	960	255	969	495	11,461
Reporting adjustments	—910	—13,895	—2,486	—70	—98	2,345	321	—1,425	2,625	—974	3,144	1,674	—9,749
Totals	7,798,038	7,964,796	8,231,878	7,044,038	7,114,674	7,656,679	9,362,793	9,194,813	8,600,106	8,702,366	8,978,620	9,715,664	100,364,465
British Columbia Refineries													
Receipts—													
British Columbia crude	1,757,184	1,631,392	1,625,614	1,519,117	1,596,757	1,692,567	1,782,858	1,625,544	1,650,095	1,683,429	1,677,456	1,737,752	19,979,765
Alberta crude	1,754,380	1,670,885	1,773,549	1,724,467	1,708,132	1,556,417	1,610,845	1,521,875	1,709,474	1,789,915	1,727,677	1,886,932	20,434,548
Alberta butane	31,490	20,282	14,631							21,241	23,073	23,872	134,589
Total receipts	3,543,054	3,322,559	3,413,794	3,243,584	3,304,889	3,248,984	3,393,703	3,147,419	3,359,569	3,494,585	3,428,206	3,648,556	40,548,902
Inventory increase/decrease (—)	117,563	16,306	162,525	5,921	—8,987	65,524	49,566	2,701	—98,314	—109,272	—26,881	253,413	430,065
Losses and adjustments	—616	26,054	761	—45	—417	—286	—244	—755	358	62	—67	—1,314	23,491
Refinery runs	3,426,107	3,280,199	3,250,508	3,237,708	3,314,293	3,183,746	3,344,381	3,145,473	3,457,525	3,603,795	3,455,154	3,396,457	40,095,346

TABLE 29.—MONTHLY NATURAL-GAS DISPOSITION, 1968

(Quantities in M s.c.f.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Available Supply													
British Columbia production—													
Wet gas	14,009,099	13,108,213	12,910,894	11,605,342	11,347,242	9,859,887	10,368,843	11,062,141	11,274,997	14,372,925	13,787,208	13,952,119	147,658,910
Dry gas	8,036,573	8,217,936	9,289,412	9,094,993	8,140,484	8,236,979	6,651,186	8,157,175	8,438,352	10,460,450	11,373,011	12,868,016	108,964,567
Associated gas	2,051,019	2,018,771	2,217,332	1,819,945	1,948,030	1,911,571	2,094,149	2,162,999	1,961,680	1,884,509	1,902,540	1,866,751	23,839,296
Less injected	667,725	657,996	747,190	651,223	691,564	638,379	644,949	725,740	643,919	493,896	585,134	683,042	7,830,757
Net British Columbia production	23,428,966	22,686,924	23,670,448	21,869,057	20,744,192	19,370,058	18,469,229	20,656,575	21,031,110	26,223,988	26,477,625	28,003,844	272,632,016
Alberta imports	28,799,404	26,878,685	28,227,546	25,697,125	25,638,804	24,967,910	25,257,850	26,632,825	25,212,581	28,276,896	27,595,227	30,507,149	323,692,002
Totals	52,228,370	49,565,609	51,897,994	47,566,182	46,382,996	44,337,968	43,727,079	47,289,400	46,243,691	54,500,884	54,072,852	58,510,993	596,324,018
Disposition													
Flared—													
Field	922,219	954,790	1,020,515	744,050	912,041	938,085	1,101,096	1,051,569	886,193	927,992	1,008,016	887,628	11,354,194
Plant—													
Residual gas		4,720	1,520	400	2,800		1,000	3,000	4,604	250	1,200		19,494
Natural gas	846,098	814,076	965,906	954,238	855,410	859,504	718,138	866,694	917,467	1,067,066	1,176,554	1,356,390	11,397,541
Gas-gathering systems			2,496	420	314	344	2,361	7,155	23,913		10,501	481	47,985
Fuel—													
Lease	156,989	139,993	172,157	124,910	109,681	127,914	131,781	147,946	176,081	188,236	170,929	195,352	1,841,969
Plant	791,942	759,008	767,035	705,149	708,688	631,389	621,654	653,294	669,096	762,887	750,024	885,015	8,705,181
Transporters	1,239,191	1,109,168	1,020,616	903,287	773,955	726,443	660,582	880,718	919,534	1,580,634	1,747,701	2,082,096	13,643,925
Gas-gathering systems	406												406
Line pack changes—													
Gas-gathering systems	—169	1,126	—345	281	681	—368	—372	—639	254,631	447	232,129	24,245	511,647
Transporters	284,429	122,661	—30,512	—114,821	21,473	—7,307	49,780	54,251	13,456	—108,154	—13,362	2,961	274,855
Losses and metering difference—													
Field	433,733	272,937	337,817	377,823	200,990	182,613	159,739	214,088	152,949	469,382	496,560	131,548	3,430,179
Gas-gathering systems		55,342								341,115		228,297	624,754
Gas plants	536,043	596,354	1,344,217	—130,689	91,471	—196,515	—54,936	246,420	—24,303	408,104	747,461	966,065	4,529,692
Transporters	—57,513	179,504	89,872	55,131	60,324	133,688	264,939	339,738	201,959	290,169	—93,658	199,143	1,663,296
Processing shrinkage	550,065	545,139	588,612	519,564	325,165	454,170	495,231	502,277	526,807	675,442	626,994	644,086	6,453,552
Deliveries—													
British Columbia distributors—													
Northeast	625,743	321,466	252,813	218,773	165,009	131,952	118,427	121,682	156,541	169,553	272,933	420,975	2,975,867
Interior	2,207,885	2,200,910	1,968,165	1,816,821	1,641,745	1,474,388	1,336,986	1,334,486	1,502,867	1,993,651	2,049,354	2,511,922	22,039,180
Lower Mainland	5,835,614	5,756,781	5,934,933	5,396,570	4,802,019	4,530,524	3,802,763	5,495,230	4,753,822	5,885,097	5,586,155	6,479,587	64,259,095
Export—													
British Columbia natural gas	10,852,108	10,404,228	11,374,803	10,952,419	10,536,258	9,812,529	9,686,088	9,602,118	10,814,278	13,223,343	13,554,152	13,607,970	134,420,294
Alberta natural gas	27,063,804	25,356,611	27,054,729	24,620,790	24,675,763	24,090,426	24,370,555	25,566,192	24,251,575	26,828,872	26,109,510	28,659,866	308,648,693
Reporting adjustments	—60,217	—29,205	—967,355	421,066	499,209	448,189	261,267	203,181	42,221	—203,202	—360,301	—772,634	—517,781
Totals	52,228,370	49,565,609	51,897,994	47,566,182	46,382,996	44,337,968	43,727,079	47,289,400	46,243,691	54,500,884	54,072,852	58,510,993	596,324,018

British Columbia Distributors													
Receipts—													
Natural gas	8,732,529	8,279,056	8,167,593	7,432,083	6,609,439	6,136,740	5,268,485	6,951,342	6,413,167	8,114,061	7,873,147	9,412,393	89,390,035
L.P.G. gas	99,055	74,598	72,063	66,926	51,211	44,874	42,411	44,877	48,208	67,852	79,361	147,243	838,679
Disposition—													
Gas used in operations	2,671	2,887	766	702	3,763	2,765	1,681	9,781	2,056	5,266	8,504	47,217	88,059
Losses and adjustments	208,920	—669,945	144,508	—307,572	—781,349	—191,797	—96,619	264,454	483,226	1,213,112	866,315	1,842,610	2,975,863
Line pack changes	17,977	18,425	—50,088	—8,795	8,869	—14,458	1,583	—4,300	10,723	5,000	—988	24,401	8,349
Sales—													
Residential	3,553,430	3,114,854	2,390,515	2,293,724	1,686,172	940,872	663,457	557,818	777,924	1,416,217	2,285,267	3,128,515	22,808,765
Commercial	1,974,232	1,860,139	1,494,401	1,391,778	1,077,182	700,782	555,619	501,549	647,205	960,684	1,447,084	1,841,741	14,452,396
Industrial	2,117,186	2,265,197	2,463,273	3,003,155	2,612,332	2,365,483	2,195,219	2,259,648	2,402,235	2,554,154	2,473,707	2,153,872	28,865,461
Electric-power generation	956,697	1,761,783	1,796,281	1,126,017	2,053,681	2,377,967	1,989,956	3,407,269	2,133,140	2,027,480	872,619	521,280	21,024,170
Miscellaneous	471	314							4,866				5,651
Total sales	8,602,016	9,002,287	8,144,470	7,814,674	7,429,367	6,385,104	5,404,251	6,726,284	5,965,370	6,958,535	7,078,677	7,645,408	87,156,443
Value of sales to distributors	$6,545,809	$6,078,086	$5,970,337	$5,126,963	$4,095,087	$3,372,832	$2,817,490	$3,292,008	$3,559,070	$5,074,562	$5,703,865	$7,003,176	$58,639,285

TABLE 30.—MONTHLY BUTANE, PROPANE, AND SULPHUR DISPOSITION, 1968

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Butane													
Production (bbl.)—													
Plant	46,454	42,605	45,836	39,741	35,806	39,443	42,668	39,526	43,412	52,462	50,908	48,685	527,546
Refinery	23,080	22,313	17,995	5,106	22,187	7,946	12,222	16,936	15,454	15,858	12,732	13,905	185,734
Opening inventory	20,376	15,299	8,161	16,638	11,345	16,515	15,355	17,977	13,607	14,713	12,541	12,688	20,376
Losses and adjustments	13,239	10,027	9,461	15,238	12,009	3,545	12,611	12,812	12,635	11,703	14,507	11,507	139,294
Plant fuel	.....	.....	3,563	1,083	6,884	18,084	5,798	5,022	2,072	.....	.....	.....	42,506
Gasoline enrichment	7,557	8,377	8,795	7,349	4,951	6,407	5,296	5,338	10,556	14,772	18,818	18,270	116,486
Sales—													
British Columbia	16,479	38,270	20,504	21,610	20,211	18,463	25,062	32,786	23,120	40,331	26,423	26,255	309,514
Alberta	.....	.....	1,514	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,514
Export—													
United States	29,799	15,382	11,517	4,860	8,768	2,050	3,501	4,874	9,377	3,686	3,745	10,209	107,768
Offshore	7,537	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,537
Total sales	53,815	53,652	33,535	26,470	28,979	20,513	28,563	37,660	32,497	44,017	30,168	36,464	426,333
Closing inventory	15,299	8,161	16,638	11,345	16,515	15,355	17,977	13,607	14,713	12,541	12,688	9,037	9,037
Propane													
Production (bbl.)—													
Plant	35,307	35,669	35,807	24,856	26,641	31,049	31,188	26,875	32,175	38,405	38,802	44,026	400,800
Refinery	35,735	29,629	29,815	21,710	27,715	23,376	25,035	30,529	31,352	32,386	32,053	31,490	350,825
Opening inventory	22,465	19,447	15,797	24,125	16,713	12,422	15,559	14,695	20,476	12,803	13,898	19,508	22,465
Plant fuel	.....	.....	2,876	11,302	3,161	296	10,469	10,077	14,391	12,720	7,999	1,644	74,935
Losses and adjustments	3,146	—35	2,242	2,998	3,029	1,608	131	59	3	—3	—131	1,630	14,677
Sales in—													
British Columbia	70,565	68,584	51,437	36,840	43,117	37,214	35,953	36,966	45,301	56,979	57,006	74,081	614,043
Alberta	349	.....	739	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,088
Northwest Territories	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yukon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Export sales—													
United States	.....	399	.....	.....	189	184	.....	193	189	.....	371	7,665	9,190
Offshore	.....	.....	.....	2,838	9,151	11,986	10,534	4,328	11,316	.....	.....	741	50,894
Total sales	70,914	68,983	52,176	39,678	52,457	49,384	46,487	41,487	56,806	56,979	57,377	82,487	675,215
Closing inventory	19,447	15,797	24,125	16,713	12,422	15,559	14,695	20,476	12,803	13,898	19,508	9,263	9,263
Sulphur													
Production (long tons)	3,364	3,410	3,316	3,198	1,622	3,570	4,364	4,730	4,279	6,301	5,660	2,854	46,668
Opening inventory	34,575	33,238	35,283	37,253	38,788	33,468	34,508	30,193	31,200	33,615	34,810	35,058	34,575
Losses and adjustments	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	81	81
Sales—													
British Columbia	144	80	162	62	63	208	227	337	337	511	502	111	2,744
Export	4,557	1,285	1,184	1,601	6,879	2,322	8,452	3,386	1,527	4,595	4,910	1,603	42,301
Total sales	4,701	1,365	1,346	1,663	6,942	2,530	8,679	3,723	1,864	5,106	5,412	1,714	45,045
Closing inventory	33,238	35,283	37,253	38,788	33,468	34,508	30,193	31,200	33,615	34,810	35,058	36,117	36,117

NOTE.—December sales include accrued sales of 2,914 long tons. Sales of sulphur are reported in this table in long tons. Sales in short tons, 50,450.

TABLE 31.—MONTHLY GROSS VALUES OF CRUDE PETROLEUM, NATURAL GAS, NATURAL-GAS LIQUIDS, AND SULPHUR TO PRODUCERS FOR 1968

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Crude petroleum	$4,035,276	$3,920,411	$4,191,492	$3,585,506	$4,019,651	$4,094,604	$4,262,213	$4,514,161	$4,244,138	$4,350,905	$4,454,246	$4,532,642	$50,205,245
Natural gas	2,119,247	2,049,291	2,125,261	1,976,374	1,859,067	1,726,041	1,643,034	1,830,645	1,910,268	2,385,184	2,360,801	2,546,232	24,531,445
Products—													
Natural-gas liquids[1]	$51,649	$44,981	$45,933	$45,481	$47,096	$47,213	$38,551	$42,367	$30,725	$47,695	$56,583	$46,252	$544,526
Sulphur	4,158	4,670	4,143	4,407	1,936	3,954	4,499	5,244	5,617	6,395	7,060	6,953	59,036
Total products	$55,807	$49,651	$50,076	$49,888	$49,032	$51,167	$43,050	$47,611	$36,342	$54,090	$63,643	$53,205	$603,562
Total value	$6,210,330	$6,019,353	$6,366,829	$5,611,768	$5,927,750	$5,871,812	$5,948,297	$6,392,417	$6,190,748	$6,790,179	$6,878,690	$7,132,079	$75,340,252

[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 May 22, 1969.

TABLE 32.—CRUDE-OIL PIPE-LINES, 1968

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.	Aitken Creek, Blueberry	12¾	2.2	1	12,000	12,000	37.4	2,880	74,800
		8⅝	62.8						
	Inga	6⅝	1.7	1	8,000	10,000	.....	4,490	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						
		6⅝	24.3	1	36,000	52,000[1]	75.9	53,897	160,000
		8⅝	103.0	2	45,000	45,000[2]			
		12¾	39.0						
Tenneco Oil & Minerals Ltd.	Inga	4½	8.7	1	.....	2,000	8.7	950	.....
Western Pacific Products and Crude Oil Pipelines Ltd.	.....	12	505.0	12	64,000	64,000	.....	54,668	586,000

[1] Boundary Lake. [2] Terminal to Western Pacific Products and Crude Oil line.

TABLE 33.—CRUDE-OIL REFINERIES, 1968

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
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.
Gulf Oil Canada Limited	Kamloops	Comp.	1954	B.C.	5,900	585,000	Catalytic-fluid	1,900	Catalytic polymerization, catalytic reformer, distillate desulphurization, naphtha desulphurization, merox.
Gulf Oil Canada Limited	Port Moody	Comp.	1958	B.C. and Alberta	18,000	1,625,000	Catalytic-fluid	8,480	Catalytic reformer, distillate desulphurization, alkalation-sulphuric acid, naphtha desulphurization, merox.
Imperial Oil Enterprises Ltd.	Ioco	S.C.A.	1915	B.C. and Alberta	33,000	2,895,000	Catalytic-fluid	9,500	Catalytic polymerization, powerformer, Ioluene extraction, middle distillate hydrofining.
Pacific Petroleums Ltd.	Taylor	Comp.	1957, 1961	B.C.	9,300	1,170,000	Catalytic-fluid	3,800	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	525,000			Unifiner, reformer.

Symbols: S.C.A.—skimming, cracking, and asphalt; Comp.—complete.

TABLE 34.—NATURAL-GAS PIPE-LINES, 1968

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	44.9	—	.....	528,000	.....	3,284.9	Lower Mainland of British Columbia.
		18	37.3						
		16	20.3						
		12	80.6						
Columbia Natural Gas Ltd.	Alberta Natural Gas Co. Ltd.	8	34.6	—	.....	.....	.....	.....	
		6	37.7	—	.....	17,130	8	1.7	
		4	11.2	—	.....	.....	6	2.4	Cranbrook, Fernie, Kimberley, Chapman Camp, Creston, Marysville.
		3	27.6	—	.....	.....	4	7.4	
		2	0.5	—	.....	.....	3	15.3	
		—	—	—	.....	.....	2	27.1	
							1¼	32.5	
Gas Trunk Line of British Columbia Ltd.	Beg field	—	—	1	1,000	.....	16	27.4	
							6⅝	6.9	
	Boundary Lake field	—	—	—	.....	.....	16	31.4	
							6⅝	1.77	To Westcoast Transmission Co. Ltd.
	Jedney and Bubbles field	—	—	4	4,960	.....	12¾	31.5	
							10¾	7.0	
	Laprise Creek field	—	—	1	2,160	.....	12¾	23.8	
	Nig Creek field	—	—	—	.....	.....	16	28.3	
Inland Natural Gas Co. Ltd.	Westcoast Transmission Co. Ltd.	12	152.8				8	12.2	
		10	116.0				6	21.0	
		8	17.1				4	91.4	MacKenzie, Hudson Hope, Chetwynd, Prince George, Cariboo, Okanagan, and West Kootenay areas.
		6	75.2	1	1,100	78,600	3	54.6	
		4	106.6				2	403.3	
		3	47.6				1½	20.8	
		2	38.5				1¼	69.3	
		1½	0.2				.....	.....	
Northland Utilities (B.C.) Ltd.	Peace River Transmission	1¼	3.5	—	.....	10,900	.....	55.4	Dawson Creek, Pouce Coupe, and Rolla.
		—	9.5	—	.....	.....	.....	.....	
Pacific Northern Gas Ltd.	Westcoast Transmission Co. Ltd.	10¾	272.0				6	0.8	
		8⅝	86.9				4	4.5	
		6⅝	36.5	—	.....	23,000	3	5.4	Vanderhoof, Fraser Lake, Burns Lake, Smithers, Terrace, Prince Rupert.
		4½	6.7				2	5.0	
		3½	16.5				1¼	1.4	
		2⅜	16.9				.....	.....	

TABLE 34.—NATURAL-GAS PIPE-LINES, 1968—*Continued*

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	
Plains Western Gas & Electric Co. Ltd.	Westcoast Transmission Co. Ltd.	6	0.3				4	12.4	
		4	17.04	...	...	...	3	1.9	Fort St. John, Aennofield, Taylor, and Grandhaven.
		3	5.7				2	28.0	
		2	0.9	...	...	...	1¼	0.1	
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	98.5	...	...	...	...	...	
		30	646.6	14	251,140	955,000	...	...	
	Alaska Highway system	...	...	...	...	...	26	37.5	
							20	19.3	
							18	17.9	
							12¾	9.9	
	Blueberry West field	...	...	...	...	...	8⅝	6.7	
	Boundary Lake field	...	...	...	...	...	16	0.5	
	Bubbles field	...	...	1	660	...	...	...	
	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	
							18	7.8	
	Fort St. John field	...	...	5	1,980	...	10¾	0.9	
							8⅝	0.7	
	Fort St. John Southeast field	12	7.0	...	...	...	12¾	4.0	
	Fort Nelson Plant	30	220.75	1	1,250	325,000	...	...	
	Gundy Creek field	...	...	...	...	...	10¾	6.1	
	Kobes-Townsend field	...	...	1	6,000	...	12¾	18.9	
							8⅝	5.5	
	Kotcho Lake field	12	11.0	...	...	...	...	...	
	Laprise Creek field	...	...	1	2,160	...	...	...	
	Montney field	...	...	...	...	...	4½	7.4	
	Parkland field	...	...	...	...	...	8⅝	6.6	
	Red Creek field	...	...	1	230	...	4½	2.9	
	Rigel field	...	...	1	6,565	...	12¾	9.6	
							10¾	10.3	
	Stoddart field	...	...	...	...	...	8⅝	6.3	
	Yoyo field	24	48.0	...	...	...	...	...	

TABLE 35.—GAS-PROCESSING PLANTS, 1968

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 British Columbia producing gasfields 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 Gas & Electric Co. Ltd.
Westcoast Transmission Co. Ltd.	Lot 2683, P.R.D.	Clarke Lake	Potassium carb. M.E.A. treating absorption	1965	516	438		Westcoast Transmission Co. Ltd.

TABLE 36.—SULPHUR PLANTS, 1968

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 DRAWINGS

FATAL ACCIDENTS

In 1968, 12 fatalities occurred in the mining industry and all were related to mines other than coal. For the coal-mining industry this was an optimum reduction from 16 in 1967 to none in 1968. Although there were three fewer fatalities than in 1967, the 1968 total still exceeds the past 10-year average of 10.7. The 12 fatalities occurred in 10 separate accidents.

The following table shows the mines at which fatal accidents occurred during 1968, with comparative figures for 1967:—

Company	Location	Number of Fatalities	
		1968	1967
Mines other than coal—			
Abbotsford Gravel Sales Ltd.	Matsqui	—	1
Aetna Investment Corporation Limited (Mineral King)	Toby Creek	—	1
Blue Star Mines Limited (Scranton)	Ainsworth	—	1
Bralorne Pioneer Mines Limited	Bralorne	—	1
Brynnor Mines Limited (Boss Mountain)	Big Timothy Mountain	1	—
Canadian Exploration Limited (Jersey)	Salmo	—	1
Craigmont Mines Limited (Craigmont)	Merritt	—	2
Domtar Chemicals Ltd.	Blubber Bay	1	—
Endako Mines Ltd. (Endako)	Endako	1	—
Giant Mascot Mines Limited (Pride of Emory)	Texas Creek	3	—
Glen Copper Mines Limited	Legate Creek	—	1
Granduc Operating Co. (Tide Lake camp)	Stewart	1	2
Jedway Iron Ore Limited	Jedway	—	1

Company	Location	Number of Fatalities	
		1968	1967
Mines other than coal—*Continued*			
King Resources Company (Knox)	Mount Copeland	1	...
Noradco-Shields Joint Venture (Goat)	Stewart	2	...
Penticton Gravel and Excavating Ltd.	Westbank	...	1
Quesnel River placer	Quesnel River	1	...
Texada Mines Ltd. (Texada)	Texada Island	...	1
W. C. Cornish Transport (Churchill Copper Corporation Ltd.)	Racing River	1	...
Wesfrob Mines Limited (Tasu)	Tasu	...	1
Zeballos Iron Mines Ltd.	Zeballos	...	1
Coal mines—			
Balmer North	Michel	...	15
Balmer South	Michel	...	1
Totals		12	31

The following table classifies fatalities as to cause and location:—

Cause	Number	Location	
		Surface	Underground
Airblast	2	...	2
Fall	1	...	1
Cave of ground	1	...	1
Blasting	2	...	2
Vehicles—			
(*a*) Faulty brakes	1	1	...
(*b*) Crushed by	2	2	...
Asphyxia	1	1	...
Drowning	1	1	...
Struck by flying rock	1	1	...
Totals	12	6	6

A description of each fatal accident follows.

James Reginald Mackay, aged 25 years, married, and employed as a development miner by Brynnor Mines Limited at Boss Mountain mine, died January 30th as a result of injuries received in an accident on the main haulage level on January 11, 1968.

On the day of the accident, Mackay and two other miners were employed drilling a slash at the side of the face of a by-pass drift being driven off the main haulage at a point approximately 450 feet within the portal. On the side track behind them were a drill wagon and a mucking machine. A supply man, acting as spare motorman, brought a battery locomotive into the side track but neglected to return the track switch to direct traffic along the main haulage track. The motorman on an incoming empty ore train, consisiting of 13 130-cubic-feet Granby cars and a trolley locomotive, did not realize his train was being sidetracked until the end car struck the battery locomotive. As soon as this happened he stopped the train and backed out. The impact of the collision drove the motor into the mucking machine, which in turn struck the drill wagon propelling it forward to crush the three miners between it and the face at which they were working. First-aid treatment was quickly available and the men were taken to the hospital at 100 Mile House. Mackay had received such injuries to his thighs as to require both legs being amputated at the hips, one of the miners required his left leg being amputated between the knee and hip, while the third miner sustained fractures to his left ankle, tibia, and fibula.

From the investigation made after the accident the following accident-prevention measures were adopted by the company:—

(1) The train switchmen are required to precede all trains past the by-pass switch while persons are employed in that area.
(2) A weighted switch was installed. It requires being held open manually when any traffic is to be routed into the side track.

The jury's verdict was " that the deceased . . . came to his death . . . as a result of injuries sustained in a mining accident . . . with no blame attached to anybody as the result of a switch (track) to a by-pass being left open." The jury recommended " that special precautions be taken in future with reference to all headings beginning off main haulage lines to prevent the inadvertent entrance of any mine vehicle or train, and that such special precautions such as spring switch and/or light system be shown on mine work plans."

Dale Bennett Dew, aged 22 years, married, and employed as a truck driver by Endako Mines Ltd. at Endako mine, died on March 16, 1968, as a result of injuries received when the front wheel of his loaded, parked, ore-haulage truck passed over him after his truck was struck in the rear by another loaded ore truck.

According to witnesses Dew appeared to be experiencing steering difficulties as he was driving a 35-ton load of ore on the main haulage road to the crushing plant. Because of this he drove to the right side of the 70-foot wide road, stopped the truck, and got out. He found the right front tire to be flat and as he was returning in front of his vehicle it was struck in the rear by another loaded haulage truck. The impact caused Dew's truck to roll forward, apparently knocked him to the ground, and the front left wheel rolled over him. First-aid treatment was given immediately and Dew was taken to Burns Lake hospital where he died two hours after the accident. The attending doctor advised that Dew's death was caused by internal hæmorrhaging from a ruptured iliac artery. Other injuries included a fractured left femur and extensive pelvic damage.

The accident investigation indicated the truck was parked well off the operating part of the road, that the rear parking-lights were on and easily visible to approaching traffic, and except for the flat tire the vehicle was in good operating condition. The other vehicle was also found to be in good operating condition and visibility was average for that time of day and month. It would appear that the accident was caused through inattention on the part of the driver of the second vehicle.

The verdict of the inquest jury was accidental death and concluded the accident was the result of an error in judgment on the part of the driver of the second vehicle. The jury made the following recommendations:—

(1) Haulage trucks should be equipped with a four-way flasher on tail-lights and head-lights and the flasher should be placed in operation whenever it is necessary for a truck to stop in a travelled area.
(2) More care should be taken in selecting drivers for haulage trucks. The driving records of potential truck drivers should be investigated and a record of their training and " check out " should be kept at the mine.

The driver of the second vehicle was charged under the *Motor-vehicle Act* with driving without due care and attention. At the hearing held at Burns Lake, December 19, 1968, he entered a plea of " not guilty " but was convicted and fined $250.

Charles Howard Howey, aged 49 years, married, and employed as a senior shiftboss in the underground tail-track installation at the Tide Lake Camp portal of the Granduc Operating Company, 30 miles north of Stewart, was fatally injured June 15, 1968, when he fell a distance of 25 feet from a ladder in a vertical slot raise.

Howey, on his regular examination tour, was making his third and final tour for the day at about 2.30 p.m. He had descended by the installed ladders and plat-

forms a distance of 50 feet down the raise. He commenced to descend the last ladder down to the working-place, had hailed the two men working in the area, and was seen to be on the ladder two or three rungs down from the top. He remained there for about one minute when one of the men saw Howey fall, head first down the raise, preceded by his hard hat. He fell about 25 feet, landing on his head on the muck pile at the raise bottom and rolled under the lip of the drift back. He made no sound during his fall. As access was not possible directly down the slot raise, the two men climbed up the raise to the level above and travelled to Howey by way of another route. First-aid services were obtained and rendered soon after he was found, but he failed to respond and the doctor on examining Howey pronounced him dead. On examination the doctor advised that death was caused by multiple fractures to the base of the skull.

The jury's verdict was " death . . . from fractures to the skull through an accidental fall."

It was established during the inquest that the nape band of the hat was missing and therefore the protection required by the *Mines Regulation Act,* section 23, Rule 238, was not provided. This rule states, " No person shall enter any underground or open-pit workings unless wearing a protective hat manufactured for such service and incorporating a device to prevent the hat from being inadvertantly dislodged."

Lorne Thomas Bass, aged 19 years, single, and employed as a surface labourer by Versatile Mining Services Ltd., at the north camp of King Resources Company at Mount Copeland (Knox group), 20 miles northwest of Revelstoke, died from carbon-monoxide poisoning during the night of August 22/23, 1968.

On the evening of August 22nd, Bass installed a propane tank and a Paulin " Infra-Red " space-heater in his room. He lit the heater and at about 9.30 p.m. he retired, leaving both the door and window to his room closed. As he did not appear for breakfast one of the crew went to Bass' room to call him. As Bass did not respond, help was obtained and artificial respiration attempted, but it was discontinued when it was realized rigor mortis was present.

The investigation of the accident showed that because of faulty assembling and a bent gas-air mixing tube the heater produced large amounts of carbon monoxide. On a 4-hour test made in Bass' room this heater produced a carbon-monoxide concentration of 800 p.p.m., while a properly functioning heater developed only a trace under similar conditions.

The inquest held in Revelstoke on September 19th determined Bass' death was as a result of " carbon-monoxide poisoning sustained while the deceased was sleeping."

The Inspector of Mines investigating the accident recommended that this type of heater should have a securely attached warning tag on which advice is printed that such heaters

(1) can produce harmful amounts of carbon monoxide;

(2) require an adequate amount of ventilating air.

Leland Compton Hees, aged 54 years, and married, was working a placer lease on the south side of the Quesnel River about 7 miles above Quesnel when on August 22, 1968, he fell into the river and was drowned.

Hees was attempting to start the motor driving the winch pulling a chair seat on a cable crossing the river. Apparently the conveyance rolled down the slope toward the river before Hees was in it and he attempted to catch it before it got away. He over-balanced in doing so but hung on to the conveyance until it rolled to the bottom of the catenary of the cable, at which point he fell off into the river. His body was found downstream in the river on September 3rd.

At the Coroner's investigation, Hees' death was determined to have been accidental.

Section 23, Rule 18, of the *Mines Regulation Act* states: "Whenever workmen are required to work near water where there could be danger from drowning, the manager shall provide suitable life-saving equipment, and every workman shall use this equipment when necessary."

Douglas Howard McCullough, aged 36 years, married, and *Kazimiere Rudnicki,* aged 48 years, married, were killed on September 1, 1968, by an unexpected detonation of explosives while they were lighting fuses of a drift round at the Goat property (Noradco mine), 35 miles northeast of Stewart. The two men were employed as miners by Gremac Contracting Limited, which company held a mining contract with the Noradco-Shield Joint Venture.

The two men had loaded a 6-foot drift round of 32 holes plus two slash holes, had trimmed the 10-foot fuses, and were igniting them with hot-wire lighters when an unexpected explosion occurred.

The accident investigation indicated the workings to have been dry and that 18 holes had detonated in normal rotation. The fuses in the remaining loaded holes had not been lit. The trimmed portions of the fuse in the muck pile varied in length from 1 inch to 4 feet. It was also determined that until the middle of August all blasting had been initiated with igniter cord, but after that date when the supplier left the area the present method of igniting the fuse was adopted.

Several possible reasons for the accident were investigated, but no actual cause was determined. It is possible inexperience may have caused the men to delay too long at the face, however, had igniter cord been used, considerably less time would have been taken to light the round.

The inquest was held in Stewart on October 8th and found that the two men "came to their deaths . . . by a blast which apparently went off prematurely. The cause of death accidental. Recommended a timing-device with a loud bell or something similar."

Robert Daniel Forsyth, aged 31 years, single, and employed as a front-end loader operator by W. C. Cornish Transport, was instantly killed at approximately 8 a.m. on September 12, 1968, when the loader he was operating rolled off the Churchill Copper mine road, approximately 30 miles south of Mile 419 on the Alaska highway.

W. C. Cornish Transport had rented the 2½-cubic-yard Hough Payloader involved in the accident from Liard Concrete Products Limited of Fort Nelson and was doing road construction work for Churchill Copper Corporation Ltd. Forsyth was considered to be an experienced loader operator.

Immediately prior to the accident, Forsyth was driving down the 19-foot wide road on an 8 to 10 per cent grade and at its right side. The loader veered to the left and went over the bank, dropping 4 or 5 feet onto a joining road-bed. The cab came off at this point and the loader continued across the lower road and overturned on dropping a further 5 feet, after having travelled a total distance of 150 feet. Forsyth remained at the controls until the loader went over the second bank, when he was thrown out and crushed by the overturning machine.

The accident investigation determined the hydraulic brake line leading to the rear left wheel had been disconnected and a plug inserted in the supply, the master brake-cylinder for brake fluid empty, and a broken steering-bar between the rear wheels. It is not known if the broken steering-bar had caused the accident or had occurred during it, nonetheless it is obvious the machine went out of control because of lack of brakes.

The inquest held at Fort Nelson on October 1st returned the following verdict ". . . Robert Daniel Forsyth died from a fracture dislocation of the neck. Cause of the accident is of undetermined nature."

On November 13, 1968, while searching for the missing and now presumed dead *Henry P. Boudier* in the Pride of Emory mine of Giant Mascot Mines Ltd., Choate, *Alexander Hector MacCulloch* and *Robert Franklyn Gehue* were instantly killed from injuries received during an air blast produced by a massive collapse of rock at the west end of the 3550 adit.

Boudier, aged 46 years, and married, was operating a diamond drill close to the west portal of 3550 adit. He was attempting to determine the pillar thickness between that level and the Brunswick No. 2 open stope which had been mined up to 170 feet below 3550 level. Inasmuch as caving was occurring in No. 2 open stope, an investigation drill hole, inclined at 65 degrees below horizontal, had been drilled a distance of 62 feet toward the stope. Caving had occurred at the 41-foot mark and Boudier was attempting to clear the hole at this point when the stope caved further and engulfed the diamond-drill station. Although three supervisors had visited his working-place during the morning, none were aware that the caving had become so extensive. About 12.45 p.m. one of the supervisors decided to withdraw Boudier from the area and issued instructions to this effect. The cage tender was sent to convey this decision to Boudier and at about 1.10 p.m. arrived at the drill where he noticed a hole in the floor of the drift. The cage tender left the area immediately and advised his shiftboss. Four men came to the caved area within 10 minutes and were about to attempt to recover the drill when further caving caused them to retreat. These men included R. F. Gehue, shiftboss, aged 28 years, married and A. H. MacCulloch, assistant mine superintendent, aged 31 years, and married.

As Boudier apparently was not on the east or shaft side of the cave it was thought he may have gone out the west portal of the 3550 drift, about 400 feet west of the diamond drill. Messrs. MacCulloch and Gehue volunteered to go out to the surface at the east portal, climb over the mountain summit, and search for Boudier at the west portal. They left for the west portal at 3.15 p.m. and it was anticipated it would take them about 45 minutes to hike over the mounain. These men were to search for Boudier and then continue west down the Emory Creek slope to a truck at the end of the road.

At about 5.30 p.m., the afternoon shift, on getting to the shaft station, found evidence of an air blast having gone through the workings. Some concern was felt for MacCulloch and Gehue until it was believed a faint odour of wood smoke could be detected in the mine air. This gave rise to an assumption the two men had lit a fire for warmth near the west portal. The following morning six men went to the west portal and discovered the bodies of MacCulloch and Gehue covered with a fresh fall of snow at the foot of the trees below the west portal dump and about 150 feet from the portal.

The post mortem examination indicated both men had died as a result of fractured skulls and brain lacerations.

Surface examination indicated the stope had caved through to the surface in a zone 200 feet in diameter and 440 feet vertically, involving approximately 1,300,000 tons of rock.

The Coroner's jury found that the two men had met their death at approximately 4.15 p.m., November 13, 1968, at the 3550 level of the west portal of the Pride of Emory mine, by being caught in a major air blast being caused by the sudden movement of large quantities of rock. Death being instant in both cases due to fractured skulls along with other injuries.

The jury also found that there was " no negligence on the part of any person or company."

The search at the west portal failed to show any trace of the diamond-driller Henry Boudier and it is presumed he fell into the caving stope at the drill-site. An investigation of this stope also indicated that it would not be possible to draw out the caved material with any hope of finding any evidence of him, hence it is inferred he is missing and presumed dead.

Joseph Patrick Nolan, aged 34 years, married, and employed as a crusher operator at the Blubber Bay limestone plant of Domtar Chemicals Ltd., died on December 21, 1968, as a result of injuries received from a flying rock while breaking limestone at the primary crusher on December 12, 1968.

Nolan was hammering off the corner of a large rock in order to drop it onto the crusher pan-feeder when a stone chip flew off, striking him laterally to the right of the right eye, causing a small cut. He reported the injury to the first-aid attendant who noted the small cut and that there was no bleeding. Nolan completed his shift that day and on the following day (December 13th) as well as December 16th. On December 17th Nolan was reported ill, went to see the doctor in Powell River, and was told to remain off work and rest for the remainder of the week. He returned to the doctor on December 18th, was hospitalized and, as his condition worsened on December 20th, was flown to Vancouver General Hospital where he died on December 21, 1968.

The Coroner's investigation held in Vancouver on December 27th indicated the death as accidental and was caused by an " Occlusion of right internal carotid artery."

It could not be determined if he was wearing the safety goggles available on the job, which after examination appeared to be able to provide the necessary protection.

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

Mines Other than Coal*

There were 12 fatalities in 10 fatal accidents and 321 accidents involving a loss of more than three working-days 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, as to 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 men employed.

Accidents Causing Death or Injury Classified as to Cause

Cause	Number of Accidents	Percentage of Total
Atmosphere	4	1.2
Explosives	8	2.4
Falls of ground	64	19.2
Falls of persons	79	23.7
Lifting and handling material	34	10.3
Machinery and tools	64	19.2
Transportation	36	10.8
Miscellaneous	44	13.2
Totals	333	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	5	1.5
Haulagemen	22	6.6
Miners	155	46.6
Helpers	12	3.6
Timbermen	11	3.3
Mechanics, electricians, etc.	24	7.2
Miscellaneous	3	0.9
Surface—		
Mechanics, electricians, repairmen	31	9.3
Mill and crusher workers	16	4.8
Carpenters	6	1.8
Miners and drillers	9	2.7
Vehicle-drivers	17	5.1
Miscellaneous	22	6.6
Totals	333	100.0

Accidents Causing Death or Injury Classified as to the Parts of the Body

Location	Number of Accidents	Percentage of Total
Eyes	22	6.6
Head, face, and neck	26	7.9
Trunk	93	27.9
Upper extremities	72	21.6
Lower extremities	98	29.4
General	22	6.6
Totals	333	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
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
1968	73	682	553	7,371	132	93

[1] Compensable accident means an injury causing a loss of more than three days' work not including the day of the accident.

DANGEROUS OCCURRENCES

Fifty-six dangerous or unusual occurrences were reported as required by section 9 of the *Mines Regulation Act* and were investigated by the Inspectors of Mines. This compares with 43 reported for 1967.

Of these occurrences, 13 involved fires, 12 with vehicles, 8 of which were on the surface, 8 with explosives, 8 with hoisting incidents, 4 with falls, 3 with gas conditions, 2 each with inrushes of water, sand, or gas, and with caves, and 1 each involving a flood, a collapse of a crane, a collapse of a building, and with horse-play.

On January 1, 1968, a fire at the portal of the Antoine mine of Antoine Silver Mines Ltd. near Three Forks destroyed the ore bin and its roof. The fire was halted from entering the mine portal by a 20-foot long fire-proof roof section. It is assumed smoke entered the mine by leakage under the portal doors, but no one was underground.

On January 2, 1968, at the Britannia mine of Anaconda Britannia Mines Ltd., the trip arm of the No. 8 shaft skip became damaged either before or during dumping. While the skip was being lowered from the dumping position some minor damage was done to shaft timbers. A closed-circuit television unit has since been installed at the dumping position so that the hoistman can keep this area under observation during dumping operations.

On January 7, 1968, at the Britannia mine of Anaconda Britannia Mines Ltd., the runoff water from Mineral and Thistle Creeks flooded Britannia townsite following a very heavy rainfall. Minor damage was done to houses and the domestic water-supply line was ruptured.

On January 11, 1968, at the Britannia mine of Anaconda Britannia Mines Ltd., one man was injured when a staging collapsed during the mucking out of No. 8 shaft sump. Investigation showed the staging to have been inadequate and the injured man failed to wear a safety belt.

On January 12, 1968, in the Tide Lake Camp adit of Granduc Operating Company, a short circuit occurred in an electric trailing cable coiled on the ramp of the sliding floor. A large volume of smoke was produced and moved toward the drift face. The smoke was dissipated by compressed air from the drill jumbo air-hoses.

On January 18, 1968, two miners received minor injuries at the Pride of Emory mine of Giant Mascot Mines Limited when one of them drilled into a bootleg, detonating a small amount of explosives. The accident was the result of improper washing and examination of the face before drilling was started.

On January 19, 1968, at the primary crusher at the Tasu mine of Wesfrob Mines Limited, two men were standing in the ore-pass access drift observing a hang-up of ore in the chute. The hang-up suddenly released and the swinging chain gate struck one man, knocking him into the ore-pass. The other man lost his balance and fell in also, in his attempt to catch his partner. Both men escaped through the feeder and were relatively uninjured.

On February 2, 1968, at the open pit of the Lynx mine of Western Mines Limited, an unexpected and unexplained explosion shattered a newly installed third or upper section of drill steel being used in an air-trac drill.

On February 14, 1968, a fire occurred in a garage at the Tide Lake Camp of Granduc Operating Company. A gas explosion occurred in the oil furnace, causing the furnace door to open. The flames issuing from the firebox ignited the vapour-barrier paper on the wall beside the furnace.

On February 23, 1968, at the mine camp of British Columbia Molybdenum Limited, the propane gas-line serving the commissary was ruptured while carpenters were raising the building. The escaping gas was ignited by a heater in the commissary. While extinguishing the fire, two men were squirted in the face with fire-extinguisher fluid.

On February 29, 1968, at the concentrator of British Columbia Molybdenum Limited, two men were temporarily overcome by hydrogen sulphide gas released during the preparation of a milling reagent. It was determined that the gas was generated as the result of an inexperienced operator blending an incorrectly balanced mixture.

On March 2, 1968, at the Pride of Emory mine of Giant Mascot Mines Limited, the cage of the inclined shaft became derailed while descending just below 3250 level. On examination it was found the cage had, for an undetermined reason, become entangled with the D.C. trolley return wire which was installed in the shaft. During the incident the cage-wheel bearing-housing was smashed. The bearing was replaced and, during a trial run while a mechanic was in the cage, it became derailed at the same point and the replacement bearing-housing was destroyed also. Heavier duty bearings and housing were installed and operated without further incident.

On March 3, 1968, at the Sunloch and Gabbro property of Cerna Copper Mines Limited, the hoistman left the hoist controls because of heat and dizziness. He subsequently collapsed on being taken home. It was determined that the ventilating fan to the hoist-room was stopped while welding was being done to the ventilation pipe. It is believed that fumes developed and possibly a lack of oxygen plus the heat from the hoisting equipment caused the hoistman to be overcome.

On March 4, 1968, at the Lynx mine of Western Mines Limited, a fire of unknown origin destroyed the cookhouse.

On March 26, 1968, at the open-pit mine of British Columbia Molybdenum Limited at Kitsault, a loaded Haulpak truck steered off the road on a soft-filled section. The truck rolled on its side but the driver was uninjured.

On April 6, 1968, at the British Columbia Molybdenum Limited mine at Kitsault, a fire of undetermined origin broke out in the engine of a Ford tandem dump truck as it proceeded down the road from the open pit to the beach. The flames engulfed the cab, but the driver escaped without injury.

On April 15, 1968, at the Atlin-Ruffner property of Interprovincial Silver Mines Ltd., a fire, presumably caused by overheating of a compressor motor, destroyed the compressor house.

On April 21, 1968, in the No. 3 shaft of Reeves MacDonald Mines Limited, No. 1 skip lodged in the shaft while descending. Upon hoisting the skip, three kinks developed in the hoisting-rope.

On April 26, 1968, in the No. 3 shaft at Reeves MacDonald Mines Limited, No. 2 skip derailed while hoisting ore. Several sets of timber were destroyed before the skip lodged in the shaft.

On May 4, 1968, at F.L. mine of Zeballos Iron Mines Limited, a fire of unknown origin broke out in the powerhouse at about 5 p.m., resulting in the total destruction of the building and generators.

On May 7, 1968, at the Pride of Emory mine of Giant Mascot Mines Limited, the man-cage left the track a short distance above the 2600 level. No one was injured, although a cage bearing was damaged. Investigation disclosed that the shaft rails required levelling at the point of derailment.

On May 15, 1968, at the Bethlehem mine of Bethlehem Copper Corporation Ltd., due to a mechanical failure the brake system was damaged on a Haulpak truck. The driver realized the danger, turned the truck into a bank with minor damage and no injury to anyone.

On May 18, 1968, at the Tide Lake Camp of Granduc Operating Company, an employee riding a motor-cycle was seriously injured on being struck with a cement-mixing truck. The motor-cyclist had failed to ensure the road was clear before he entered it.

On May 22, 1968, at the Pride of Emory mine of Giant Mascot Mines Ltd., two miners were overcome by blasting gases when they entered and remained in a raise in which blasting had been done the day previously but in which ventilation had been cut off. Fortunately one man did not become unconscious until the shift-boss was inspecting the workings. The two men were removed and regained consciousness in fresh air.

On May 25, 1968, at the Granduc mine of the Granduc Operating Company, the driver of a Wagner PT14 carrier was injured when he attempted to change gears while driving the vehicle out of an underground ramp and lost control.

On May 28, 1968, at the Granduc mine of Granduc Operating Company, a miner while cleaning down a subdrift fell down an unguarded raise and onto the subdrift below.

On June 20, 1968, at the Trojan camp of South Seas Mining Limited, a fire of undetermined origin destroyed the dry and wash-house.

On June 28, 1968, the mill of Jedway Iron Ore Limited was destroyed by fire while a crew was removing the milling equipment. It is believed the fire may have originated from either hot cuttings from a welding torch or an overheated electrical circuit.

On July 2, 1968, at the Bluebell mine of Cominco Ltd., a heavy inflow of water, carbon dioxide gas, and sand and mud issued from a water course that had been intersected on No. 8 level north drift. Fortunately the ventilation and pumping systems proved adequate to cope with the emergency after the mine had been flooded to the No. 5 level.

On July 2, 1968, at the A.M. mine of Giant Mascot Mines Limited, a man was overcome from lack of oxygen when he entered a raise in which the mechanical ventilation had been stopped for a few days. This raise was connected by open rock fissures to an adjacent stope in which there was a deficiency of oxygen. On falling from the raise the man was removed to fresh air by his partner.

On July 12, 1968, at the Craigmont mine of Craigmont Mines Limited, a brake failure due to a short circuit in the control mechanism resulted in a collision between two ore trains on the 2400 level. No damage or injuries resulted.

On July 18, 1968, at the Pinchi Lake mine of Cominco Ltd., a truck driver was uninjured when the Euclid truck he was driving capsized over a dump and into shallow water at the edge of Pinchi Lake.

On July 25, 1968, at the Goat property of the Noradco-Shield Joint Venture near Stewart, a blaster did improperly guard a blasting operation, thus permitting rock to shower down a hillside where men were exposed to it.

On July 28, 1968, at the Granduc mine of the Granduc Operating Company, an employee was injured when the engine of a Scooptram which he was driving down an underground ramp stalled and the vehicle continued out of control. The service brakes and the emergency brakes failed to operate due to improper adjustment.

On July 30, 1968, at Jessie mine of Jedway Iron Ore Limited, three men employed by Cameron-McMynn Limited were travelling down a hill in a panel truck when the truck brakes failed. Two of the men received minor injuries when they jumped off the moving vehicle.

On August 6, 1968, at the Oliver open pit of Pacific Silica Limited, a failure of the north wall at the quarry dropped approximately 40,000 tons of rock to the quarry floor, partially burying the Northwest power shovel and some other equipment. The collapse occurred during the night when no one was working.

On August 13, 1968, at the Goat property of Noradco-Shield Joint Venture near Stewart, two men were slightly injured in an unexpected explosion which occurred while they were attempting to collar a hole in a tunnel face. It is presumed the drill had encountered some unexpected explosives concealed in the drift face.

On August 23, 1968, at the Alice Arm dock of British Columbia Molybdenum Limited, due to operator error the base section of a 25-ton P & H mobile crane collapsed as it was hoisting a barge out of water.

On August 26, 1968, at the Lynx mine of Western Mines Limited, a miner working in a stope was drawn into the drawpoint of a chute from which he had directed the tramming crew to draw ore. He was removed without injury after having been trapped for five hours.

On September 7, 1968, at the camp of British Columbia Molybdenum Limited at Kitsault, the driver of a Haulpak truck was uninjured when the truck he was driving went off the road and overturned. The causes of the accident were that the truck was being driven too close to the edge of the road, there was a soft shoulder on the road, and the weather conditions were wet and foggy.

On September 16, 1968, the Pride of Emory mine skip of Giant Mascot Mines Limited derailed because someone had neglected to shut the cage door; the door swung open, caught in the shaft timbers, and derailed the cage on its initial test-run for the day.

On September 22, 1968, at Britannia mine of Anaconda Britannia Mines Ltd., the south side cage-skip safety dogs engaged, thus holding the conveyance in the shaft and permitting a considerable amount of hoist rope to pile up on the cage roof. The excess rope was successfully rewound and the dogs disengaged, but no explanation could be found to account for their initial action.

On September 26, 1968, at Cassiar Asbestos Corporation Limited, a loaded Kenworth truck, owned and operated by a contractor, ran off the road and overturned while enroute from the mine to the mill. The driver was not injured. The accident was attributed primarily to the driver having failed to select the correct gear before proceeding on the 4-per-cent downhill haul and also to not having used the Jacob's retarder correctly. As a result of this, the brakes overheated and failed to stop the vehicle when applied.

On September 29, 1968, in the Granduc mine of Granduc Operating Company, a propane tank caught fire when the tank valve nipple broke off when the tank was knocked over. An attempt was made to extinguish the fire as one man was trapped behind it. He managed to escape without injury but the tank burned out.

On October 6, 1968, at the abandoned camp of Moresby Mines Limited at Botany Inlet, Queen Charlotte Islands, an explosion occurred when an abandoned box containing explosives was struck by a shot fired from a rifle.

On October 15, 1968, at the Bethlehem mine of Bethlehem Copper Corporation Ltd., a man carrying out a routine inspection of the steering system of a Haulpak truck was seriously injured when a prankster twisted the truck steering-column.

On November 5, 1968, at the British Columbia Molybdenum Limited mine at Kitsault, the driver of a loaded Haulpak truck escaped without injury as the truck capsized over the mine dump when the dump slid out from under the truck wheels. The collapse of the dump was due to a failure in its foundation, which was on muskeg.

On November 12, 1968, at the Torbrit camp of Dolly Varden Mines Ltd., a workman had his right hand severely injured by an exploding detonating cap which he was holding on a short length of fuse. The workman had not been instructed in the use of explosives and, against his partner's advice, ignited and held a short capped fuse he had found while cleaning up refuse.

On November 19, 1968, at Brenda mine of Brenda Mines Ltd., a supply tank of liquid propane connected to a heating unit of a cement-mixing plant caught fire. Contrary to accepted procedure, the fire was extinguished by burying the tank in sand. Escaping gas from the tank prior to being stopped made it necessary to evacuate for several hours a nearby contractor's camp.

On November 20, 1968, at Tetra (Moricetown) exploration adit of Silver Standard Mines Limited, the north adit face which was 323 feet from the portal unexpectedly broke into an old deep stream-channel and was blocked by an inflow of wet sand and gravel and boulders.

On November 27, 1968, in the Prescott North mine area of Texada Mines Limited, a miner received numerous small cuts as a result of an explosion which occurred when the steel with which he was drilling slipped into the socket of a hole in which blasting had been done. The face had been thoroughly washed with water prior to the accident and no explosive was evident.

On November 27, 1968, in Texada Mines Limited shaft, a skip-hoist drawbar, connecting one of the four cappels to the skip, broke as a loaded skip was approaching the ore dump. The loose rope in going over the drum struck the air-control valves, actuated them and stopped the skip. The loose rope dropped down the shaft onto the counterweight near the shaft bottom.

On November 28, 1968, at the Granduc mine of the Granduc Operating Company, an employee was injured when a Wagner UT truck that he was driving ran out of control down a ramp in the mine. The brakes on this vehicle had apparently been reported defective and, although this was brought to the attention of the driver, he still took the truck onto the ramp.

On December 3, 1968, at the Craigmont mine of Craigmont Mines Limited, two men, while blasting a drift round, failed to properly guard all access to the blasting area, thereby endangering the lives of two other workmen who were in the vicinity. The blasting certificates of the two blasters were suspended for a period of one month.

On December 4, 1968, at the British Columbia Molybdenum Limited open-pit mine at Kitsault, an employee was seriously injured when struck by a wall of a portable explosives magazine as it collapsed while being towed to a new location.

On December 10, 1968, at the Britannia mine of Anaconda Britannia Mines Ltd., a fire of undetermined origin occurred in the compensator starter of the 40-057 ventilation fan. Some smoke passed down the ventilation raise, but not enough to become a hazard.

On December 27, 1968, at the British Columbia Molybdenum Limited mine at Kitsault, a mechanic sustained severe head injuries when he lost balance and fell 20 feet when the frame he was cutting suddenly released. The workman was not wearing the safety belt which was on site.

Coal Mines

Five dangerous occurrences were reported as required by section 59 of the *Coal Mines Regulation Act*. Two involved the use of electricity, another involved spontaneous combustion in an abandoned area in one mine, a fourth was in connection with the collapse of a shaft lining, and the fifth was in connection with the deaths of two persons trapped in the massive slide of a spoil dump.

On January 23, 1968, the trailing cable of a shuttle car in the Balmer North mine, Michel Colliery, was damaged by the car being driven beyond the limit of the cable. A flash occurred, but no one was injured, and the electrical controls isolated the power from the cable immediately.

On July 23, 1968, several large sections of steel lining in a newly constructed air shaft in the Balmer North mine, Michel Colliery, collapsed, falling to the bottom. It is suspected the lining was not properly anchored.

On August 17, 1968, traces of carbon monoxide were found leaking past a seal on No. 104 room in the Balmer No. 1 mine, Michel Colliery, indicating that incipient heating was taking place in an area of gob workings that had been sealed and abandoned for several years. Precautionary measures were immediately taken, including the withdrawal of workmen from the mine. Later the area was further sealed by the erection of four stoppings by mine-rescue personnel wearing equipment.

On August 21, 1968, a power cable on a continuous miner in the Balmer North mine, Michel Colliery, was damaged, causing an arc which ignited a small feeder of gas in the floor. The fire was extinguished after some difficulty and no one was injured. Subsequent investigation disclosed that a slide plate on the " miner " had worked loose, damaging the cable.

On November 24, 1968, from a spoil dump at the Balmer South strip-mine at Michel Colliery, there was a massive rock and mud slide which slid down the mountainside burying a stretch of No. 3 highway below, and killing two occupants of a car that was passing at the time.

PROSECUTIONS

Two prosecutions were instituted under the *Mines Regulation Act* and none under the *Coal Mines Regulation Act.*

Two men employed in the A.M. mine of Giant Mascot Mines Limited were charged under section 23, Rule 39 (*b*), of the *Mines Regulation Act* for smoking while sitting on an explosives magazine containing explosives. A hearing was held in Hope on February 9, 1968, at which time the defendants pleaded guilty and were fined $25 each. One of the two men had his blasting certificate suspended for three months and the other who was applying for a provisional certificate had his application refused.

BLASTING CERTIFICATE SUSPENSIONS

There were 10 certificate suspensions made for violations of the explosives and blasting-procedure provisions as contained in the *Mines Regulation Act.* The suspensions were from periods varying from six weeks to three months, although in one instance the suspension remains until the offender successfully passes a blasting examination. The offences included drilling a new hole at a distance less than 6 inches from the socket of a hole in which blasting had been done (four instances), failure to guard the entrances to the scene of a blasting operation (two instances), smoking while seated on an explosives magazine containing explosives (one instance), storing detonators and other explosives together (one instance), and drilling and loading explosives simultaneously at the same face (one instance).

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 1968 electric power was used by 39 companies in operations at 42 lode mines and two colleries. Twenty-nine metallurgical concentrators were operated. Electric power was used at 24 structural-material and industrial-mineral mines and quarries. Fifty-four gas and oil well-drilling rigs were operated. A concentrator at Pinchi Lake mine was completed and put into service. A small concentrator was completed at Silver Tip Explorations Ltd. A 4,160-volt power-line was built into the pit at Brenda mine to supply a 1,200-horsepower shovel and 600-horsepower drill. The Kennedy Lake Division of Brynnor Mines Limited and Jedway Iron Ore Limited closed permanently. Silbak Premier Mines Limited, Kindrat Mines Ltd. (Cronin mine), Mollycot Mines Ltd., and Columbia River Mines Ltd. did not operate.

The following table gives the kilovolt-ampere capacity of mining-company-owned power plants at lode mines and the amount of power generated in 1968:—

Prime Mover	Generator Kva. Capacity	Kilowatt-hours Generated
Diesel engines	38,488	
Hydro	11,910	
Steam	30,000	
Totals	80,398	103,111,060

The electric power purchased from public utilities and from the generating division of Cominco Ltd. amounted to 627,082,650 kilowatt-hours. This amount added to that produced by the privately owned plants makes a total of 730,193,710 kilowatt-hours.

A general breakdown of the connected load at the mines which operated in 1968 is as follows:—

Equipment	Horsepower
Hoists and overhead trams	7,399
Hoists (scraper)	9,240
Electric shovels	5,625
Rock drills	1,585
Mucking-machines	130
Fans (mine ventilating)	10,564
Pumps (mine)	7,677
Rectifiers and M.G. sets	8,663
Air compressors	24,917
Sink float	1,594
Crushing equipment	20,946
Grinding equipment	58,003
Concentrating equipment	30,917
Magnetic separators	2,601
Conveyors	9,525
Mill pumps	16,339
Fresh-water pumps	8,055
Workshops	3,740
Miscellaneous	10,074
Total	237,594

On the track haulage systems, there were in use 120 battery, 108 trolley, and 23 diesel locomotives.

In 1968 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 and for the remainder it is purchased. The amount of power produced and purchased is as follows:—

	Kilowatt-hours
Produced by diesel 7,426-kva. generating capacity	20,058,640
Amount purchased	17,920,320
Total	37,978,960

A general breakdown of the connected load is as follows:—

Equipment	Horsepower
Hoists and aerial trams	273
Hoists (scraper)	405
Fans	130
Pumps	670
Rectifiers and M.G. sets	8
Air compressors	652
Electric shovels	655
Electric drills	72
Crushing plants	6,363
Conveyors	4,086
Screens	802
Milling	4,323
Pumps	578
Workshops	450
Miscellaneous	2,071
Total	21,538

One battery locomotive was in use for underground haulage.

The distribution of the connected load at collieries in operation during 1968 was as follows:—

Surface—	Horsepower
Air compressors	1,800
Ventilation	500
Hoisting	145
Conveyors	56
Crushers	30
Washing and screening	2,048
Pumping	65
Coke production	1,573
Miscellaneous	1,227
Total	7,444

	Horsepower
Underground—	
Ventilation	200
Pumping	130
Air compressors	400
Continuous miners	2,175
Shuttle cars	735
Loading	200
Conveying	1,235
Hoisting	145
Miscellaneous	25
Total	5,245
Total for surface and underground	12,689

A total of 26,690,100 kilowatt-hours of electric power was used for mining and coal-processing during the year.

The following table and graph show the power consumption in kilowatt-hours in various mining operations since 1960. There was a slight drop in power consumption during 1960, since then, total consumption has increased annually.

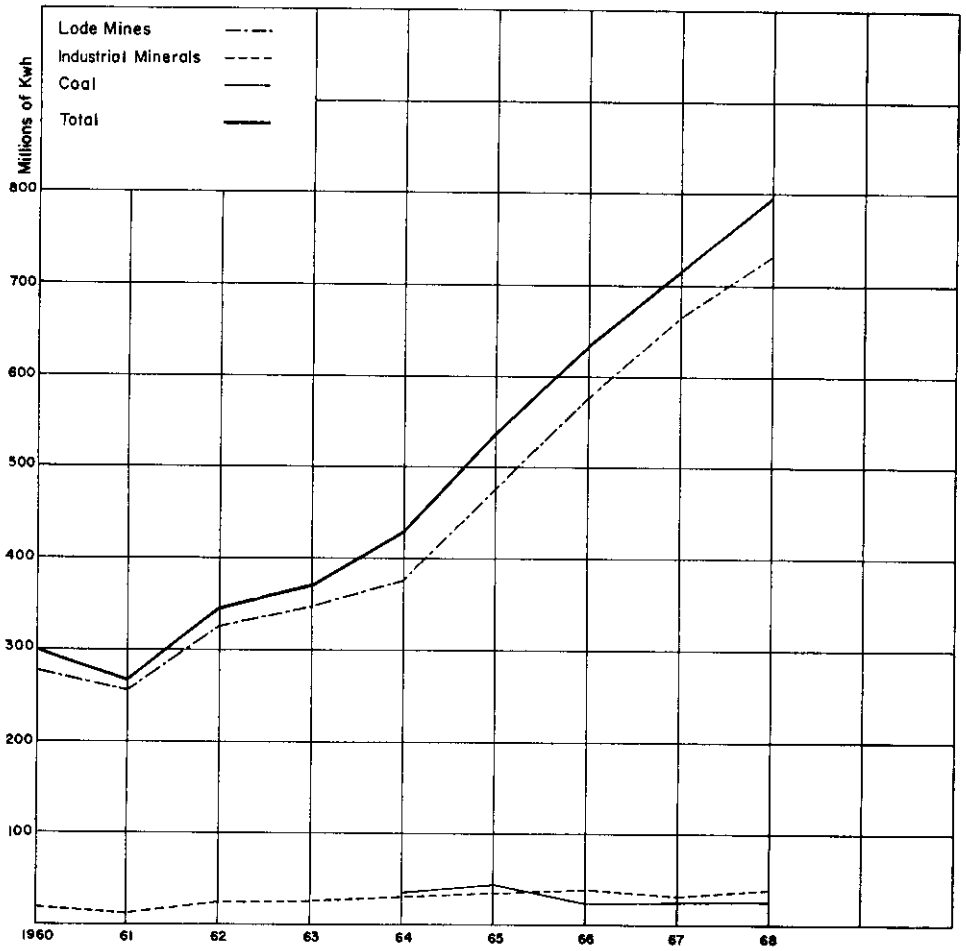

Figure 41. Annual consumption of power in kilowatt-hours, 1960–1968.

ANNUAL CONSUMPTION OF POWER (IN KILOWATT-HOURS)

Year	Lode Mines	Industrial Minerals	Total	Coal	Total
1960	273,986,328	15,830,880	.....	.....	289,817,208
1961	255,643,278	13,095,147	.....	.....	268,738,425
1962	324,638,348	23,262,091	.....	.....	347,900,439
1963	345,296,000	23,321,875	.....	.....	368,617,875
1964	373,279,423	26,460,100	399,739,523	31,160,152	430,899,675
1965	467,654,500	32,010,923	499,665,423	40,915,890	540,581,313
1966	573,345,458	35,081,797	608,427,255	22,503,551	630,930,806
1967	660,924,689	31,719,975	692,644,664	22,730,640	715,375,304
1968	730,193,710	37,978,960	768,172,670	26,690,100	794,862,770

MECHANICAL

Diesel Equipment Underground

The use of diesel-powered equipment underground has continued to increase and, up to the end of the year, a total of 154 permits had been issued. A summary of this equipment is as follows:—

Equipment	Permits Issued	Total Horsepower
Locomotives	31	1,240
LHD units (Scooptrams, Transloaders, etc.)	29	3,575
Front-end loaders	3	600
Ore carriers (trucks, Scootcretes, etc.)	36	3,870
Tractors	4	400
Drilling Jumbos	13	864
Graders	4	290
Service personnel vehicles	22	966
Scaling platforms (2 vehicles, 5 engines)	5	407
Miscellaneous (welders, Shotcrete machines, slushers, and generators)	7	1,124
Totals	154	13,336

The total ventilation required by all the permits issued above amounts to over 1,600,000 cubic feet per minute.

Five approvals were issued by the British Columbia Department of Mines and Petroleum Resources during the year for diesel engines which had not previously been approved for underground use by any other recognized authority. These approvals are based on the chemical analyses of exhaust gas samples collected while the engine is operated at varying conditions of load and speed on a dynamometer.

The following is a summary of approvals issued up to the end of 1968:—

Approval Number	Engine Details	Minimum Ventilation Required
		(C.f.m.)
B.C. Dept. of Mines 1967-1	Jenbach JW20 (20 h.p.)	2,000
B.C. Dept. of Mines 1968-1	International TD6S/N (55 h.p.)	5,750
B.C. Dept. of Mines 1968-2	Ford 220X596E (60 h.p.)	5,000
B.C. Dept. of Mines 1968-3	General Motors 4-71N (160 h.p.)	34,000
B.C. Dept. of Mines 1968-4	Jenbach JW10A (10 h.p.)	1,000
B.C. Dept. of Mines 1968-5	Leyland U/E 400/100/1 (125 h.p.)	30,000

In addition to the large increase in the use of "load-haul-dump" equipment, several mines have now introduced dump trucks in the 10- to 20-ton size range for the underground transport of ore.

Hoisting Equipment

Most of the mines where hoists are in use are now having their ropes checked periodically by non-destructive testing apparatus. Two such instruments used during the year were the DC Defectograph, owned and operated by Wire Rope Industries of Vancouver, and the AC Electromagnetic Rope Tester of McPhar Manufacturing Limited, Don Mills, Ontario. Altogether, 59 separate non-destructive rope tests were made in 1968. This is a large increase over the 16 tests made in 1967, which was the first year that this method of rope inspection became generally accepted in British Columbia.

The use of non-destructive testing, in general, also increased during the year and several mines had the vital components of their hoisting equipment tested for flaws or other serious defects, such as fatigue cracks, by this means. The commonest portable method for non-destructive testing is by means of ultrasonic instruments, although some use has also been made of magnetic methods. A sinking contractor had his equipment tested ultrasonically and several unsuspected cracks were found in the main suspension components of the bucket. It is revelations such as these that stress the urgent need for a more general acceptance by the industry of these modern techniques for examining and testing vital equipment.

As a result of the increased knowledge gained of the condition of hoisting ropes from the non-destructive test programme, 35 four-month rope-life extensions have been issued up to the end of the year. These extensions allow the ropes to remain in service beyond the normal two-year life specified in the *Mines Regulation Act*. Normally, three satisfactory non-destructive test reports in addition to the normal six-monthly breaking-test reports are required before any rope-life extension is granted.

In order to allow more complete records to be kept of the non-destructive tests made and rope-life extensions issued, a revised Rope Record Book has been printed and is available.

A potentially serious accident occurred in November at a four-rope friction-hoist installation when one of the four drawbars connecting the hoisting-rope cappels to the cage broke. Although, in this case, there were no injuries or serious damage, the accident once again stresses the need for initiating routine non-destructive test programmes for all hoisting equipment.

During the year, 31 shaft hoists were used, comprising five friction hoists, nine single-driven units, and 17 double-drum units. Twenty-two of these hoists were operated at vertical shafts and nine at inclined shafts varying from 27 degrees to 58 degrees.

There was only one aerial tramway and one surface skip in operation in 1968 and at neither of these were persons transported.

Due to a prior cessation of mining activities, the hoists at the following properties were removed from service during the year: Mineral King mine, Aurum mine. Brynnor mine (Kennedy Lake Division).

Also as a result of mine closures, the aerial tramway installations at the Yreka mine (Yreka Mine Limited) and Merry Widow mine (Empire Development Company Limited) were removed from service.

Hoists were put into operation for sinking purposes at Boss Mountain mine (Boss Mountain Division of Brynnor Mines Limited) and at the Annex mine of Reeves MacDonald Mines Limited, and a sampling shaft was sunk on the Island Copper (Bay) property of the Utah Construction & Mining Company.

A ventilation shaft was also sunk during the year at the Balmer North mine of the Kaiser Coal Ltd., and a permanent material hoist has been installed at this shaft.

Conveyor Belts

At the beginning of the year, many inquiries were received from conveyor-belt manufacturers and distributors concerning the type of fire-resistant certification that would be acceptable to the Department of Mines and Petroleum Resources for conveyor belting used underground. It was decided that certifications issued by any of the following authorities for fire resistant belting would be acceptable:—

Department of Energy, Mines and Resources, Ottawa.

National Coal Board, Great Britain.

United States Bureau of Mines.

Accidents still occur at intervals, due to persons becoming caught between a moving conveyor belt and a pulley. Consequently it is essential to have adequate guards or fences at all hazardous locations. There has been a tendency in the past to neglect the return or tail end of a conveyor unit from the point of view of guarding, and yet there have been many instances of accidents occurring at these points. All " nip " points should be effectively protected both at the drive end and at the tail end.

Open-pit and Quarry Equipment

There was a continued trend during the year toward the use of more and larger open-pit and quarry equipment. Altogether, more than 260 dump trucks were used for mineral or rock hauling with the largest having a rated capacity of 100 tons.

There were 49 shovels in use in the open pits and quarries, with the largest having a capacity of 11 cubic yards.

The size distribution of this equipment is summarized as follows:—

Size of Dump Trucks (Tons)	Number in Use
0– 20	65
21– 40	158
41– 60	18
61– 80	9
81–100	11

Size of Pit Shovels (Cubic Yards)	Number in Use
0–2	26
2¼–4	19
4¼–6	17
6¼–8	4
11	2

ENVIRONMENTAL CONTROL

Dust and Ventilation

Dust and ventilation conditions at mines and their associated crushing plants were surveyed by the Environmental Control Inspectors of the Department. During the year, Herbert Cameron was appointed Inspector and trained to assist in doing these surveys. Excerpts from the report of the Senior Inspector, S. Elias, follow:—

1. Owing to difficulties in obtaining an adequately experienced individual to fill a staff vacancy, the number of surveys completed during 1968 was considerably

reduced, being 55 in number when compared with 98 completed in 1967. The surveys were made of lode mines, both underground and open pit, rock quarries, and coal mines.

2. In British Columbia three sampling instruments are used to assess dust hazards. These are the konimeter, used to sample dust of lode mines; the midget impinger, used to sample asbestos dust; and the long-running thermal precipitator for sampling dust in coal mines. Threshold-limit values for dust concentrations have, from experience, been established in various countries, notably England, South Africa, Australia, United States, and Canada, and there is reasonable assurance silicosis, asbestosis, or pneumoconiosis will not occur if exposures are kept below these limits. In lode mining the threshold-limit value observed is 300 particles per cubic centimetre, in asbestos-mining the established maximum allowable concentration is 5 million particles per cubic foot, and for the mining of any but anthracite coal the established maximum is 700 particles between 1 and 5 microns in size per cubic centimetre.

3. Wherever possible, water and water sprays are used to minimize the amount of airborne dust which once produced must be controlled with adequate ventilation. The recommended volumes of ventilating air that should be supplied to drilling locations are as follows:—

(*a*) *Development Drives and Raises.*— Fifty c.f.m. per square foot of face area with the end of the duct not more than 30 feet from the working-face when a blowing system is in use.

(*b*) *Stopes.*—A linear velocity of 50 feet per minute in a small stope, in a large stope an amount less than 50 feet per minute may be adequate due to better opportunity of dilution by diffusion.

4. Inasmuch as considerably fewer surveys were made in 1968, a comparison with those made in past years may well be not in correct perspective. However, an improvement appears to have been indicated in dust control at underground drilling operations with 43 per cent of the surveys indicating below 300 particles of dust per cubic centimetre of air. In 1958, 29 per cent were below this amount.

5. At all underground locations, except those where drilling is being done, the percentage of surveys below 300 particles of dust per cubic centimetre of air was 77, which is the same as the average amount for the past five years.

6. The surveys of the underground crushing plants indicate 58 per cent of operations had dust counts below 300 dust particles per cubic centimetre. This is considerably less than in 1967 when 73 per cent were below the standard, but almost the same as the five-year average of 60 per cent.

7. Dust control of open-pit drilling operations improved, inasmuch as 75 per cent of the surveys indicated dust concentrations below 300 particles per cubic centimetre of air. In 1967, the percentage below 300 particles per cubic centimetre was 47. The high level of dust control in all open-pit operations excepting mining was maintained when all surveys made indicated below 300 particles of dust per cubic meter. These two commendable achievements were were somewhat offset by a deterioration of dust control at open-pit crushing plants where only 13 per cent of all surveys made indicated surveys below 300 particles per cubic centimetre.

8. In assay grinding-rooms, 82 per cent of surveys gave averages of less than 300 particles of dust per cubic centimetre of air. This compares favourably with the average of 79 per cent recorded over the past five-year period.

9. In the mining of structural materials and industrial minerals, the drilling and bagging operations dust surveys indicated them to be in the acceptable con-

centration range, whereas the concentration registered at all other operations, including crushing, leave room for improvement.

10. Of the 2,956 certificates of fitness examined, 98 per cent were found to be subsistent.

11. Of the coal-dust surveys made with a midget impinger, 67 per cent of the dust particles, 1 to 5 microns in size, were below the standard of 700 particles per cubic centimetre of air.

12. The attached graphs show the median of all averages in various operations obtained each year since 1937 in the lode mine.

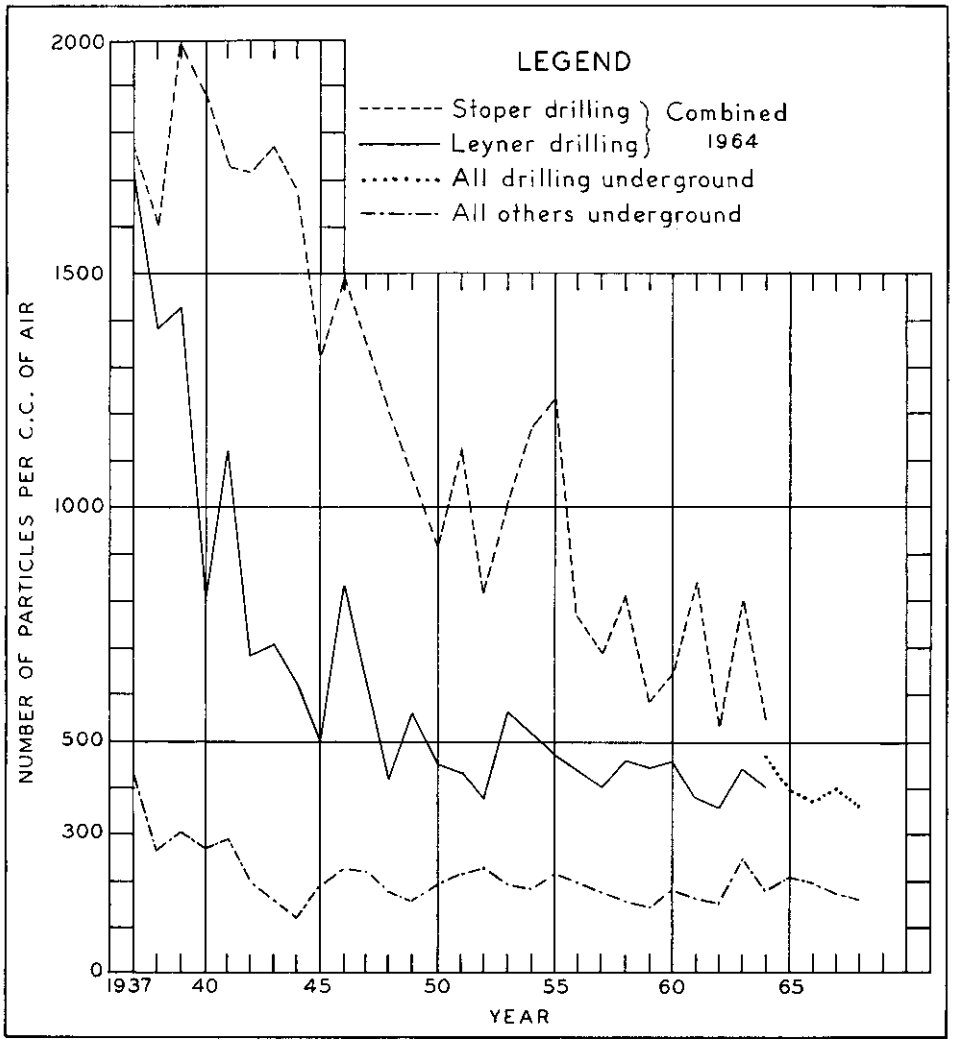

Figure 42. Average underground dust counts.

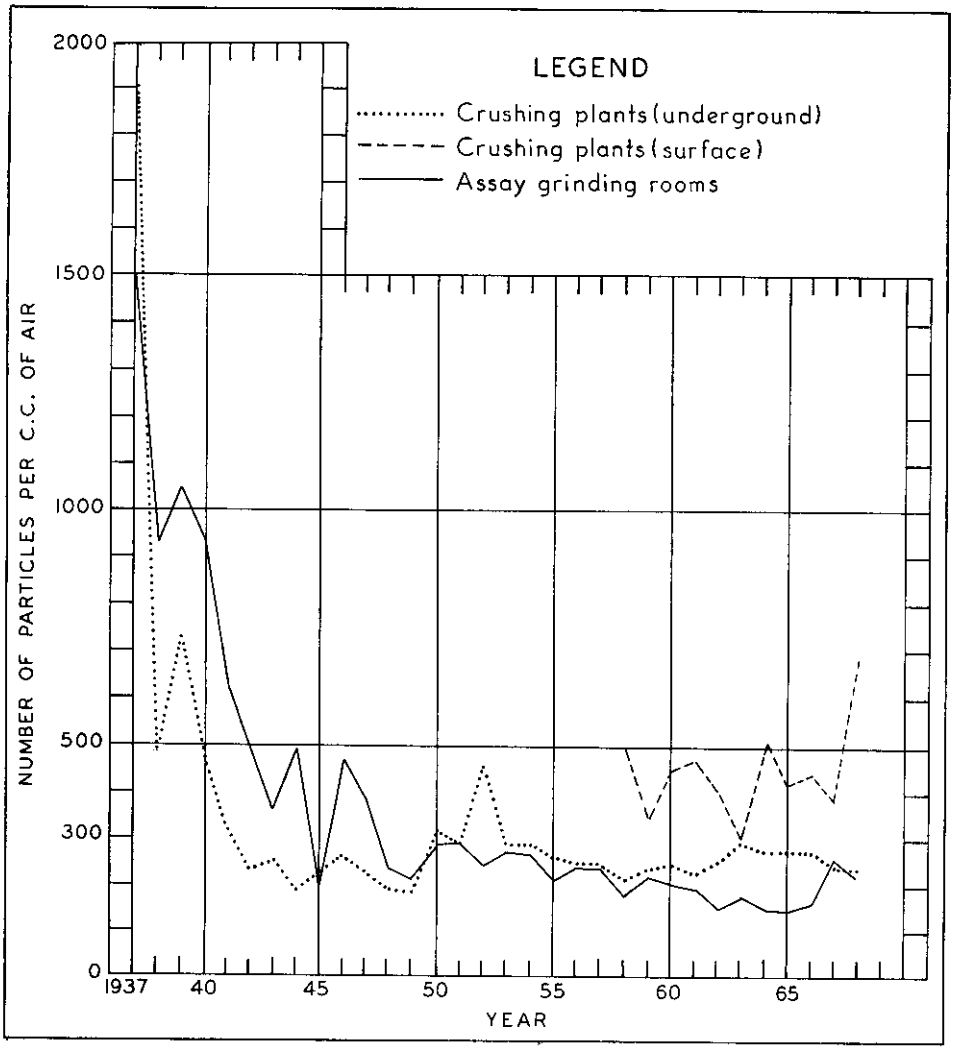

Figure 43. Average crushing and grinding dust counts.

Noise Control

To implement the noise-control rules introduced in the *Mines Regulation Act* (1967) surveys were commenced in 1968. W. H. Childress was appointed Technician and trained to assist in the performance of these surveys.

The first consideration in a hearing-conservation programme is to eliminate the source of the noise hazard. This is supplemented with personal protection when all engineering control of noise has been utilized and there still remains noise exposure fo sufficient magnitude to produce hearing-loss.

In the mining industry the major source of high-level sound intensity is where drilling is being done. The levels of intensity are related to the air drilling pressure, surrounding area dimensions, reflective surfaces, absorption materials, and the mechanical condition of the drill. The sources of sound in a drilling-machine are from mechancial vibrations and exhaust-air noise. While some changes in design may dampen the mechanical noise, no practical method has been developed to

reduce drill-steel noise. The predominating noise is probably that of the exhaust and this appears the simplest to reduce, mainly by muffling.

Muffler design can be classified as follows: Absorption type, resonance type, a combination of both absorption and resonance types, and remote discharge by leading the noisy exhaust away from the machine with the use of an airhose. To be acceptable for use, mufflers should be small, sturdy, inexpensive, cause little or no loss in drilling efficiency, and reduce the noise levels to within the desired range. Common problems occurring when mufflers are in use are deterioration of rubber parts in contact with lubricating oil and the formation of ice by the freezing of the free moisture contained in the compressed air when it undergoes expansion in the muffler, or when worn machines are used and water escapes into the compressed-air circuit subsequently to freeze in the muffler.

In conjunction with the muffling of noise-making equipment, the programme should include a course of educational instruction to workmen in which it should be demonstrated by audiometric test there is a necessity for protection, that ear protection must be used in addition to equipment muffling, and that the loss in drilling efficiency of a muffled machine is minor. In addition the workmen require to be instructed in the correct use and care of hearing protective equipment.

In summary then, to establish an effective noise-attenuation programme, the following details should be observed:—

(1) Regular monitoring of noise hazards.
(2) Adequate muffling of all high-intensity noise-producing sources.
(3) Insure that all drilling-machines are maintained in good repair.
(4) Insure a supply of dry compressed air.
(5) Proper instruction of workmen concerning the programme.
(6) Regular audiometric tests with properly calibrated instruments to be made on all workmen exposed to high levels of sound intensity.

A total of 29 surveys of noise conditions were made in various mining operations during 1968. A Bruel and Kjaer, type 2203, sound level meter with type 1613 octave-filter set with preferred cut-off frequencies is used to measure the sound-pressure levels. These levels are determined for octave bands having mean frequencies of 63, 125, 250, 500, 1,000, 2,000, 4,000, and 8,000 Hz (cycles per second). The sound-pressure levels are taken of the approximate position of the workmen's ear with the indicating meter set at fast response and read as the average of the maximum reading of the meter. In all measurements the linear network is used with sound-level meter and microphone at 0 degree angle of incidence.

Inasmuch as hearing-loss from excessive industrial noise is not usually developed in a short period of time, an over-all assessment of the noise-suppression programme in British Columbia mines cannot be made for the interval it has been in effect. A surprising degree of co-operation has been demonstrated by workmen in the use of hearing protective equipment and most manufacturers of drilling equipment have endeavoured to supply some form of muffling on drilling-machines, but in many instances muffle design leaves considerable room for improved durability and noise-suppression efficiency.

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 1968, 58 provisional certificates of six months' duration were issued.

Examinations were held at various places throughout the Province, and the following 49 men were successful in qualifying for their permanent certificates:—

Shiftboss Certificates—1968

Cert. No.	Name	Date	Cert. No.	Name	Date
477	John Arthur Thomasson	4–1–68	507	Brinsley Thomas Nevile	25–3–68
478	Ian Douglas Graham	5–1–68	508	John William Groeb	10–4–68
484	Louis A. Holm	3–1–68	509	Richard Thomas Avison	29–5–68
485	Douglas John MacPherson	3–1–68	510	Eugene Stanford Walsh	10–5–68
486	Albert Theo Hanson	3–1–68	511	Brian Herbert Good	10–6–68
487	Nick Darychuk	3–1–68	512	Milton Alexander Mellor	10–5–68
488	Lawrence McGillivray	3–1–68	513	Hans J. Millahn	17–5–68
489	Lloyd E. Iverson	3–1–68	514	David Leslie Cook	17–5–68
490	James Paxton	3–1–68	515	Oral Alvin Butler	4–6–68
491	Peter Schultz	3–1–68	516	James Ronald Greenhalgh	10–6–68
492	J. A. Millican	3–1–68	517	Johann Heinrich Klaus Janssen	10–6–68
493	Robert Leftrook	3–1–68	518	Sergio Petrucci	10–6–68
494	David Wellington Stewart	3–1–68	519	John Michael Willson	10–6–68
495	John Jefferson Thompson	3–1–68	520	David Bruce Rovig	17–6–68
496	James Robert Walmsley	6–5–68	521	John Thomas Shaw	10–6–68
497	Joseph Wilfred Lepine	26–1–68	522	William Rudd Stevens	12–8–68
498	John Panagopka	1–2–68	523	William George Stelljes	14–8–68
499	Henry Marasek	5–2–68	524	Per-Olaf A. Sandstrom	4–9–68
500	Allan William Primrose	7–2–68	525	Harold Milton Hemmerich	16–10–68
501	Clarence Herbert McDowell	11–3–68	526	Raymond Robert Spinks	18–10–68
502	Martin Quick	11–3–68	527	Tadeusz Horyza	2–12–68
503	William Carl Wingert	11–3–68	528	Robert David Ballantyne	24–12–68
504	Donald Alexander Wright	13–3–68	529	Elmer H. Olafson	24–12–68
505	William A. Zelisney	25–3–68	530	Joseph Yakachuk	24–12–68
506	Carl M. Anderson	25–3–68			

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 63).

In 1968 two first-class certificates were issued, one by examination and one by interchange. Nine candidates obtained coal-miners' certificates.

MINE RESCUE, SAFETY, AND FIRST AID

In April, W. H. Childress, the mine-rescue instructor at Nanaimo, transferred to the Environmental Control section of this Department. He was succeeded by T. H. Robertson on transfer from the Kamloops mine-rescue station. Mr. Robertson was succeeded by J. A. Thomson.

The heavy demands on the Department mine-rescue and first-aid training services continued unabated throughout 1968. Mine-rescue training stations were maintained at Fernie, Kamloops, Nanaimo, and Nelson with an instructor qualified in both mine-rescue and first-aid training 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 for either 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, varying amounts of similar equipment are maintained at the different mines throughout the Province. This equipment is either wholly owned by the mines or is on loan from the Department. In 1968 the mine-rescue equipment owned by this Department totalled 12 Aerorlox two-hour liquid-oxygen machines, 63 two-hour McCaa high-pressure oxygen machines, and 47 Chemox one-hour chemical oxygen-producing apparatus. The equipment owned by industry totalled 6 Draeger BG 174 two-hour high-pressure oxygen machines, 72 McCaa's, and 54 Chemox's. Each station as well as most mines have auxiliary equipment such as Type N gas masks, self-rescuers, gas detectors, oxygen-therapy units, and first-aid equipment. District instructors make periodic service checks of all this equipment maintained at the mines.

The Nanaimo mobile unit gave mine-rescue training at Britannia, Old Sport, Granduc, Texada, Tasu, Lynx, and F.L. mines, at the W. A. C. Bennett Dam, British Columbia Institute of Technology, University of British Columbia, the Forestry Branch Marine Services Division in Vancouver, and the Comox Queen ferry. In addition, first-aid instruction was given at Granduc, Tasu, and Western mines.

The Nelson mobile unit provided similar training services at Bluebell, Jersey, Highland Bell, Phoenix, and Reeves MacDonald mines as well as to classes held in New Denver, Salmo, and Silverton. Twelve Aerorlox liquid-oxygen machines were supplied to the Nelson station, and during the year extensive operational tests were performed to evaluate this equipment. With only minor equipment modifications necessary, this apparatus has been found quit serviceable for Departmental and industry needs in that district.

The Kamloops mobile unit provided mine-rescue and first-aid training at Bethlehem, Boss Mountain, Bralorne, Craigmont, Pinchi Lake, and Horn Silver mines as well as in Kamloops.

The mine-rescue station at Fernie is maintained principally to serve the coal mines in the Fernie-Michel area. Mine-rescue and first-aid training were given in these two towns by the Fernie instructor, who also assisted in mine-rescue training given at the Sullivan mine at Kimberley.

Instruction in first-aid work was given to more than 360 persons, and 237 men were trained in mine-rescue work and received the Departmental certificates of competency. This is the largest number of persons trained in mine rescue in any one year in British Columbia. They are listed as follows:—

MINE-RESCUE CERTIFICATES, 1968

Cert. No.	Name	Where Trained
4367	Arthur E. Nontell	Craigmont Mines Limited.
4368	Allan W. Primrose	Craigmont Mines Limited.
4369	Stuart S. Taylor	Craigmont Mines Limited.
4370	John J. Thompson	Craigmont Mines Limited.
4371	Lloyd W. Lockstead	Cominco Ltd. (Pinchi Lake).
4372	Herman Grande	Panoil Canadian Minerals Associates.
4373	John P. Harding	Panoil Canadian Minerals Associates.
4374	Ernest C. Heichert	Panoil Canadian Minerals Associates.
4375	Frederick M. Hamlin	Brynnor Mines Limited (Boss Mountain).
4376	Philip Lockie	Antoine Silver Mines Limited.
4377	John Emond	Brynnor Mines Limited (Boss Mountain).
4378	James Robert Pownall	Brynnor Mines Limited (Boss Mountain).
4379	William Carl Wingert	Brynnor Mines Limited (Boss Mountain).
4380	Richard Thomas Avison	Panoil Canadian Minerals Associates.
4381	John C. P. Varcoe	Cerna Copper Mines Limited.
4382	Martin Quick	Cerna Copper Mines Limited.
4383	John Upward	Cerna Copper Mines Limited.
4384	William Stelljes	Cerna Copper Mines Limited.
4385	William R. Stevens	Cerna Copper Mines Limited.

MINE-RESCUE CERTIFICATES, 1968—*Continued*

Cert. No.	Name	Where Trained
4386	Robert William McGeachy	Cerna Copper Mines Limited.
4387	Jeffrey J. Whisken	Cerna Copper Mines Limited.
4388	Donald A. Wright	Craigmont Mines Limited.
4389	Clarence H. McDowell	Craigmont Mines Limited.
4390	Joseph Dolphis Hector Lagace	Self-employed.
4391	Donald C. Faulkner	Self-employed.
4392	Brian Whitehead	Brynnor Mines Limited (Boss Mountain).
4393	Vernon Murray Bodnar	Brynnor Mines Limited (Boss Mountain).
4394	Kenneth David Seaman	Brynnor Mines Limited (Boss Mountain).
4395	George Thomason	Brynnor Mines Limited (Boss Mountain).
4396	James William Griffith	Brynnor Mines Limited (Boss Mountain).
4397	Arthur H. Ditto	Brimont Mining Limited.
4398	Harry Edward Elsmore	Panoil Canadian Minerals Associates.
4399	David Bruce Rovig	Brimont Mining Limited.
4400	Keith McFadden	Cominco Ltd. (Benson Lake).
4401	Gordon R. Gould	Cominco Ltd. (Benson Lake).
4402	Gregory D. Tomaszewski	Cominco Ltd. (Benson Lake).
4403	Carl Clifford Linn	Cominco Ltd. (Benson Lake).
4404	Neville Charles Bambrick	Cominco Ltd. (Benson Lake).
4405	Kenneth Mathis Baher	Cominco Ltd. (Benson Lake).
4406	James Bruce Lennox	Cominco Ltd. (Benson Lake).
4407	John Alan Hausch	Cominco Ltd. (Benson Lake).
4408	Edward M. Wilson	Panoil Canadian Minerals Associates.
4409	Michael Kuchta	I.P.E.C. (W. A. C. Bennett Dam).
4410	Lloyd Polglaze	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4411	Levern Allan Fawkes	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4412	Edwin Leonard Dow	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4413	Lloyd Clark Story	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4414	Harry Wilkinson	Northern Powerplant Builders (W. A. C. Bennett Dam).
4415	Harold R. Sutton	I.P.E.C. (W. A. C. Bennett Dam).
4416	Kenneth G. Macklem	I.P.E.C. (W. A. C. Bennett Dam).
4417	Bill Weitzel	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4418	Roy Johan Van Ryswyk	I.P.E.C. (W. A. C. Bennett Dam).
4419	Donald J. Gerein	Northern Powerplant Builders (W. A. C. Bennett Dam).
4420	Romeo Joseph Gauthier	B.C. Hydro (W. A. C. Bennett Dam).
4421	Dave K. Doman	I.P.E.C. (W. A. C. Bennett Dam).
4422	Stephen Trickett	B.C. Hydro (W. A. C. Bennett Dam).
4423	Peter Huang	B.C. Hydro (W. A. C. Bennett Dam).
4424	Michael Slade	I.P.E.C. (W. A. C. Bennett Dam).
4425	Kenneth Montgomery	Foundation-Comstock (W. A. C. Bennett Dam).
4426	Brian Howard Matheson	B.C. Hydro (W. A. C. Bennett Dam).
4427	L. J. Roman	Foundation-Comstock (W. A. C. Bennett Dam).
4428	Gordon Frank	I.P.E.C. (W. A. C. Bennett Dam).
4429	Nels Green	I.P.E.C. (W. A. C. Bennett Dam).
4430	Ernest G. Hancock	I.P.E.C. (W. A. C. Bennett Dam).
4431	Jack Sehne	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4432	Vern Motzer	Northern Powerplant Builders (W. A. C. Bennett Dam).
4433	Paul McCarthy	Foundation-Comstock (W. A. C. Bennett Dam).
4434	John Hood	Northern Powerplant Builders (W. A. C. Bennett Dam).
4435	Fred Gaudet	Foundation-Comstock (W. A. C. Bennett Dam).
4436	Kelvin Lavalle	Foundation-Comstock (W. A. C. Bennett Dam).
4437	Michael McNally	Foundation-Comstock (W. A. C. Bennett Dam).
4438	Len Hoffman	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4439	Raymond McFaul	I.P.E.C. (W. A. C. Bennett Dam).
4440	Marvin G. Johnston	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4441	L. Kenneth Austin	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4442	Earl R. Fredrics	Kiewit-Dawson-Johnson (W. A. C. Bennett Dam).
4443	William Blair Childress	B.C.I.T.[1]
4444	Risto N. Peltola	B.C.I.T.
4445	John Tribe	B.C.I.T.
4446	Robert Sharp	B.C.I.T.
4447	William James Mullin	B.C.I.T.
4448	Howard A. Maynard	B.C.I.T.
4449	Graydon Powers	B.C.I.T.
4450	Robert John McKay	B.C.I.T.
4451	Charles Pitcher	B.C.I.T.
4452	Alan Whitaker	B.C.I.T.
4453	Gordon R. Peake	B.C.I.T.
4454	David W. Philip	B.C.I.T.
4455	James Patrick Westman	B.C.I.T.
4456	Larry D. Kornze	B.C.I.T.
4457	Clifford I. K. Britch	B.C.I.T.

[1] B.C.I.T.=British Columbia Institute of Technology.

MINE-RESCUE CERTIFICATES, 1968—*Continued*

Cert. No.	Name	Where Trained
4458	Wolfgang P. Nickel	B.C.I.T.[1]
4459	Roger E. Shields	B.C.I.T.
4460	Daniel William Lovett	B.C.I.T.
4461	Norman Rodney Austin	Cominco Ltd. (Sullivan).
4462	Bryan Herbert Good	Cominco Ltd. (Sullivan).
4463	James Ronald Greenhalgh	Cominco Ltd. (Sullivan).
4464	William Ralph Hargrave	Cominco Ltd. (Sullivan).
4465	Robert George Hunt	Cominco Ltd. (Sullivan).
4466	Johann Heinrich Klaus Jansse	Cominco Ltd. (Sullivan).
4467	John Wilfred Jolie	Cominco Ltd. (Sullivan).
4468	Douglas James McKee	Cominco Ltd. (Sullivan).
4469	Sergio Petrucci	Cominco Ltd. (Sullivan).
4470	John Michael Willson	Cominco Ltd. (Sullivan).
4471	Keith Wilson	Cominco Ltd. (Sullivan).
4472	David Leo Wolf	Cominco Ltd. (Sullivan).
4473	Robert Arthur DesJardins	Kaiser Coal Ltd. (Michel Colliery).
4474	Henry John Eberts	Kaiser Coal Ltd. (Michel Colliery).
4475	Herman Sharkey	Bethlehem Copper Corporation Ltd.
4476	Robert J. Lang	Bethlehem Copper Corporation Ltd.
4477	Gerald Jones	Bethlehem Copper Corporation Ltd.
4478	Robin S. MacKenzie	Bethlehem Copper Corporation Ltd.
4479	Gerald A. Geiss	Bethlehem Copper Corporation Ltd.
4480	Tadeusz Horyza	Anaconda Britannia Mines Ltd.
4481	Alan John Stembridge	Anaconda Britannia Mines Ltd.
4482	Wilfred E. Belanger	Anaconda Britannia Mines Ltd.
4483	Alfred Stembridge	Anaconda Britannia Mines Ltd.
4484	Arthur Theodor Bolch	Anaconda Britannia Mines Ltd.
4485	Frank J. Zubek	The Granby Mining Co. Ltd. (Phoenix Copper).
4486	Nick S. Strukoff	The Granby Mining Co. Ltd. (Phoenix Copper).
4487	William John Beck	The Granby Mining Co. Ltd. (Phoenix Copper).
4488	Robert J. Stewart	Bethlehem Copper Corporation Ltd.
4489	Joseph Serek	Kaiser Coal Ltd. (Michel Colliery).
4490	Stanley Jan Plonka	Kaiser Coal Ltd. (Michel Colliery).
4491	Josef Paul Schittek	Mastodon-Highland Bell Mines Limited.
4492	Clifford Bert Killman	Mastodon-Highland Bell Mines Limited.
4493	Arthur Haes	Mastodon-Highland Bell Mines Limited.
4494	George Funk	Mastodon-Highland Bell Mines Limited.
4495	Ian Edward McLeod	Panoil Canadian Minerals Associates.
4496	Karl Chalupa	Zeballos Iron Mines Ltd.
4497	Valmar V. Pratico	U.B.C.
4498	Donald G. Sutton	U.B.C.
4499	Brian Victor Brown	U.B.C.
4500	John E. Stockwell	U.B.C.
4501	Reginald Arthur Olson	U.B.C.
4502	Cary C. McLeod	U.B.C.
4503	Edward Wayne Marshall	Bralorne Pioneer Mines Limited.
4504	Alvin McLellan	Bralorne Pioneer Mines Limited.
4505	Andre Germain	Bralorne Pioneer Mines Limited.
4506	Walter Glenn Carr	Bralorne Pioneer Mines Limited.
4507	Murphy Shewchuk	Bralorne Pioneer Mines Limited.
4508	Henry L. Humphry	Bralorne Pioneer Mines Limited.
4509	Kalman Borsos	Bralorne Pioneer Mines Limited.
4510	Edward McConville	Bralorne Pioneer Mines Limited.
4511	Maurice Clark	Brynnor Mines Limited (Boss Mountain).
4512	Gerard J. Bertrand	Brynnor Mines Limited (Boss Mountain).
4513	Robert T. Chataway	U.B.C.
4514	Charles N. Forster	U.B.C.
4515	J. Michael Braet	U.B.C.
4516	Charles A. Main	U.B.C.
4517	Stanley Larry McLennan	U.B.C.
4518	George T. Norgard	U.B.C.
4519	David J. Copeland	U.B.C.
4520	Brian C. Mahood	U.B.C.
4521	Wayne J. Skinner	U.B.C.
4522	David Richard Bruce	U.B.C.
4523	Steven Grant Lightburn	U.B.C.
4524	Kenneth J. Kirkland	U.B.C.
4525	Stephen C. Gower	U.B.C.
4526	H. Ralph Bullis	U.B.C.
4527	Robert G. Adolphson	Canadian Exploration Limited (Jersey).
4528	William Evert Besanger	Canadian Exploration Limited (Jersey).
4529	Lloyd E. Girardo	Canadian Exploration Limited (Jersey).

[1] B.C.I.T.=British Columbia Institute of Technology.

MINE-RESCUE CERTIFICATES, 1968—*Continued*

Cert. No.	Name	Where Trained
4530	Edward Moreland Gladu	Canadian Exploration Limited (Jersey).
4531	Walter Krestinsky	Canadian Exploration Limited (Jersey).
4532	William Edward Secord	Canadian Exploration Limited (Jersey).
4533	Gordon William Thompson	Canadian Exploration Limited (Jersey).
4534	James Stanley Wiewior	Canadian Exploration Limited (Jersey).
4535	Wesley Boyd Peters	R. F. Fry & Associates (Western) Ltd.
4536	Charles William Skeates	Gremac Contracting.
4537	Charles Owen Emery	Copper-Can Developments Ltd.
4538	Vincent Michael Hunter	Craigmont Mines Limited.
4539	Donald M. Sutherland	Craigmont Mines Limited.
4540	Creighton William Smith	Craigmont Mines Limited.
4541	Michael George Catchpole	Craigmont Mines Limited.
4542	John Sobbie Lowe	Craigmont Mines Limited.
4543	Theodore Pomarenski	Craigmont Mines Limited.
4544	Frederic George Hewett	Craigmont Mines Limited.
4545	Elmer Harvey Olafson	Craigmont Mines Limited.
4546	Warren Embury	Craigmont Mines Limited.
4547	Donald Douglas Myles	Craigmont Mines Limited.
4548	Robert David Ballantyne	Craigmont Mines Limited.
4549	John Robert Thomson	Craigmont Mines Limited.
4550	Karl Seidel	Craigmont Mines Limited.
4551	James McCracken	Craigmont Mines Limited.
4552	Joseph Yakachuk	Craigmont Mines Limited.
4553	Delvin R. Chatterson	Craigmont Mines Limited.
4554	Albert Joe Blanchette	Anaconda Britannia Mines Ltd.
4555	Herbert Mengelkoch	Anaconda Britannia Mines Ltd.
4556	William Whiteside	Anaconda Britannia Mines Ltd.
4557	John Bailey	Anaconda Britannia Mines Ltd.
4558	Daryl Robert Johnston	Anaconda Britannia Mines Ltd.
4559	William Fulton McNeill	Anaconda Britannia Mines Ltd.
4560	Donald Dale MacGregor	Anaconda Britannia Mines Ltd.
4561	Charles Robert Joseph Harvey	Anaconda Britannia Mines Ltd.
4562	Virs Laimonis	Anaconda Britannia Mines Ltd.
4563	Duro Tutush	Anaconda Britannia Mines Ltd.
4564	Charles Neil Smith	Anaconda Britannia Mines Ltd.
4565	Richard William Lewis	Dept. of Mines and Petroleum Resources.
4566	Thomas G. C. Richards	Utica Mines Ltd. (Horn Silver).
4567	Frederick Melvin Harrington	Utica Mines Ltd. (Horn Silver).
4568	William Lionel Newson	Utica Mines Ltd. (Horn Silver).
4569	Gerd Antpoehler	Utica Mines Ltd. (Horn Silver).
4570	Gunter G. Grunewald	Utica Mines Ltd. (Horn Silver).
4571	Paul Emile Vachon	Utica Mines Ltd. (Horn Silver).
4572	James J. Penny	Utica Mines Ltd. (Horn Silver).
4573	Cancelled.	
4574	Lawrence Dennis Short	Texada Mines Ltd.
4575	Maurice Norman Balez	Texada Mines Ltd.
4576	Urbain J. Robillard	Texada Mines Ltd.
4577	Steve J. Butz	Texada Mines Ltd.
4578	Royce James Stevenson	Texada Mines Ltd.
4579	Jack W. House	Texada Mines Ltd.
4580	Gaston Josehf Ayotte	Texada Mines Ltd.
4581	Peder H. L. Norbygard	Texada Mines Ltd.
4582	Joseph Frederick Flynn	Texada Mines Ltd.
4583	Thomas Patrick Miller	Texada Mines Ltd.
4584	Ronald F. Brow	Texada Mines Ltd.
4585	Donald John Grayson	Texada Mines Ltd.
4586	William Barry Abbott	Cominco Ltd. (Bluebell).
4587	Robert Hugh Buckley	Cominco Ltd. (Bluebell).
4588	Edward Furlinger	Cominco Ltd. (Bluebell).
4589	Robert Allan Mullin	Cominco Ltd. (Bluebell).
4590	Arthur Ronald McClure	Cominco Ltd. (Bluebell).
4591	Orest Slonowski	Cominco Ltd. (Bluebell).
4592	Basil Boyd Spence	Cominco Ltd. (Bluebell).
4593	Louie Wachter	Cominco Ltd. (Bluebell).
4594	David E. Bakka	Reeves MacDonald Mines Limited.
4595	Robert Allen Gates	Reeves MacDonald Mines Limited.
4596	Allen Richard Taylor	Reeves MacDonald Mines Limited.
4597	Louris Chester Kornum	Reeves MacDonald Mines Limited.
4598	John James McConachie	Reeves MacDonald Mines Limited.
4599	Harry Sookrow	Reeves MacDonald Mines Limited.
4600	Guy Francois Guilleminot	Western Mines Limited (Lynx).
4601	Peter Asmus Christoffersen	Western Mines Limited (Lynx).
4602	David Adrian Oliver	Western Mines Limited (Lynx).
4603	John Robert Morris	Western Mines Limited (Lynx).

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 promote mine-rescue and first-aid training as well as safety education in their various districts.

The Vancouver Island Mine Safety Association held its 54th annual competition in Nanaimo on May 25th. The six teams that competed in the mine-rescue event came from Britannia, Old Sport, Sunloch and Gabbro, Texada, Lynx, and F.L. mines. The winning team was from Texada mine and was captained by Donald C. Legault.

The East Kootenay Mine Safety Association held its 47th annual competition on June 1st at Chapman Camp with four teams competing in the mine-rescue event. Two teams were from the Sullivan mine and one team each from Fernie and Michel, who represented Kaiser Coal Ltd. The Sullivan mine No. 3 team, captained by R. Macsporran, was successful in winning the competition.

The West Kootenay Mine Safety Association held its 22nd annual competition at Nelson on June 8th. Six teams participated in the mine-rescue event—two from Bluebell mine and one each from the Highland Bell, Jersey, Phoenix, and Reeves MacDonald mines. The Highland Bell mine team, captained by J. W. Murton, won the district shield.

The Central British Columbia Mine Safety Association held its 20th annual competition at Merritt on June 15th. Five teams competed in the mine-rescue event and represented Bethlehem, Boss Mountain, Craigmont, Pride of Emory, and Knox mines. The team from Bethlehem mine, captained by G. Begon, won the competition.

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 men, women, and juniors. The entries in these events came from other industries and the public at large and were not necessarily connected with mining.

The winners of the four district mine-rescue competitions met in the 13th Provincial mine-rescue competition held in Penticton on June 22nd. The Highland Bell mine team, captained by J. W. Murton, won the Provincial trophy and silver trays and the silver cup donated by the International Union of Mine, Mill, and Smelter Workers for annual competition for mine-rescue teams from metalliferous mines. The Texada mine team placed second. In conjunction with this event, the Workmen's Compensation Board sponsored the 12th Provincial men's first-aid competition in which the entrants had competitions at Kimberley, Kitimat, Merritt, Nanaimo, Nelson, Vancouver, and Victoria. The winning team was the Crown Zellerbach Building Materials team from Ladysmith, captained by W. R. Sutherland.

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 1968 the regional trophy for metal mines was won by Brynnor Mines Ltd. (Boss Mountain Division) with an accident frequency of 10.15.

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 the Michel Colliery

of Kaiser Coal Ltd. with a frequency of 62.0 and this frequency was also sufficient to win the Canada Trophy.

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 an incident involving more than three days' time loss by the workman.

In 1968 the award was won for the second year in a row by Antoine Silver Mines Ltd., New Denver, again with an accident frequency of zero.

SAFETY COMPETITION, OPEN-PIT MINES AND QUARRIES

In 1961 the Department of Mines and Petroleum Resources organized a safety competition for the open-pit and quarry industry and instituted awards and donated 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 donate a second trophy and to divide the entrants having a large number of man-hours into two groups—the "A" group, for those operations having from 35,000 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 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 1968 the "A" trophy was won jointly by Imperial Limestone Ltd., Beale Quarry Division of Lafarge Cement of North America Ltd., and Ocean Cement Limited, Albert Head, Mary Hill, and Pitt River Quarry Divisions. All operators had zero accident frequencies.

The Phoenix Copper Division of The Granby Mining Company Limited won the "B" trophy. This mine had an accident frequency of 10.15 per million man-hours.

In addition to the foregoing operations, certificates of achievement were won by Coquitlam Gravel Plant of Deeks McBride Ltd., the Alberni sand and gravel operation of Dolans Ltd., the Texada Island quarry of Imperial Limestone Co. Ltd., Beale Quarries Division of Lafarge Cement of North America Ltd., and seven operations of Ocean Cement Limited, namely, the Albert Head pit, the Cobble Hill quarry of the B.C. Cement Division, the Cassidy pit, the Kamloops Division, the Langley Division, the Mary Hill Division, and the Pitt River Quarry Division.

Coal

By D. R. Morgan, Senior Inspector of Mines

CONTENTS

LIST OF ILLUSTRATIONS

Photographs

PRODUCTION

The gross production of coal in short tons in the Province during 1968 was 1,120,746 tons, an increase of 161,161 tons or 16.8 per cent over 1967. There were 12 mines in operation (including those at Michel Colliery) and 553 men employed. A total of 358,023 tons was mined from the seven strip-mining operations at Michel, Tent Mountain, and near Telkwa. Other statistical information is given in Tables 8A and 8B.

The production of coal from the East Kootenay District was 1,107,258 tons, an increase of 161,034 tons or 17 per cent over 1967. Most of the production was obtained from the Michel Colliery which was operated by the Crows Nest Industries Limited, up to February 28th, and later by the Kaiser Coal Ltd., a subsidiary company of the Kaiser Steel Corporation of Oakland, California, who optioned the coal resources of the former company following the signing of an agreement to export 45 million tons of coal to Japan over a period of 15 years. The remainder of the production in the district was obtained from the Tent Mountain strip mine, which is operated by Coleman Collieries Limited on both sides of the British Columbia-Alberta interprovincial boundary near Corbin. Extensive exploration for coal was conducted by the Canadian Pacific Oil and Gas Limited in the Fording River area, and by the Scurry-Rainbow Oil Limited in the upper Elk Valley. Crows Nest Industries Limited in 1968 acquired the coal leases held by McIntyre Porcupine Mines Limited and undertook exploration in the Line Creek area.

The production of coal in the Northern District was 13,395 tons, an increase of 408 tons or 3.1 per cent over 1967. The entire production was obtained from the Telkwa strip mine near Telkwa, which was operated by Forestburg Collieries Limited, of Edmonton, Alta. Other activities included the development of the

Garraway mine of the Northern Coal Mines Limited on Bowron River, the production from which was placed on stockpile. Pine Pass Coal Company Ltd. shipped a number of bulk samples of coal from a prospect adit on Noman Creek in the Pine Pass area.

The production of coal from the Vancouver Island District was 93 tons, a decline of 281 tons from 1967. The operations were restricted to one small outcrop mine in the Nanaimo area. The mine closed in July and has been inactive since.

There was no production or coal-mining activity in the Nicola-Princeton District.

REPORTS ON COAL MINES

VANCOUVER ISLAND INSPECTION DISTRICT

By A. R. C. James

The gross output of coal from the Vancouver Island Inspection District was 93 tons, produced from one small mine which closed at the end of July. This probably marks the end of production in the once important and historic Nanaimo coalfield.

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 1968 was 93 tons with a crew of one. The mine was closed at the end of July.

EAST KOOTENAY INSPECTION DISTRICT

By R. W. Lewis

Kaiser Coal Ltd.

J. E. Morris, manager of underground mines and coal-stripping operations; P. J. Urso, open-pit manager. This company on February 29, 1968, took over ownership of the coal-mining operations of Crows Nest Industries Limited. The latter company, formerly known as The Crow's Nest Pass Coal Company Limited, had conducted coal-mining operations in the Crowsnest Pass area since 1897. Present activities are confined to the Michel Colliery. The coal is sold on the industrial market and a large proportion exported to Japan. A large amount of fines is also utilized in the making of coke, and the coke is sold in various parts of Canada and the United States. The operations are directed from a central office situated on the Elk Valley road 2 miles from Natal.

MICHEL COLLIERY.—(49° 114° N.W.) J. E. Morris, mine manager; James Anderson, general mine overman; Paul Kusnir, safety supervisor, Harry Corrigan, afternoon-shift overman.

The colliery is at Michel, 24 miles northeast of Fernie, and is on the Crowsnest Pass branch of the Canadian Pacific Railway. It is a large colliery, and has been in operation since 1899. Present workings include three underground mines, five stripping operations, and a coal-preparation plant and by-product plant that are located on the colliery-site. The mines are at various elevations on both sides of the Michel Valley and, with the exception of the Balmer North mine, have been opened from the outcrop of the seams. The underground mines are operated in the No. 10 seam and the "C" seam, and are worked by the room-and-pillar

Plate VIIIA. Lectra Haul dump truck of 200 tons capacity used by Kaiser Coal Ltd. at its Harmer Ridge strip mine. This is currently the world's largest two-axle truck.

method. The underground mines are highly mechanized, and the entire output is obtained by the use of continuous miners. The underground equipment is chiefly operated by electricity; it is of the flame-proof type that has been approved for use in coal mines. The present transportation of coal at the underground mines is by shuttle cars and fast-moving belt conveyors which convey the coal to the surface, whence it is hauled by road to the coal-preparation plant for cleaning and treatment. Battery and diesel locomotives are used for transportation in one mine only.

The colliery employs an average of 454 men, of whom 152 are employed underground and 302 on surface. The underground operations are under the direct supervision of four overmen and 22 firebosses. A description of the underground operations follows.

Balmer North Mine.—William Davey, overman. This mine, in the No. 10 seam, is on the north side of the 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 mine portals are at an elevation of 3,850 feet. They are approximately 1 mile west of the coal-preparation plant and can be reached by private road access. The seam is 40 to 60 feet in thickness, 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 then loaded on to shuttle cars and transported from the mine by a trunk belt conveying system.

An explosion occurred on April 3, 1967, in this mine with disastrous results, a full account of which was contained in the Annual Report for 1967, page 427. Whilst the mine as a whole cannot be classed as very gassy, certain sections have

been known to yield as much as 1,500 to 2,000 cubic feet of methane per ton of coal produced. This together with the volatile-matter content of the coal and its explosibility make it necessary to have an efficient ventilating system, and efficient means of limestone-rock dust application, and a systematic means throughout the mine of cleaning coal-dust deposits.

A significant improvement in the mine ventilation was achieved during 1968 as a result of the sinking of a 400- by 16-foot-diameter ventilating-shaft, situated approximately 1,200 feet from the portals. Following completion of the shaft, the ventilation system of the mine was changed. Both the No. 1 and No. 2 Rock Tunnels became intake airways, and the new shaft became the main return for the whole mine. This together with the provision of one extra forcing fan at the entrance to the No. 1 Rock Tunnel provided an additional 40,000 cubic feet of air per minute for ventilating the mine workings. Kaiser Coal Ltd. is awaiting delivery of a new exhaust fan, which will be installed in the very near future, and will be capable of providing the mine with an additional 100,000 cubic feet of air per minute. During December, work was commenced on the drilling from the surface of a 6-foot-diameter air-shaft. The nature of the strata and the thickness of cover from the hangingwall of the coal seam to the surface lends itself to this particular application. This means of providing additional intake air-shafts will prove to be of immense value when used in conjunction with the new bigger-capacity exhausting-type fan at the top of the main return shaft.

Following the construction of a number of air-crossings and the forming of a number of additional airways, a situation was reached during 1968 whereby each of the three continuous miners was ventilated by a separate split. Two continuous miners worked three shifts each up until September, when the third machine came into production following the above-mentioned ventilation improvements.

The mode of application of limestone-rock dust was greatly improved in the mine by the introduction of "sprinkle-dusters." By the end of the year about eight of these machines were in operation, and the results to date have been very encouraging. The proper use and positioning of these "sprinkle-dusters" gives a far better degree of control in achieving uniform dilution of coal dust as it becomes deposited on the floor, roof, and sides of the underground roadways.

Further water sprays were installed at the conveyor transfer points to reduce the coal-dust hazard on the conveyor roadways. The three continuous miners are equipped with water sprays, but further improvements could be obtained by introducing wetting agents into the water supply.

During the latter part of the year, three sets of water barriers were erected at the entrance to the panel being mined at the bottom of the slopes. The practical difficulties involved in the use of barriers in the room-and-pillar method of working are well known, but with careful selection of sites there is still room for further development in the use of both water and stone-dust barriers in the mine.

The mine averaged a daily production of 1,000 tons of saleable coal during 1968. Two continuous-miner machines were employed from the beginning of the year until September, when a third machine was then put on production.

The mine ventilation was improved considerably during the year, and the situation at the end of the year was that the mine was ventilated by three electically driven fans. These were two 100-horsepower axivane fans at the entrance to the No. 2 Rock Tunnel intake operating at a 3.3-inch water gauge, and a 100-horsepower aerodyne fan at the entrance to the No. 1 Rock Tunnel intake airway operating at a 3-inch water gauge. The combined effect of the three fans delivered

Plate VIIIB. Kaiser Coal Ltd., portal of the tunnel to be used for moving coal from the breaker station to the coal-preparation plant at Sparwood.

190,000 cubic feet of air per minute to the mine workings. Smaller 30- and 15-horsepower auxiliary fans, in conjunction with 36- and 24-inch-diameter flexible ducting, were used for the ventilation of the face of the rapidly advancing rooms. The conditions in general were found to be satisfactory during the course of inspections, with the exception of two instances, which are reported more fully in another part of this report under the heading of "Dangerous Occurrences."

Balmer No. 1 (South) Mine.—Arnold Webster, overman. This mine, operating in the No. 10 seam, was opened in 1960 to develop a large area of virgin coal on the south side of the Michel Valley. The portals are 1 mile west of the coal-preparation plant, and the workings are entered by three levels, which have been driven from the outcrop of the seam, 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. The mine was one of the major operations at the colliery, but in recent months has been run down considerably.

The mine averaged a daily production of 600 tons of saleable coal during 1968. There were two continuous miners in operation from January to August and one only for the remainder of the year. Descriptions of the method of work and means of transportation have been given in past Annual Reports.

The mine is ventilated by a 100-horsepower electrically driven axivane fan which delivers 94,000 cubic feet of air per minute to the mine workings at a 3.7-inch water gauge. Auxiliary fans and flexible tubing were used with each continuous miner to provide adequate ventilation at the face. Conditions in general were found to be satisfactory during the course of inspections, with the exception to the occurrence of spontaneous combustion in one old panel. This is more fully

reported on in another part of the report under the heading of " Dangerous Occurrences."

" 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 coal-preparation plant. The mine entries were made on the seam outcrop by using continuous miners. 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 400 tons of saleable coal during 1968. The room-and-pillar method of work was used, and the coal was mined by a continuous miner. Transportation of coal was by shuttle car and fast-moving belt conveyors and later trucked by road to the preparation plant. Underground roadways are invariably supported by the use of rock-bolts.

In September, following some difficulty experienced with geological disturbances and thickening of the seam, work was commenced on the extension to the mine. Three new portals were established at an elevation of 5,200 feet, about 3,000 feet in a southeasterly direction from the main portals.

The mine is ventilated by a 100-horsepower electrically driven fan capable of providing the mine workings with 80,000 cubic feet of air per minute at a 1.2-inch water gauge. At the end of the year, the extension to the mine was ventilated by a 30-horsepower electrically driven fan. Ventilation is provided at the face by smaller auxiliary fans in conjunction with flexible tubing.

General conditions were found to be satisfactory during the course of inspections. No indications of methane have been reported from the mine to date, and in most parts of the mine underground workings naturally damp conditions prevail.

Prospecting and Exploration.—Brian Murphy, geologist. The principal objective of the 1968 exploration programme was to explore more fully the 10,000-acre Michel area. About 45 persons were directly involved throughout the year. As many as five drills were used to complete 176 drill-holes, totalling some 61,000 feet of drilling. Bulldozers were used to construct access roads, expose coal measures, and to prepare eight adit-sites. A total of 1,265 feet of underground workings was completed for bulk sampling purposes. This work was under the direciton of Brian Murphy, geologist for Kaiser Coal Ltd.

During 1968, 20,000 pounds of Monobel No. 4, 2,000 pounds of CXL-ite, and 2,350 electric detonators were used at the colliery for coal and rock blasting. No misfired shots were reported.

A total of 2,744 tons of limestone dust was used for the application of inert dust over the roadways at the various mines to minimize the coal-dust explosion hazard, sealing old workings, and tamping shots. Monthly dust samples were taken at all the mines and analyzed. 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 safety meetings were held each month at the colliery office. Reports kept at the mines in compliance with the *Coal Mines Regulation Act* were checked periodically and found to be in order.

No. 3 Seam Strip Mine.—James Anderson, foreman. This mine was opened in the spring of 1967 and has produced coal from the No. 3 seam situated on Natal Ridge, approximately 2½ miles northwest of Michel. The mine is at an ele-

vation of 5,000 feet and can be reached by a 3½-mile private road leading from the preparation plant. The coal is 30 feet thick but contains two dirt bands totalling 12 to 15 feet. The total production of saleable coal during 1968 was 86,522 tons.

No. 7 Seam Strip Mine.—James Anderson, foreman. This mine is on the Natal Ridge, approximately 2 miles southwest of Michel, and was opened in September, 1966. The mine is at an elevation of 4,800 feet and is reached by a private road leading from the coal-preparation plant. The seam is 31 feet thick, contains a 6-foot dirt parting about 6 feet above the footwall, and dips in a southwesterly direction at about 15 to 20 degrees. The total production of saleable coal during 1968 was 63,481 tons.

Balmer South, No. 10 Seam, 4 Pit.—James Anderson, foreman. This mine was opened in October, 1967, to work an area of No. 10 seam outcropping on the Sparwood Ridge, at a distance of about 2½ miles southwest of Michel. It is at an elevation of 5,000 feet and is reached by a private road leading from the coal-preparation plant. The coal is 40 to 50 feet thick and dips in an easterly direction at about 30 degrees. During 1968 most of the activities were directed to the removal of overburden, but a total production of saleable coal of 104,050 tons was obtained. On November 24th, a slide from the spoil dump of this mine covered part of the main highway, and caused the death of the two occupants of a car that was enveloped by the debris. Reference is made to this in the section of the report under the heading of "Dangerous Occurrences."

Balmer South, No. 10 Seam, 5 Pit Strip Mine.—James Anderson, foreman. This mine was opened at the end of 1967 on Harmer Ridge at an elevation of 5,000 feet. During 1968 a total saleable production of 32,340 tons of coal was obtained from the mine.

Balmer South, No. 10 Seam, 6 Pit Strip Mine.—James Anderson, foreman. This mine was opened during the spring of 1968 for the mining of an area of the No. 10 seam on the south side of the Michel Valley. The operations at this mine were spasmodic and the production of saleable coal during 1968 was 1,382 tons.

Coal-preparation Plant.—George Lancaster, superintendent. This plant is on the colliery-site and is located near the entrance to the old rock tunnels on the south side of the Michel Valley. It was built in 1936, but has been modernized since that date. A description of this preparation plant has been given in past Annual Reports.

By-product Plant.—Ian Dufour, superintendent. This plant is situated adjacent to the coal-preparation plant and employed 58 men in 1968. Present operations are confined to the Curran-Knowles ovens, a detailed description of which has been given in past Annual Reports. The plant produced a total of 150,156 tons of coke and coke breeze during 1968.

Construction Division.—E. T. Ryan, engineer. To facilitate the proposed expansion of the coal industry in the Michel area, Kaiser Coal Ltd. commenced its development and construction programme on May 15, 1968. This work was performed under the direction of E. T. Ryan, construction engineer for Kaiser Coal Ltd. The work is phased so that the company will be able to meet its market commitments by February, 1970. The following is a brief account of the work performed from the date of commencement to the end of the year.

An area of 670 acres was cleared, and a total length of 16 miles of roadway was constructed. The site of the new coal silos and coal-preparation plant was cleared, and the necessary benching was completed in readiness for the erection of the plant.

Work was commenced on a conveyor tunnel, which when completed will be a mile long and will serve to transport the coal from the open-pit site, through the mountain, to the coal-preparation plant. The contract for driving the tunnel was awarded to Northern Construction and J. W. Stewart Ltd. By the end of the year the tunnel had advanced approximately 1,600 feet, and preparations were being made to commence tunnelling from the opposite end.

The necessary work of clearing and grading for the construction of a railroad spur to the plant-site was completed. Two camps were constructed—one in Elk Valley and the other on Harmer Ridge. A temporary central office was established in Elk Valley approximately 2 miles from Natal. The foregoing construction work provided employment for some 650 persons.

Coleman Collieries Limited

(49° 114° N.W.) M. Bianchini, foreman. The coal-mining activities of this company in the East Kootenay District are confined to a large stripping operation on the interprovincial boundary at Tent Mountain near Corbin. Most of the operations are conducted on the Alberta side, but large quantities of coal have been produced from the British Columbia side for the past 17 years. The present operation is confined to the No. 4 pit, which is at an elevation of 7,000 feet, and is reached by means of a private road leading from the No. 3 highway at Crowsnest Lakes. The coal produced is taken to the company's coal-preparation plant in Coleman. The production of coal from the British Columbia side of this strip mine during 1968 was 10,129 tons. A total of 156,227 cubic yards of rock overburden was removed during 1968. There were no accidents or dangerous occurrences reported from this mine in 1968, and general conditions were found to be satisfactory during the course of inspections.

Canadian Pacific Oil and Gas Limited

(50° 114° S.W.) Company office, 205 Ninth Avenue Southeast, Calgary, Alta. J. G. Mathews, manager, mining division. The following exploration work was carried out by the above company in the Fording River area of the East Kootenay District from May 15th to October 12th.

An average crew of 65 men was employed, comprising three diamond-drill crews (of three shifts each), two to four mining crews (of two shifts each), four bulldozer operators, three chain-saw operators, two survey crews, three geologists, two engineers, plus cooks and miscellaneous helpers.

Thirty-nine diamond-drill holes were drilled totalling 30,934 feet. All core was drilled HQ (2½). Twelve adits were driven in various coal seams, totalling 1,871 feet. All adits were bulk sampled, with shipments to Japan and to the Department of Energy, Mines and Resources for further test work. Approximately 35 miles of drill access roads was constructed. Complete photogrammetric mapping, at 1 inch equals 200 feet, was carried out, and ground survey control established. The property was inspected on August 9, 1968, and general conditions were found to be satisfactory.

Scurry-Rainbow Oil Limited

(50° 114° N.W.) Registered office, 539 Eighth Avenue Southwest, Calgary 2, Alta. D. M. Lane, senior geologist. The North American Coal Corporation (registered office, 12800 Shaker Boulevard, Cleveland, Ohio 44120) carried out an exploration programme on lands held in the Elk River area by Scurry-Rainbow Oil

Limited and Canadian Pacific Oil and Gas Limited during the period June to November, 1968.

Major work completed was 3,353 feet of vertical wireline drilling, 1,001 feet of horizontal diamond drilling, and 7,610 feet of vertical percussion drilling. Nine prospect tunnels totalling over 560 feet of drifting and over 200 feet of crosscutting were driven on nine separate coal seams. Bulk samples from eight of these seams were shipped for testing. A considerable amount of trenching was done. Maximum number of men employed during exploration was 35.

Crows Nest Industries Limited

(49° 114° N.W.) W. R. Prentice, president; J. J. Crabb, exploration manager. During 1968 exploration work was carried out on the coal licence area in the vicinity of Line Creek. The work was performed over a period of seven months under the direction of Irvine Morgan; seven workmen were employed.

An aerial survey of the area was made, and geological mapping of the area was done by J. A. Irvine, geologist. A total length of 18 miles of road construction and trenching was carried out, together with the driving of eight adits in various coal seams. Coal samples were transported to Fernie, where they were assayed in the Crowsnest Fernie laboratory. This property was inspected on October 11, 1968, and general conditions were found to be satisfactory.

NICOLA-PRINCETON INSPECTION DISTRICT

By David Smith

There was no coal production in 1968 in the Nicola-Princeton District. Imperial Metals and Power Ltd. has retained its interests but has discontinued the tests carried out in previous years.

NORTHERN INSPECTION DISTRICT

By David Smith, Except as Noted

The coal mines of the Northern District produced a total of 13,395 tons of coal in 1968. The output is sold entirely on the domestic market, thus all operations are limited to seasonal work.

No serious accidents and no dangerous occurrences were reported in this district in 1968.

Peace River (56° 122° S.E.)

The King Gething mine on Lot 1039, 12 miles west of Hudson Hope, remained closed in 1968 owing to lack of markets.

Chetwynd (55° 121° N.W.)

Pine Pass Coal Company Ltd.

In October, 1968, a small crew of men drove a 120-foot adit which is immediately north of the John Hart-Peace River highway and 32 miles west of Chetwynd station on the Pacific Great Eastern Railway. The adit is in seam 76 on the west limb of the Noman Creek syncline. In the adit the seam is 16 feet thick and dips 76 degrees to the northeast. Sixteen barrels of fresh coal was removed and shipped for testing.

[References: *B.C. Dept. of Mines,* Bull. No. 36, 1955, pp. 15–17; Bull. No. 52, 1967, p. 87.]

BOWRON RIVER

Northern Coal Mines Limited

(53° 121° N.W.) Registered office, 3, 1330 Third Avenue, Prince George. A. J. Garraway, manager. This company holds Coal Licence No. 148, covering Lot 9592 and parts of Lots 9591 and 9593, which are on the lower Bowron River 4 miles south of Purden Lake and about 32 miles east of Prince George. In 1968 the coal slope was advanced 320 feet and a landing on the 2160 level was started and had advanced 15 feet. A crosscut was turned off the coal slope and was driven a distance of 185 feet.

Surface exploration by diamond drill was intermittent in 1968. An average crew of six men was employed. Permitted explosives and short-period delay detonators were used for blasting rock and coal. General working conditions were found to be satisfactory in the course of inspections. Coal produced in 1968 was placed on a stockpile at the mine.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 459–460.]

TELKWA (54° 127° N.E.)

Forestburg Collieries Limited By W. G. Clarke

Company office, 918 Royal Bank Building, Edmonton, Alta.; mine office, Telkwa. J. G. Dewolfe, general manager; S. Housdorff, mine manager. This company succeeded Luscar Sales Ltd., of Edmonton, which in turn had succeeded Bulkley Valley Collieries Ltd., in the operation of the Telkwa strip mine on Goathorn (Goat) Creek 7 miles southwest of Telkwa. Conventional strip-mining methods were used by a crew averaging eight men; 13,395 tons of coal was produced.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1967, pp. 458–459.]

MORICE RIVER

Morice River (Clark Fork) By R. V. Kirkham

LOCATION: (54° 127° S.E.) Between 4,000 and 4,700 feet elevations in the valley of Denys Creek in the Telkwa Range.

CLAIMS: Eleven coal licences, Nos. 139 and 4806 to 4815.

ACCESS: Tractor-road from the Santa Maria property or 26 miles by helicopter south from Smithers.

OWNER: Bethlehem Copper Corporation Ltd., 1818, 355 Burrard Street, Vancouver 1.

WORK DONE: Eleven men were employed for two months during the summer. Four miles of tractor-road was built, nine trenches totalling 3,250 feet were dug, and three diamond-drill holes totalling 1,988 feet were completed. The area of interest was geologically mapped at a scale of 1 inch equals 500 feet. The work was under the supervision of I. M. Watson.

REFERENCES: *Minister of Mines, B.C.*, Ann. Rept., 1908, pp. 168–169; *Geol. Surv., Canada,* Paper 44-23.

DESCRIPTION: Several narrow coal seams occur in a small basin of folded siltstones, mudstones, and greywackes, which probably belong to the Bowser assemblage. The property was explored during the period 1908 to 1918 by Jefferson Dockrill and associates. W. W. Leach (1908, p. 169) reports the presence of an 8-foot, a 6½-foot, and a 3½-foot coal seam in this area.

ZYMOETZ RIVER

Coal Creek

By R. V. Kirkham

LOCATION: (54° 127° N.W.) The showings are at about 3,000 feet elevation on Coal Creek 1 mile upstream from the Zymoetz River.

CLAIMS: Thirteen coal licences, Nos. 462 to 474, covering ground formerly held by Copper River Coal Company.

ACCESS: Twenty-five miles by helicopter west of Smithers or 4 miles by trail from the McDonell Lake road.

OWNER: Western Coal & Coke Ltd., 404, 510 West Hastings Street, Vancouver 2.

WORK DONE: Three diamond-drill holes totalling 545 feet were completed near the old workings on Coal Creek in order to obtain coal samples suitable for coking tests. D. R. Morgan, of Cannon Engineering Limited, supervised the drilling and did some geological mapping.

REFERENCES: *Minister of Mines, B.C.*, Ann. Repts., 1914, pp. 206–213; 1922, pp. 111–113.

DESCRIPTION:

The area under investigation is an old coal property that was initially explored prior to 1914 (for description *see* J. D. Galloway, Ann. Rept., 1914). In 1922 three holes totalling 2,539 feet were drilled to test the continuity of the coal beds at depth to the west (for logs *see* Ann. Rept., 1922). Although coal seams were intersected at depth in each of these holes, there remains some question as to how these seams correlate with the ones exposed near surface at Coal Creek.

The coal occurs near the base of a sedimentary sequence that apparently unconformably overlies an irregular surface of volcanic and sedimentary rocks of the Hazelton Group. The coal-bearing rocks probably are Upper Jurassic or Lower Cretaceous age belonging to the Bowser assemblage. Grey mudstones, siltstones, sandstones, and conglomerates with abundant plant debris are common in the sequence. In places these rocks are poorly consolidated. Downstream from the coal exposures, pebble conglomerates and interbedded sandstones are particularly abundant.

In the vicinity of the old workings the rocks strike about north 30 degrees east and dip 25 degrees northwest. However, presumably as a result of deformation and because of irregularities in the underlying surface of deposition, elsewhere in the area there is considerable divergence from this attitude.

Four distinct seams were intersected in the diamond-drill holes. The No. 1 seam ranges from 8.7 to 17.7 feet in width and the No. 2 seam from 2.0 to 6.1 feet. The No. 3 and No. 4 seams, which were intersected in only two of the three holes, vary from 2.1 to 3.0 feet in width. From this information it appears that there is considerable pinching and swelling of the seams over relatively short distances.

In order to ascertain the quality of the coal, two samples were submitted for chemical analysis. Sample No. 1 was taken from a large hand specimen of predominantly clean vitreous coal with a few silty partings. This specimen was collected by D. R. Morgan from the outcrop of No. 1 seam in Balsam Creek. Sample No. 2 was a chip sample taken across 1½ feet of clean coal exposed in the bed of Coal Creek about 800 feet upstream from Balsam Creek. This is No. 4 seam shown by Galloway (1914). However, recent work by the company indicates that this could be the No. 3 seam. There are also some 6-inch clean and silty coal beds at this locality. The results of the analyses are as follows:—

	No. 1 Sample		No. 2 Sample	
	Air Dried	Dried	Air Dried	Dried
Moisture (per cent)	3.4	.....	2.7	.....
Ash (per cent)	2.0	2.1	6.4	6.6
Volatile matter (per cent)	39.6	41.0	40.1	41.2
Fixed carbon (per cent)	55.0	56.9	50.8	52.2
Sulphur (per cent)	0.5	0.5	0.4	0.4
Calorific value, gross (B.T.U. per lb.)	13,970	14,450	13,400	13,780
Fuel ratio (F.C./V.M.)	1.39	1.39	1.27	1.27

The coke produced from both samples was coherent but had a very low swelling index (Woodall-Duckham No. 1). However, further coking tests of the material obtained from drilling are being carried out at the Mines Branch in Ottawa.

Although the entire area has not been mapped in detail, regional work by the writer indicates that the coal-bearing sequence in this area is not very extensive. It is apparently bounded by the unconformity to the east, probably by a fault to the west, by a fault or unconformity to the south, and immediately north by porphyry intrusions. Hence only small tonnages of near-surface coal should be expected.

Groundhog Basin

Groundhog Coalfield

By K. E. Northcote

LOCATION: (56° 128° N.E. and N.W. and 57° 128° S.E. and S.W.) Headwaters of Stikine and Skeena Rivers, Kluayetz and Kluatantan Valleys.

CLAIMS: Coal licences 233 to 255 (cancelled).

ACCESS: By air from Terrace or Smithers, about 160 miles from each.

OWNER: Coastal Coal Company Limited (cancelled).

OPERATOR: Dillingham Corporation of Canada Ltd.; J. M. Black, consultant.

WORK DONE: A crew of eight men, directed by J. M. Black, consultant, and R. V. Best, party chief, carried out surface reconnaissance, with helicopter support, for a period of nine weeks, the most intensive survey of the Groundhog area hitherto. The work consisted of prospecting for coal of coking quality and measurement of stratigraphic sections. No underground work or drilling was done. Field tests were made of surface samples of coal for coking quality, and samples were collected for thorough laboratory tests.

REFERENCE: Buckham, A. F., and Latour, B. A., The Groundhog Coalfield, British Columbia; *Geol. Surv., Canada,* Bull. 16, 1950.

DESCRIPTION:

R. V. Best recognized four units within the Bowser assemblage of rocks of Upper Jurassic to Lower Cretaceous age in the Groundhog Coalfield area. The following description of the units is from information provided by J. M. Black.

Upper Conglomerate.—Estimated thickness 1,000 feet. Conglomerate beds 50 to 200 feet thick are interbedded with sandstone beds up to 50 feet thick and shale beds, some of which are carbonaceous. Crops out on the ridge in the middle of the Groundhog area.

Upper Shales.—Estimated thickness 4,500 feet. Contains many sandstone and siltstone beds. Similar to lower shales but lacks coal seams. Contains limy beds and concretions which contain fossil plants. Underlies most of the south-western two-thirds of the Groundhog area.

Lower Shales.—Estimated thickness 1,500 to 2,500 feet. Shale beds with many dirty sandstone beds and interbedded coal seams, some 10 to 12 feet thick. Most beds are non-marine, but there are some marine sandstones, grey shales, and coquinas. This unit is mostly exposed in valley bottoms and lower slopes of valleys, but also at moderately higher elevations in the southeastern part of the area.

Lower Conglomerate.—Estimated thickness 1,000 to 1,500 feet. Base of this unit is not exposed in the Groundhog Coalfield area. Composed of non-marine coarse clastics, thick sandstones, and conglomerates interbedded with some thin-bedded sandstone, siltstone, and shale and a few minor seams at the top. This Lower Conglomerate unit crops out along the east side of the Groundhog area.

The Bowser assemblage has been intensely deformed in the Groundhog area. Locally the structure is extremely complex. In general the strata lie in folds overturned to the northeast and are further complicated by minor fractures, folds, and crumples. There may be as many as five recumbent folds or nappes piled one upon the other. Blocks of overturned folds have been thrust northeastward by northwesterly striking thrust faults (Buckham and Latour, 1950, p. 25, quoting Mulloch). The incompetent beds of the lower and upper shales, including the coal-bearing sequence, are usually the most contorted. Chevron folds, similar folds, overturned isoclinal folds, and concentric folds are all represented.

The folds are crossed by faults of normal and reverse sense and by low-angle thrust faults. Locally bedding is cut by axial plane cleavage and the rocks are slightly metamorphosed in structurally complex areas. Quartz veins filling cross-fractures are locally abundant.

Work in the Groundhog area in 1968 led to the following conclusions:—

(*a*) No significant amount of coal of coking quality was found. Many apparently clean seams were found, but all outcrop samples were found to be non-coking.

(*b*) The coal has been metamorphosed to anthracite grade and has a low volatile content. It is impure and has a high ash content.

(*c*) Coal occurs in many thin beds. There are from 5 to 10 beds averaging 4 feet in thickness, including two 10 and 12 feet thick. The exact number of beds was not determined because of structural complexities.

(*d*) The contorted structure results in a lack of continuity or in steeply dipping seams that are not amenable to open-pit methods of mining.

(*e*) Coal seams are bracketed by incompetent shale, which would have to be supported in an underground mining operation.

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