Minister of Mines and Petroleum Resources

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

for the Year Ended December 31

1970

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1971

BRITISH COLUMBIA DEPARTMENT OF MINES AND PETROLEUM RESOURCES

VICTORIA, BRITISH COLUMBIA

HON. FRANK RICHTER, *Minister.*

K. B. BLAKEY, *Deputy Minister.*

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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 1970 is herewith respectfully submitted.

FRANK RICHTER
Minister of Mines and Petroleum Resources

Minister of Mines and Petroleum Resources Office,
June 1, 1971

Joseph J. Haile, retired Instructor, Inspection Branch, died in Fernie on January 31, 1970, in his seventy-fifth year. He was born in England and came to Coal Creek in 1906 where he worked in the coal mines until 1941 when he moved to Fernie to take over the mine-rescue station of the Department of Mines. From 1941 until his retirement on December 31, 1960, "Joe" Haile trained several hundred individuals in mine-rescue and first-aid work. As a former mine-rescue captain and as an Instructor with the Department his teams won numerous competitions both local and Provincial. Mr. Haile was also an active citizen of Fernie. He was secretary-treasurer for 20 years of the Fernie Centre, St. John Ambulance Association, a member of Rotary, an alderman for nine years, and vice-president and later chairman of the Hospital Board. Mr. Haile is survived by his wife, one son, and one daughter.

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ANNUAL REPORT OF THE MINISTER OF MINES AND PETROLEUM RESOURCES, 1970

CHAPTER 1

Introduction

A report on the mineral industry in the Province has been published annually 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.

Starting with 1969, the Annual Report of the Minister of Mines and Petroleum Resources contains a review of the mineral industry, and chapters dealing with Statistics, Departmental Work, Petroleum and Natural Gas, and Inspection of Mines. Technical reports on geology, mineral exploration, metal mines, placer, industrial minerals and structural materials, and coal which formerly were included in the Annual Report are published separately in a volume entitled *Geology, Exploration, and Mining in British Columbia.* A new series of annual publications of that name began with the 1969 volume.

This Annual Report contains a general review of the mineral industry as a whole. The chapter on Statistics records in considerable detail all phases of the mineral production of the Province. Current and past practices in arriving at quantities and in calculating the values of products are described.

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

The chapter on Petroleum and Natural Gas contains a general review and 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 are contained in the chapter on Inspection of Mines.

Review of the Mineral Industry

By Stuart S. Holland

Production—The value of the 1970 production of British Columbia's mineral industry amounted to $485,233,614. A new record was established for the ninth successive year and the previous year's total was exceeded by $20,844,865 or 4.5 per cent. The total value to date has now reached $7,645,530,896.

The values of the four classes of products are as follows:

	1969	1970	Change (Per Cent)
Metals	$294,881,114	$306,525,445	+3.9
Industrial minerals	20,492,943	22,106,822	+7.9
Structural materials	55,441,528	46,067,211	−17
Fuels	93,573,164	110,534,136	+18

The increase in value of metal production of 3.9 per cent was due to gains in copper, lead, molybdenum, nickel, and silver which more than compensated for decreases in cadmium, iron, and zinc. The enormous increase in quantity of copper produced (39.3 million pounds) was diminished statistically by the fall in price of copper from an average of 66.66 cents per pound in 1969 to 58.70 cents per pound in 1970.

The value of industrial minerals increased by $1.6 million or 7.9 per cent largely due to increased production of asbestos.

The value of structural materials decreased by $9.4 million or 17 per cent due to the decreased value of sand, gravel, and cement owing to the decline in construction activity.

The value of fuels increased by $17 million or 18 per cent due largely to the enormous gain in value of coal, $12.7 million or 187 per cent, combined with small gains in crude oil and natural gas.

During the next several years it is anticipated that the total value of production will continue to increase, though depending on metal and mineral prices, the rate of increase may be less than formerly. New production of copper is expected from several important properties proceeding toward production. The production of molybdenum is expected to decline in 1971 due to reduced sales and cut backs in production. Production of coal should continue to increase and petroleum and natural gas production are expected to maintain a steady growth.

Provincial revenue—Direct revenue to the Provincial Government derived from the entire mineral industry in 1970 was as follows:

Free miners' certificates, recording fees, lease rentals, assessment payments, etc.	$1,964,958.07
Royalties on iron concentrates	313,661.04
Rentals and royalties on industrial minerals and structural materials	282,332.00
Fifteen-per-cent mining tax (received during 1970)	12,723,581.00
Coal licences	94,943.00
Petroleum and natural gas rentals, fees, etc.	9,174,447.99
Sale of Crown reserves	16,339,801.19
Royalties on oil, gas, and processed products	13,474,606.62
Miscellaneous	21,843.23
Total	$54,390,174.14

Expenditure by the industry—Expenditures in 1970 by companies involved in the exploration, development, and production of metals, minerals, and coal were $488,866,838.

Expenditures in 1970 by companies involved in the exploration and production of petroleum and natural gas were $121,110,000.

The total expenditures in 1970 by the mineral industry in exploration, development, and production were $609,976,838.

Metal mining—In 1970, 66 mines produced 40.16 million tons of ore. Nine produced more than 1,000,000 tons each, and 14 produced between 100,000 and 1,000,000 tons each. Ten open-pit mines produced more than 26.4 million tons of ore.

In 1970, 37 concentrators were in operation. Concentrators having a total capacity of 11,730 tons were completed at eight mines, of which the more important were Granduc, Greyhound, Ruth Vermont, Magnum, and Mount Copeland. Concentrators having a total capacity of 88,510 tons per day were under construction at seven mines, of which the more important were Lornex, Island Copper, Similkameen (Ingerbelle), Pride of Emory, and Bull River.

During the year mining and concentrating operations were terminated by Utica Mines Ltd. at the Horn Silver mine and by Greyhound Mines Ltd. at the Greyhound pit. Coast Copper Company Limited discontinued production of iron concentrates but continues production of copper from their Benson Lake mine.

The Trail smelter treated 12,850 tons of crude ore and 339,667 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 2,167,548 tons of concentrates was shipped to foreign smelters. Of the total metal production of the Province, concentrates representing 6.0 per cent of the total value were shipped to American smelters and concentrates representing 46.7 per cent of the total value were shipped to Japanese smelters.

DESTINATION OF BRITISH COLUMBIA CONCENTRATES IN 1970

Smelters	Gold-Silver	Lead	Zinc	Copper	Nickel-Copper	Iron
	Tons	Tons	Tons	Tons	Tons	Tons
Trail	763	151,956	186,948	.....	.....	.....
United States	.....	9,916	67,301	7,100	.....	.....
Japan	.....	773	4,321	384,894	18,950	1,674,293

Most molybdenum is sold as molybdenite concentrate, but Endako Mines Ltd. convert part of their output to molybdic oxide and ferromolybdenum. Destinations of British Columbia molybdenum are largely Europe and Japan.

Prospecting for, and exploration and development of, mineral deposits continued at a high level of activity throughout the Province. The chief interest was in copper, copper-molybdenum, and molybdenum properties in the Kamloops, Omineca, Cariboo, and Liard Mining Divisions.

The number of mineral claims recorded in 1970 was 69,546, a 17.8 per cent decrease from 1969. Footage of exploratory diamond drilling was 673,121 feet, down 65,434 feet or 8.9 per cent, and footage of percussion drilling was 235,883 feet, down 17,566 feet or 6.9 per cent.

About 628 geological, geochemical, and geophysical reports were accepted in 1970 by the Department for assessment work credit. They represent not less than $4,412,374 in work done on claims.

The following statistics of expenditures on exploration and development of coal, mineral and metallic deposits, and mines are summarized from data recorded on Statistics Canada forms. They represent minimum amounts, but the response of the industry is sufficiently complete to provide figures that are substantially correct. Comparable figures for petroleum and natural gas operations are not available.

EXPLORATION AND DEVELOPMENT EXPENDITURES, 1970

	Number of Mines Reporting	Physical Work and Surveys	Administration, Overhead, Land Costs, Etc.	Total
A. Prospecting and exploration on undeclared mines—				
1. Metal mines	481	$35,655,902	$10,697,609	$46,353,511
2. Coal mines	5	4,160,385	757,626	4,918,011
3. Others	8	708,638	202,470	911,108
Totals	.....	$40,524,925	$11,657,705	$52,182,630
B. Exploration on declared or operating mines—				
1. Metal mines	18	$1,769,279	$255,940	$2,025,219
2. Coal mines	2	622,500	26,800	649,300
3. Others	5	39,279	9,760	49,039
Totals	.....	$2,431,058	$292,500	$2,723,558
C. Development on declared mines—				
1. Metal mines	5	$60,318,274	$3,291,536	$63,609,810
2. Coal mines	1	19,728,038	211,500	19,939,538
3. Others	1	251,262	24,294	275,556
Totals	.....	$80,297,574	$3,527,330	$83,824,904
D. Development on operating mines—				
1. Metal mines	26	$45,573,577	$4,337,676	$49,911,253
2. Coal mines	1	43,399,000	6,479,000	49,878,000
3. Others	3	8,885,649	897,284	9,782,933
Totals	.....	$97,858,226	$11,713,960	$109,572,186
E. Total expenditures on exploration and development—				
1. Metal mines—A(1) + B(1) + C(1) + D(1)	.....	$143,317,032	$18,582,761	$161,899,793
2. Coal mines—A(2) + B(2) + C(2) + D(2)	.....	67,909,923	7,474,926	75,384,849
3. Others—A(3) + B(3) + C(3) + D(3)	.....	9,884,828	1,133,808	11,018,636
Grand totals	.....	$221,111,783	$27,191,495	$248,303,278

Exploration includes all work done up to the time when a company declares its intention of proceeding to production, after that date the work becomes development.

Major expenditures in 1970 by companies involved in the exploration, development, and mining of metals, minerals, and coal were as follows:

Mining operations (metals, minerals, coal)		$185,305,280
Mining operations (structural materials)		13,677,801
Repairs expenditures		41,580,479
Capital expenditures	$121,601,714	
Exploration and development	126,701,564	
		248,303,278
Total		$488,866,838

Capital and repair expenditures are listed separately because of difficulties in allocating them consistently. Actually most of the repair expenditures should be applied to mining operations, and most of the capital expenditures to exploration and development.

Structural materials and industrial minerals—In 1970, additions were made to the processing plant of Cassiar Asbestos Corporation Limited to increase the fibre production to 110,000 tons annually. The new cement plant of Canada Cement

Lafarge Ltd. at Kamloops went into production and a new plant to recover barite from the tailings of the old Mineral King mine went into operation on Toby Creek. Crownite Industrial Minerals Ltd. at Quesnel began running-in trials treating diatomite and shale to make pozzolan.

Coal mining—As a result of the availability of large Japanese markets for western Canadian coking-coals and of the changing world outlook for coal as an energy source, large investments were made by many companies in 1970 for coal exploration and coal production facilities. At the end of the year two companies held 15-year contracts for the shipment of coal to Japanese steel producers. Kaiser Resources Ltd., whose main contract began on April 1, 1970, has agreed to ship approximately 5 million long tons per year. Fording Coal Limited, whose contract begins on April 1, 1972, is to deliver 3 million long tons per year.

The total amount of coal mined (gross production) in 1970 was 3,483,062 short tons, a three-fold increase over 1969. The amount of coal sold and used in 1970 was 2,644,056 short tons valued at $19.6 million, an increase of 1.8 million tons or 210 per cent. Almost all this production was from the Michel operations of Kaiser Resources Ltd. The first shipment by unit train to Roberts Bank left Sparwood on April 28, 1970.

Extensive exploration and development continued during the year in the Elk River coalfield. On the Fording Coal property, extensive coal reserves have been established and the property is being prepared for production commencing in 1972. North of the Fording Coal property, in the vicinity of Aldridge Creek, Emkay Canada Natural Resources Ltd. carried out exploration which has indicated large coal reserves. In the south, Crows Nest Industries Limited were active in exploration and it is reported that large reserves of coal have been indicated.

The eastern foothills of the Rocky Mountains is another belt that is receiving intensive prospecting and examination. Brameda Resources Ltd. diamond drilled an area of 8 square miles near Sukunka River and established reserves of 60 million tons of high-grade coking-coal. Other companies were undertaking preliminary exploration elsewhere in the foothills.

The Groundhog coalfield in north central British Columbia received detailed geological examination. The economic outlook for the region is improving with the northwestward extension of the Pacific Great Eastern Railway due to pass through the coalfield.

A record number of coal licences was issued under the *Coal Act* in 1970. By the end of the year 1,442 coal licences covering not less than 685,875 acres were in good standing.

Petroleum and natural gas—The value of production of the petroleum industry in 1970 amounted to $90,974,467, up 5 per cent from 1969. For the sixth successive year there has been an increase in production. Natural gas delivered to pipelines from 282 of 725 producible gas wells was 272,554,221 MSCF, an increase of 6.3 per cent in quantity and 6.8 per cent in value over 1969. Crude-oil production from 259 of 640 producible oil wells remained virtually unchanged at 25,361,333 barrels, an increase of 0.2 per cent in quantity and 3.8 per cent in value. Crude oil was second only to copper in value. The major gas-producing fields were Yoyo, Laprise Creek, Sidney, Nig Creek, and Rigel and the major oil-producing fields were Boundary Lake, Peejay, Milligan Creek, Inga, and Weasel.

Production and drilling operations in the Province during 1970 recorded only minor increases over 1969. Over-all drilling operations increased about 3 per cent over 1969 with notable decreases in development-type drilling. This is indicative that areas for concentrated development drilling were not available and that oil

companies devoted more of their drilling to seeking new fields. Drilling objectives were for gas in the Devonian of the northern part of northeastern British Columbia and for oil and gas in the Lower Cretaceous and Triassic in the southern part of the area. An important discovery of gas was made in the Mississippian in the disturbed belt of the foothills near Pink Mountain.

Most exploration activity was in proven areas of the Province in addition to which some work was undertaken in the Fernie and Chilcotin areas, in the Bowser Basin, and on the Queen Charlotte Islands.

Minor expansions were made to processing facilities for petroleum products and to transportation systems. A natural gas transmission line to the prolific Beaver River gasfield was under construction.

Expenditures in 1970 made by companies involved in the exploration and production of petroleum and natural gas were as follows:

Exploration, land acquisition, and drilling	$54,961,000
Development drilling	12,705,000
Capital expenditures	20,373,000
Natural gas plant operations	3,666,000
Field, well, and pipe-line operations	12,565,000
General (excluding income tax)	16,840,000
Total	$121,110,000

Statistics

CHAPTER 2

CONTENTS

INTRODUCTION

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

In the interests of uniformity and to avoid duplication of effort, beginning with the statistics for 1925, Statistics Canada and the Provincial departments have co-operated in collecting and processing 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 Statistics Canada.

As far as possible, both organizations follow the same practice in processing the data. The final compilation by Statistics Canada is usually published considerably later than the Annual Report of the Minister of Mines and Petroleum Resources for British Columbia. Differences between the values of production published by the two organizations arise mainly because Statistics Canada uses average prices considered applicable to the total Canadian production, whereas the British Columbia mining statistician uses prices considered applicable to British Columbia production.

Peat, classified as a fuel by Statistics Canada, is not included in the British Columbia statistics of mineral production being regarded as neither a fuel nor a mineral.

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. For petroleum, natural gas, and liquid by-products, production figures supplied by the Petroleum and Natural Gas Branch of the Department of Mines and Petroleum Resources are compiled from the monthly disposition reports and the Crown royalty statement filed with the Department by the producers.

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

METALS

Average Prices

The prices used in the valuation of current and past production of gold, silver, copper, lead, and zinc are shown in the table on page A 26.

The price of gold used is the average Canadian Mint buying-price for fine gold. In 1970 this was $36.56 per ounce.

The price used for placer gold originally was 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 26, converted into Canadian funds. The abbreviations 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 silver, copper, lead, and zinc are average United States prices converted into Canadian funds. Average monthly prices are supplied by Statistics Canada from figures published in the Metal Markets section of *Metals Week*. 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. However, commencing in 1970 the copper price is the average of prices received by the various British Columbia shippers.

For antimony the average price for the year and for cadmium, the New York producers' price to consumers are used. For nickel the price used is the Canadian price set by the International Nickel Company of Canada Ltd. The value per ton of the iron ore used in making pig iron at Kimberley is an arbitrary figure, being the average of several ores of comparable grade at their points of export from British Columbia.

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
Zinc	50	90	—	—	—
Cadmium	—	70	—	—	—
Nickel	—	—	—	88	—

Value of Production

For indium, iron concentrate shipped to Japan, mercury, molybdenum, and tin the value of production is the amount received by the shippers.

For gold, silver, copper, lead, zinc, antimony, bismuth, cadmium, some iron concentrate, and nickel the value of production is calculated from the assay content

of the ore, concentrate, or bullion less appropriate smelter losses, and an average price per unit of weight.

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 26.

For 1925 and subsequent years the value has been calculated by using the true average price (*see* p. A 26) and the net metal contents, in accordance with the procedures adopted by Statistics Canada 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 metals, by multiplying the net contents of metals as determined by means of the above table by the average price for the year.

Industrial Minerals and Structural Materials

The values of production of industrial minerals and structural materials are approximately the amounts received at the point of origin.

Fuel

The value of production of coal is calculated using a price per ton (*see* p. A 26) which is the weighted average of the f.o.b. prices at the mine for the coal sold.

The values of production of natural gas, natural gas liquid by-products, and 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 metal was produced at the Trail smelter from 1939 to 1944; since 1944 it has been marketed alloyed with lead. The antimony is a by-product of silver-lead ores. In 1907 the first recorded antimonial ore mined in British Columbia was shipped from the Slocan area to England. Since then other out-of-Province shipments have originated in the Bridge River, North Lardeau, Slocan, Spillimacheen, and Stuart Lake areas. In Table 7C the antimony assigned to individual mining divisions is the reported content of ore exported to foreign smelters; the antimony "not assigned" is that recovered at the Trail smelter from various ores received there. *See* Tables 1, 3, and 7C.

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

Asbestos—British Columbia has produced asbestos since 1952 when the Cassiar mine was opened. All British Columbia production consists of chrysotile from the Cassiar mine near the Yukon border. This deposit is noted for its high percen-

tage of valuable long fibre and for the low iron content of the fibre. The original claims were located at Cassiar in 1950, and the first fibre was shipped two years later. The fibre is milled from the ore at Cassiar, shipped by truck to Whitehorse, and then moved by rail to tidewater at Skagway. From 1953 to 1961 the fibre was valued at the shipping point in North Vancouver, but beginning in 1962 it has been valued at the mine, and values for the preceding years have been recalculated on that basis. *See* Tables 1, 3, and 7D.

Barite—Barite production began in 1940 and has been continuous since then, coming from several operations in the upper Columbia River valley. Some barite is mined from lode deposits and the rest is recovered from the mill-tailings ponds of the former Silver Giant and Mineral King silver-lead-zinc mines. *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—Since 1929 the Trail smelter has produced bismuth. It is a by-product of lead refining and thus the production cannot be assigned to specific properties or mining divisions. *See* Tables 1, 3, and 7C.

Brick—*See* Clay and shale products.

Building-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* Table 7E.

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 has been recovered as a by-product at the Trail zinc refinery since 1928. It occurs in variable amounts in the sphalerite of most British Columbia silver-lead-zinc ores. In Table 7C the cadmium assigned to individual mining divisions is the reported content of custom shipments to the Trail and foreign smelters; that "not assigned" 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 carefully proportioned mixtures of limestone, gypsum, and other mineral materials. It has been produced in British Columbia since 1905. Present producers are Ocean Cement Limited, with a 4.8-million-barrel-per-year plant at Bamberton, and Canada Cement Lafarge Ltd. with a 3.5-million-barrel-per-year plant on Lulu Island and a 1.2-million-barrel-per-year plant at Kamloops. *See* Tables 1, 3, and 7E.

Chromite—Two shipments of chromite are on record, 670 tons from Cascade in 1918 and 126 tons from Scottie Creek in 1929. *See* Tables 1 and 7C.

Clay and shale products—These include brick, blocks, tile, pipe, pottery, light-weight aggregate, and pozzolan manufactured from British Columbia clays and shales. Common red-burning clays and shales are widespread in the Province, but better grade clays are rare. The first recorded production was of bricks at Craigflower in 1853 and since then plants have operated in most towns and cities for short periods. Local surface clay is used at Haney to make common red brick, tile, and flower pots. Shale and fireclay from Abbotsford Mountain are used to make firebrick, facebrick, sewer pipe, flue lining, and special fireclay shapes in plants at Kilgard, Abbotsford, and South Vancouver. A plant on Saturna Island makes light-weight expanded shale aggregate and pozzolan clinker from a local shale

deposit. A plant at Quesnel makes pozzolan from burnt shale quarried south of Quesnel. Common clays and shales are abundant in British Columbia, but fireclay and other high-grade clays are rare. Several hobby and art potteries and a sanitary-ware plant are in operation, but these use mainly imported raw materials and their production is not included in the tables. *See* Tables 1, 3, and 7E.

Coal—Coal is almost as closely associated with British Columbia's earliest history as is placer gold. Coal was discovered at Suquash on Vancouver Island in 1835 and at Nanaimo in 1850. The yearly value of coal production passed that of placer gold in 1883 and contributed a major part of the total mineral wealth for the next 30 years.

First production, by Mining Divisions: Cariboo, 1942; Fort Steele, 1898; Kamloops, 1893; Liard, 1923; Nanaimo, 1836; Nicola, 1907; Omineca, 1918; Osoyoos, 1926; Similkameen, 1909; and Skeena, 1912.

The Nanaimo and Comox fields produced virtually all of the coal until production started from the Crowsnest field in 1898. The Crowsnest field contains coking-coal and prospered in the early years of smelting and railroad-building. Mining started in the Nicola-Princeton coalfield in 1907, at Telkwa in 1918, and on the Peace River in 1923. The Nanaimo field was exhausted in 1953 when the last large mines closed, and only small operations on remnants were left. The colliery at Merritt closed in 1945 and at Coalmont in 1940. The closing of the last large mine at Tsable River in 1966, and of the last small one, near Wellington in 1968, marked the end of production from the once important Vancouver Island deposits.

Undeveloped fields include basins in the foothills of the Rocky Mountains north and south of the Peace River, the Groundhog basin in north central British Columbia, the Hat Creek basin west of Ashcroft, and basins on Graham Island.

The enormous requirements for coking-coal in Japan created great activity in coal prospecting in various areas of British Columbia since 1968. The signing of large contracts with the Japanese resulted in preparations for production at several deposits in the East Kootenays. First shipments to Japan via special port facilities at North Vancouver and Roberts Bank began in 1970.

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—In 1928 a recovery of 1,730 pounds of cobalt was made from a shipment of arsenical gold ore from the Victoria mine on Rocher Déboulé Mountain. *See* Tables 1 and 7C.

Coke—Coke is made from special types of coal. It has been produced in British Columbia 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 has been discontinued. The coal used in making coke is still recorded in Table 8B. Coke statistics are available on request from the Economics and Statistics Branch, Department of Industrial Development, Trade, and Commerce, Victoria.

Copper—Copper concentrates are shipped to Japanese and American smelters because no copper smelter has operated in British Columbia since 1935. Small amounts of gold and silver are commonly present and add value to the ore, but some

ores contain important amounts of gold (as at Rossland), silver (Silver King mine), lead and zinc (Tulsequah), or zinc (Britannia mine). Most of the smelting in British Columbia in early years was done on ore shipped direct from the mines without concentration, but modern practice is to concentrate the ore first.

Ore was smelted in British Columbia first in 1896 at Nelson (from Silver King mine) and at Trail (from Rossland mines), and four and five years later at Grand Forks (from Phoenix mine) and Greenwood (from Mother Lode mine). Later, small smelters were built in the Boundary district and on Vancouver and Texada Islands, and 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 concentrates were then smelted mainly at Tacoma, and since 1961 have gone chiefly to Japan.

Most of the production has come from southern British Columbia—from Britannia, Copper Mountain, Greenwood, Highland Valley, Merritt, Nelson, Rossland, Texada Island, and Vancouver Island, although a sizeable amount came from Anyox and some from Tulsequah. During recent years exploration for copper has been intense, interest being especially directed toward finding very large, low-grade deposits suitable for open-pit mining. This activity has resulted in the establishment of operating mines at Merritt (Craigmont) in 1961, in Highland Valley (Bethlehem) in 1962, on Babine Lake (Granisle) in 1966, near Peachland (Brenda) in 1970, and Stewart (Granduc) in 1971. Large mines near Port Hardy (Island Copper), Babine Lake (Bell), McLeese Lake (Gibraltar), Highland Valley (Lornex), and Princeton (Ingerbelle) are nearing production. Others are in an advanced planning stage or under exploration.

After a lapse of many years, copper has been produced comparatively recently on Vancouver Island at Jordan River, Courtenay, Benson Lake, Quatsino, and also at Buttle Lake together with zinc and silver. At Tasu Harbour on Moresby Island and at Texada Island copper is produced as a by-product of iron-mining.

Copper is now the most valuable single commodity of the industry. Production in 1970 was 206.7 million pounds. *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, when the 12-inch oil pipe-line was built to connect the oil-gathering terminal at Taylor to the Trans Mountain Oil Pipe Line Company pipe-line near Kamloops. In 1970, oil was produced from 24 separate fields, of which the Boundary Lake, Peejay, Milligan Creek, Inga, and Weasel fields were the most productive.

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 condensate listed separately. Full details are given in tables in the Petroleum and Natural Gas chapter of this report.

Diatomite—Relatively large deposits of diatomite are found near the Fraser River in the Quesnel area, and small deposits are widespread throughout the Province. Small amounts of diatomite have been shipped from Quesnel periodically since 1928. One plant to process the material locally was built in Quesnel in 1969 and a new one to replace it was completed in 1970. *See* Tables 1, 3, and 7D.

Field condensate—Field condensate is the liquid hydrocarbons separated and recovered from natural gas in the field before gas processing. *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. From

1958 to 1968, small quantities were produced as a by-product at the Oliver silica quarry. *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. In the past silica was shipped from Grand Forks, Oliver, and the Sheep Creek area. Today silica from Salmo and limestone, chiefly from Texada Island, are produced for flux. Quantities have been 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 on Moresby Island in 1852, when some gold was recovered from a small quartz vein. The first stamp mill was built in the Cariboo in 1876, and it seems certain that some arrastras—primitive grinding-mills—were built even earlier. These and other early attempts were short lived, and the successful milling of gold ores began about 1890 in the southern part of the Province. The value of production was second only to that of coal by 1900 and continued to be very important. At the start of World War II, gold-mining attained a peak yearly value of more than $22 million, but since the war it dwindled, owing to the fact that the price for gold was fixed and the cost of mining rose and continues to rise.

In the early years, lode gold came mostly from the camps of Rossland, Nelson, McKinney, Fairview, Hedley, and also from the copper and other ores of the Boundary district. A somewhat later major producer was the Premier mine at Stewart. In the 1930's the price of gold increased and the value of production soared, new discoveries were made and old mines were revived. The principal gold camps, in order of output of gold, have been Bridge River, Rossland, Portland Canal, Hedley, Wells, and Sheep Creek. In 1971 the Bralorne mine in Bridge River closed; it was the last gold mine in the Province to operate. To date the gold mines have paid a total of about $82 million in dividends.

As long as the price of gold remains fixed and costs continue to rise, there can be no increase in the mining of lode gold except as a by-product. With the closing of the Bralorne mine all is produced as a by-product of 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.

The year of greatest placer-gold production was 1863, shortly after the discovery of placer in the Cariboo. Another peak year in 1875 marked the discovery of placer on creeks in the Cassiar. A minor peak year was occasioned by the discovery of placer gold on Granite Creek in the Tulameen in 1886. A high level of production ensued after 1899, when the Atlin placers reached their peak output. Other important placer-gold camps were established at Goldstream, Fort Steele, Rock Creek, Omineca River, and Quesnel River. The last important strike was made on Cedar Creek in 1921, and coarse gold was found on Squaw Creek in 1927 and on Wheaton Creek in 1932.

Mining in the old placer camps revived during the 1930's under the stimulus of an increase in the price of fine gold from $20.67 per ounce to $35 per ounce in United States funds. Since World War II placer-mining has declined under conditions of steadily rising costs and a fixed price for gold. Since 1858 more than 5.2 million ounces valued at almost $97 million has been recovered.

A substantial part of the production, including much of the gold recovered from the Fraser River upstream from Yale (in the present New Westminster, Kam-

loops, 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 28, *Placer Gold Production of British Columbia*. *See* Tables 1, 3, 6, and 7A.

Granules—Rock chips used for bird grits, exposed aggregate, roofing, stucco dash, terrazzo, etc., have been produced in constantly increasing quantities since 1930. Plants operate in Burnaby, near Hope, at Rock Creek, Grand Forks, Sirdar, Vananda, and Armstrong. *See* Tables 1, 3, and 7D.

Gypsum and gypsite—Production of gypsum and gypsite has been recorded since 1911. Between 1925 and 1956 more than 1,000,000 tons was shipped from Falkland and some was quarried near Cranbrook and Windermere. Since 1956 all production has come from Windermere. *See* Tables 1, 3, and 7D.

Hydromagnesite—Small shipments of hydromagnesite were made from Atlin between 1904 and 1916 and from Clinton in 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—Iron ore was produced in small quantities as early as 1885, commonly under special circumstances or as test shipments. Steady production started in 1951 with shipments of magnetite concentrates to Japan from Vancouver and Texada Islands.

Most of the known iron-ore deposits are magnetite, and occur in the coastal area. On the average they are low in grade and need to be concentrated. Producing mines have operated on Texada Island, at Benson Lake and Zeballos on Vancouver Island, and at Tasu and Jedway on Moresby Island. At Texada Island copper is a by-product of iron-mining, and at the Coast Copper mine at Benson Lake iron was a by-product of copper-mining. The latest operation, and to date the largest, is that of Wesfrob Mines Limited at Tasu, begun at the end of 1967; copper is produced as a by-product.

Since January 1961, calcined iron sulphide from the tailings of the Sullivan mine has been used for making pig iron at Kimberley. This is the first manufacture of pig iron in British Columbia. The iron occurs as pyrrhotite and pyrite in the lead-zinc ore of the Sullivan mine. In the process of milling, the lead and zinc minerals are separated for shipment to the Trail smelter, and the iron sulphides are separated from the waste rock. Over the years a stockpile had been built containing a reserve of about 20 million tons of iron ore.

The sulphur is removed in making pig iron and is converted to sulphuric acid, which is used in making fertilizer. A plant built at Kimberley converts the pig iron to steel, and a fabricating plant has been acquired in Vancouver. 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 bedrock occurrences on Mount Ogden and near Dease Lake 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. *See* Tables 1, 3, and 7D.

Lead—Lead was the most valuable single commodity for many years, but it was surpassed by zinc in value of annual production in 1950 and in total production in 1966. The two metals usually occur together in nature although not necessarily in equal amounts in a single deposit. Zinc is the more abundant metal, but lead ore usually is more valuable than zinc ore because it contains more silver as a by-product. For a long time British Columbia produced almost all of Canada's lead, but now produces only about one-quarter of it. Most of the concentrated ore is smelted and the metal refined at Trail, but some concentrate is shipped to American and Japanese smelters.

Almost all of British Columbia's lead comes from the southeastern part of the Province. The Sullivan mine at Kimberley is now producing about three-quarters of the Province's lead and has produced about 85 per cent of the grand total. This is one of the largest mines in the world and supports the great metallurgical works at Trail. Other mines are at the Pend d'Oreille River, North Kootenay Lake, Slocan, and southwest of Golden. In northwestern British Columbia less important parts of the total output have come from Tulsequah, the Premier mine, and several small mines in the general region of Hazelton.

A small amount of high-grade lead ore is shipped directly to the smelter, but most of the ore is concentrated by flotation and the zinc content is separated from the lead. All output from the Sullivan and other mines owned by Cominco Ltd. goes to the Trail smelter but part of the output of other mines goes to American smelters. Lead was first produced in 1887, and the total production amounts to approximately 7.5 million tons.

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—Besides being used for flux and granules (where it is recorded separately), limestone is used in agriculture, cement manufacture, the pulp and paper industry, and for making lime. It has been produced since 1886. Quarries now operate at Cobble Hill, near Prince George, and on the north end of Texada Island. *See* Tables 1, 3, and 7E.

Magnesium—In 1941 and 1942, Cominco Ltd. produced magnesium from magnesite mined from a large deposit at Marysville. *See* Tables 1 and 7C.

Magnesium sulphate—Magnesium sulphate was recovered in minor amounts at various times between 1915 and 1942 from small alkali lakes near Basque, Clinton, and Osoyoos. *See* Tables 1 and 7D.

Manganese—From 1918 to 1920 manganese ore was shipped from a bog deposit near Kaslo and from Hill 60 near Cowichan Lake, and in 1956 a test shipment was made from Olalla. *See* Tables 1 and 7C.

Mercury—Mercury was first produced near Savona in 1895. Since then small amounts have been recovered from the same area and from the Bridge River district. The main production to date was between 1940 and 1944 from the Pinchi Lake and Takla mines near Fort St. James. In 1968 the Pinchi Lake mine reopened and continues in operation. *See* Tables 1 and 7C.

Mica—No sheet mica has been produced commercially in British Columbia. Between 1932 and 1961 small amounts of mica schist for grinding were mined near Albreda, Armstrong, Oliver, Prince Rupert, and Sicamous. *See* Tables 1, 3, and 7D.

Molybdenum—Molybdenum ore in small amounts was produced from high-grade deposits between 1914 and 1918. Recently, mining of large low-grade molybdenum and copper-molybdenum deposits has increased production to the point that molybdenum now ranks second in importance in annual value of metals produced in British Columbia. The upswing began when the Bethlehem mine recovered by-product molybdenum from 1964 to 1966. In 1965, the Endako and Boss Mountain mines, followed by the Coxey in 1966, and British Columbia Molybdenum mine in 1967, all began operations as straight molybdenum producers. In 1970, the Brenda mine, a combined copper-molybdenum producer, started operating. Large-scale combined metal deposits at Island Copper, Lornex, and Gibraltar mines are being prepared for production in 1971 and 1972. *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 900,000,000 cubic feet. In 1970 there were 40 producing gas fields of which the Yoyo, Laprise Creek, Clarke Lake, Jedney, Nig Creek, and Rigel were the most productive.

The production shown in Tables 1, 3, and 7A is the total amount sold of residential 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 chapter of this report.

Nickel—One mine, the Pride of Emory near Hope, shipped nickel ore in 1936 and 1937 and began continuous production in 1958. Since 1960, bulk copper-nickel 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 Ltd. produced 3,842 tons of phosphate rock for test purposes, but the grade proved to be too low for commercial use. More test shipments were made in 1964 but there has been no commercial production. *See* Tables 1 and 7D.

Plant condensate—Plant condensate is the hydrocarbon liquid extracted from natural gas at gas-processing plants. *See* Tables 1, 3, and 7A.

Platinum—Platinum has been produced intermittently from placer streams in small amounts since 1887, mostly from the Tulameen and Similkameen Rivers. Placer platinum also has been recovered from Pine, Thibert, McConnell, Rainbow, Tranquille, Rock, and Government Creeks; from Quesnel, Fraser, Cottonwood, Peace, and Coquihalla Rivers; and from beach placers on Graham Island. Some platinum recovered between 1928 and 1930 as a by-product at 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—Silver is recovered from silver ores or as a by-product of other ores. Most of it is refined in Trail, some goes to the Mint in gold bullion, and some is exported in concentrated ores of copper, lead, and zinc to American and Japanese smelters. Silver bullion was produced by the Torbrit mine from 1949 to 1959.

Invariably some silver is associated with galena, so that even low-grade lead ores if mined in quantity produce a significant amount of silver. Some silver is recovered from gold ores and some from copper ores, and although the silver in such ores is usually no more than a fraction of an ounce per ton, even that amount is important in a large-tonnage operation.

Silver-bearing ores were intensively sought in the early days. A metal of high unit value was the only one worth finding in regions remote from market, and in the 1880's and 1890's, there was little point in prospecting for ores that did not contain values in silver or gold. Prospecting for silver ores started in southeastern British Columbia in about 1883, and from 1894 to 1905 British Columbia produced most of Canada's silver, many of the early ores being mined primarily for their silver content.

Production of silver began in 1887 from silver-copper and silver-lead ores in the Kootenays and has continued in this area to the present. Now, most of the silver is a by-product of lead-zinc ores and nearly all is refined at Trail, although some is exported with concentrates to American and Japanese smelters, or may go to the Mint in gold bullion. Today the greatest single source of silver is the Sullivan mine, which has been in production since 1900. By 1970 the Sullivan mine has accounted for 47 per cent of the total silver production of the Province. A significant total amount is contributed by the Lynx, Phoenix, Bethlehem, Granisle, Brenda, and Tasu mines. The only steady producer that is strictly a silver mine is the Highland Bell mine at Beaverdell, in operation since 1922. A former important mine, the Premier near Stewart, produced more than 41 million ounces of silver between 1918 and 1968. *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—Cut stone for building purposes is prepared from rock produced at quarries in various parts of the Province when required. Two of the most productive quarries have operated on Haddington and Nelson Islands. *See* Tables 1, 3, and 7E.

Structural materials—In Table 7E the value of $5,972,171 for unclassified materials 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. (now Canadian Occidental Petroleum Ltd.) 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 to make dust for 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 Columbia Tungstens (Hardscrabble) mine in 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. Small amounts of scheelite have been produced from the Bridge River, Revelstoke, and other areas when demand was high. In 1970 production began from the Invincible mine near Salmo.

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. For many years lead was the most valuable single metal but in 1950 the annual value of production of zinc surpassed that of lead and in 1966 the total value of zinc production exceeded that of lead. In 1970 the annual production of zinc is exceeded by that of copper, crude oil, and molybdenum. Zinc is invariably associated with lead, and most ores are mined for their combined values in zinc, lead, and silver, and rarely for their zinc content alone. Some zinc ores contain a valuable amount of gold, and zinc is associated with copper at the Britannia and Lynx mines. Modern practice is to concentrate and separate the zinc mineral (sphalerite) from the lead mineral (galena). Most of the zinc concentrates go to the zinc recovery plant at Trail, are roasted, and are converted electrolytically to refined metal. Some concentrates are shipped to American or Japanese smelters.

More than 87 per cent of the 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 from mines at Portland Canal and Tulsequah and is coming from 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.	.....	2.65
1902	.....	.....	49.55 ,,	11.70 ,,	3.66 ,,	.....	2.63
1903	.....	.....	50.78 ,,	13.24 ,,	3.81 ,,	.....	2.67
1904	.....	.....	53.36 ,,	12.82 ,,	3.88 ,,	.....	2.62
1905	.....	.....	51.33 ,,	15.59 ,,	4.24 ,,	.....	2.70
1906	.....	.....	63.45 ,,	19.28 ,,	4.81 ,,	.....	2.61
1907	.....	.....	62.06 ,,	20.00 ,,	4.80 ,,	.....	3.07
1908	.....	.....	50.22 ,,	13.20 ,,	3.78 ,,	.....	3.11
1909	.....	.....	48.93 ,,	12.98 ,,	3.85 ,,	.....	3.19
1910	.....	.....	50.812 ,,	12.738 ,,	4.00 ,,	4.60 E.St.L.	3.35
1911	.....	.....	50.64 ,,	12.38 ,,	3.98 ,,	4.90 ,,	3.18
1912	.....	.....	57.79 ,,	16.341 ,,	4.024 ,,	5.90 ,,	3.36
1913	.....	.....	56.80 ,,	15.27 ,,	3.93 ,,	4.80 ,,	3.39
1914	.....	.....	52.10 ,,	13.60 ,,	3.50 ,,	4.40 ,,	3.46
1915	.....	.....	47.20 ,,	17.28 ,,	4.17 ,,	11.25 ,,	3.43
1916	.....	.....	62.38 ,,	27.202 ,,	6.172 ,,	10.88 ,,	3.45
1917	.....	.....	77.35 ,,	27.18 ,,	7.91 ,,	7.566 ,,	3.48
1918	.....	.....	91.93 ,,	24.63 ,,	6.67 ,,	6.94 ,,	4.99
1919	.....	.....	105.57 ,,	18.70 ,,	5.19 ,,	6.24 ,,	4.92
1920	.....	.....	95.80 ,,	17.45 ,,	7.16 ,,	6.52 ,,	4.72
1921	.....	.....	59.52 ,,	12.50 ,,	4.09 ,,	3.95 ,,	4.81
1922	.....	.....	64.14 ,,	13.38 ,,	5.16 ,,	4.86 ,,	4.72
1923	.....	.....	61.63 ,,	14.42 ,,	6.54 ,,	5.62 ,,	4.81
1924	.....	.....	63.442 ,,	13.02 ,,	7.287 ,,	5.39 ,,	4.89
1925	.....	.....	69.065 ,,	14.042 ,,	7.848 Lond.	7.892 Lond.	4.79
1926	.....	.....	62.107 ,,	13.795 ,,	6.751 ,,	7.409 ,,	4.84
1927	.....	.....	56.370 ,,	12.920 ,,	5.256 ,,	6.194 ,,	4.81
1928	.....	.....	58.176 ,,	14.570 ,,	4.575 ,,	5.493 ,,	4.71
1929	.....	.....	52.993 ,,	18.107 ,,	5.050 ,,	5.385 ,,	4.74
1930	.....	.....	38.154 ,,	12.982 ,,	3.927 ,,	3.599 ,,	4.73
1931	.....	.....	28.700 ,,	8.116 ,,	2.710 ,,	2.554 ,,	4.35
1932	19.30	23.47	31.671 ,,	6.380 Lond.	2.113 ,,	2.405 ,,	4.04
1933	23.02	28.60	37.832 ,,	7.454 ,,	2.391 ,,	3.210 ,,	3.90
1934	28.37	34.50	47.461 ,,	7.419 ,,	2.436 ,,	3.044 ,,	4.00
1935	28.94	35.19	64.790 ,,	7.795 ,,	3.133 ,,	3.099 ,,	3.95
1936	28.81	35.03	45.127 ,,	9.477 ,,	3.913 ,,	3.315 ,,	4.23
1937	28.77	34.99	44.881 ,,	13.078 ,,	5.110 ,,	4.902 ,,	4.25
1938	28.93	35.18	43.477 ,,	9.972 ,,	3.344 ,,	3.073 ,,	4.01
1939	29.72	36.14	40.488 ,,	10.092 ,,	3.169 ,,	3.069 ,,	4.02
1940	31.66	38.50	38.249 ,,	10.086 ,,	3.362 ,,	3.411 ,,	4.26
1941	31.66	38.50	38.261 ,,	10.086 ,,	3.362 ,,	3.411 ,,	4.15
1942	31.66	38.50	41.166 ,,	10.086 ,,	3.362 ,,	3.411 ,,	4.13
1943	31.66	38.50	45.254 ,,	11.750 ,,	3.754 ,,	4.000 ,,	4.17
1944	31.66	38.50	43.000 ,,	12.000 ,,	4.500 ,,	4.300 ,,	4.25
1945	31.66	38.50	47.000 ,,	12.550 ,,	5.000 ,,	6.440 ,,	4.24
1946	30.22	36.75	83.650 ,,	12.800 ,,	6.750 ,,	7.810 ,,	4.68
1947	28.78	35.00	72.000 ,,	20.390 ,,	13.670 ,,	11.230 ,,	5.12
1948	28.78	35.00	75.000 Mont.	22.350 U.S.	18.040 ,,	13.930 ,,	6.09
1949	29.60	36.00	74.250 U.S.	19.973 ,,	15.800 U.S.	13.247 U.S.	6.51
1950	31.29	38.05	80.635 ,,	23.428 ,,	14.454 ,,	15.075 ,,	6.43
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 ,,	6.94
1953	28.31	34.42	83.774 ,,	30.333 ,,	13.265 ,,	10.675 ,,	6.88
1954	27.52	34.07	82.982 ,,	29.112 ,,	13.680 ,,	10.417 ,,	7.00
1955	28.39	34.52	87.851 ,,	38.276 ,,	14.926 ,,	12.127 ,,	6.74
1956	28.32	34.44	89.373 ,,	39.787 ,,	15.756 ,,	13.278 ,,	6.59
1957	27.59	33.55	87.057 ,,	26.031 ,,	14.051 ,,	11.175 ,,	6.76
1958	27.94	33.98	86.448 ,,	23.419 ,,	11.755 ,,	10.009 ,,	7.45
1959	27.61	33.57	87.469 ,,	27.708 ,,	11.670 ,,	10.978 ,,	7.93
1960	27.92	33.95	88.633 ,,	28.985 ,,	11.589 ,,	12.557 ,,	6.64
1961	29.24	35.46	93.696 ,,	28.288 ,,	11.011 ,,	11.695 ,,	7.40
1962	29.25	37.41	116.029 ,,	30.473 ,,	10.301 ,,	12.422 ,,	7.43
1963	29.31	37.75	137.965 ,,	30.646 ,,	12.012 ,,	13.173 ,,	7.33
1964	29.96	37.75	139.458 ,,	33.412 ,,	14.662 ,,	14.633 ,,	6.94
1965	28.93	37.73	139.374 ,,	38.377 ,,	17.247 ,,	15.636 ,,	7.03
1966	29.08	37.71	139.300 ,,	53.344 ,,	16.283 ,,	15.622 ,,	7.28
1967	28.77	37.76	167.111 ,,	50.022 ,,	15.102 ,,	14.933 ,,	7.75
1968	29.21	37.71	231.049 ,,	54.216 ,,	14.546 ,,	14.153 ,,	7.91
1969	29.37	37.69	192.699 ,,	66.656 ,,	16.039 ,,	15.721 ,,	8.00
1970	**28.89**	**36.56**	**184.927 ,,**	**58.698[2] ,,**	**16.336 ,,**	**16.006 ,,**	**7.40**

[1] *See* page A 13 for detailed explanation.
[2] *See* page A 14 for explanation.

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

Products[1]	Total Quantity to Date	Total Value to Date	Quantity 1969	Value 1969	Quantity 1970	Value 1970
Metals		$		$		$
Antimony lb.	52,566,382	16,881,213	820,122	508,476	726,474	1,104,040
Bismuth lb.	6,746,455	13,750,108	62,488	288,070	132,135	828,486
Cadmium lb.	39,421,511	72,327,469	1,141,133	4,016,788	939,310	3,343,944
Chromite tons	796	32,295				
Cobalt lb.	1,730	420				
Copper lb.	4,254,041,748	1,108,799,081	167,415,411	111,592,416	206,735,343	121,349,512
Gold—placer oz.	5,235,408	96,957,397	399	11,720	491	14,185
„ —lode, fine oz.	17,025,851	503,792,457	117,481	4,427,506	100,179	3,662,444
Iron concentrates tons	26,304,064	238,773,655	2,074,854	19,787,845	1,877,209	17,397,574
Lead lb.	15,828,315,846	1,347,940,476	210,072,565	33,693,539	214,838,525	35,096,021
Magnesium lb.	204,632	88,184				
Manganese tons	1,724	32,668				
Mercury[2] lb.	4,171,110	10,447,358				
Molybdenum lb.	119,634,910	204,271,452	26,597,477	47,999,442	31,276,497	52,431,558
Nickel lb.	41,681,506	37,473,210	2,979,130	3,396,208	3,408,203	4,703,320
Palladium oz.	749	30,462				
Platinum oz.	1,407	135,008				
Selenium lb.	731	1,389				
Silver oz.	485,262,219	353,174,747	5,760,534	11,100,491	6,511,316	12,041,181
Tin lb.	18,184,983	16,199,240	288,427	470,136	263,716	421,946
Tungsten (WO_3) lb.	16,019,324	38,663,751				
Zinc lb.	14,421,058,870	1,389,884,751	296,667,033	46,639,024	275,590,749	44,111,055
Others		33,874,870		10,949,453		10,020,179
Totals		5,483,531,661		294,881,114		306,525,445
Industrial Minerals						
Arsenious oxide lb.	22,019,420	273,201				
Asbestos tons	925,207	179,412,042	80,388	14,871,334	86,730	16,013,827
Barite tons	373,654	3,914,563	30,624	248,818	45,320	382,508
Bentonite tons	791	16,858				
Diatomite tons	8,718	201,892			1,276	26,567
Fluorspar tons	35,682	795,950				
Fluxes tons	4,084,331	7,575,904	22,342	81,917	31,626	106,533
Granules tons	392,467	6,104,839	34,746	654,701	25,198	622,202
Gypsum and gypsite tons	4,085,291	14,425,904	280,894	764,032	270,266	736,635
Hydromagnesite tons	2,253	27,536				
Iron oxide and ochre tons	18,108	155,050				
Jade lb.	596,394	531,670	26,332	42,635	262,602	250,256
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	7,295,699	95,544,071	349,122	3,824,593	336,659	3,968,294
Talc tons	1,805	34,871				
Others		5,213		4,913		
Totals		309,616,129		20,492,943		22,106,822
Structural Materials						
Cement tons	12,954,060	213,808,313	795,591	16,604,688	601,893	13,485,549
Clay products		77,691,583		4,550,546		4,714,368
Lime and limestone tons		53,671,899	1,911,881	3,237,032	1,867,586	3,169,665
Rock tons		49,911,302	3,756,559	4,456,211	2,692,282	3,018,242
Sand and gravel tons		253,415,606	29,132,650	26,553,699	23,155,989	21,679,387
Stone tons	1,161,879	9,204,354	2,177	39,352		
Not assigned		5,972,171				
Totals		663,675,228		55,441,528		46,067,211
Fuels						
Coal tons	145,089,102	636,283,545	852,340	6,817,155	2,644,056	19,559,669
Crude oil bbl.	159,289,278	350,580,748	25,309,036	58,176,213	25,361,336	60,405,941
Field condensate bbl.	410,688	936,197	78,147	180,520	116,637	277,829
Plant condensate bbl.	10,803,697	5,664,042	944,111	263,278	1,003,138	253,009
Nat'l gas to pipe-line M s.c.f.	1,892,240,528	192,568,510	256,223,244	27,897,585	272,554,221	29,803,411
Butane bbl.	4,982,947	1,594,542	417,540	133,613	308,664	98,772
Propane bbl.	3,375,928	1,080,294	327,501	104,800	420,327	134,505
Totals		1,188,707,878		93,573,164		110,534,136
Grand totals		7,645,530,896		464,388,749		485,233,614

[1] *See* notes on individual products listed alphabetically on pages A 15 to A 25.
[2] From 1968, excludes production which is confidential.

TABLE 2—TOTAL VALUE OF MINERAL PRODUCTION, 1836–1970

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, 1836–1970—*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	250,912,026	26,056,782	45,189,476	82,870,204	405,028,488
1969	294,881,114	20,492,943	55,441,528	93,573,164	464,388,749
1970	306,525,445	22,106,822	46,067,211	110,534,136	485,233,614
Totals	5,483,531,661	309,616,129	663,675,228	1,188,707,878	7,645,530,896

TABLE 3—MINERAL PRODUCTION FOR THE 10 YEARS, 1961 TO 1970

Description	1961		1962		1963		1964		1965	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Metals		$		$		$		$		$
Antimony ..... lb.	1,331,297	469,948	1,931,397	748,223	1,601,253	624,489	1,591,523	700,270	1,301,787	689,947
Bismuth ..... lb.	283,363	637,567	228,601	507,494	157,099	348,760	213,428	480,213	144,630	446,907
Cadmium ..... lb.	907,432	1,451,891	2,086,692	3,839,513	1,981,004	4,754,410	1,864,255	6,040,186	466,586	1,297,110
Copper ..... lb.	31,692,412	8,965,149	108,979,144	33,209,215	118,247,104	36,238,007	115,554,700	38,609,136	85,197,073	32,696,081
Gold—placer ..... oz.	3,416	99,884	3,315	96,697	4,620	135,411	1,842	55,191	866	25,053
„ —lode, fine ..... oz.	159,821	5,667,253	158,850	5,942,101	154,979	5,850,458	138,487	5,227,884	117,124	4,419,089
Iron concentrates ..... tons	1,335,068	12,082,540	1,793,847	18,326,911	2,060,241	20,746,424	2,002,562	20,419,487	2,165,403	21,498,581
Lead ..... lb.	384,284,524	42,313,569	335,282,537	34,537,454	314,974,310	37,834,714	268,737,503	39,402,293	250,183,633	43,149,171
Mercury ..... lb.	.....	.....	.....	.....	.....	.....	5,548	22,848	1,520	12,301
Molybdenum ..... lb.	.....	.....	.....	.....	.....	.....	28,245	47,063	7,289,125	12,405,344
Nickel ..... lb.	4,180,677	3,194,037	3,476,467	2,902,850	3,699,402	3,107,498	3,398,560	2,854,790	3,322,000	2,790,480
Platinum ..... oz.	.....	.....	5	375	2	150	.....	.....	.....	.....
Silver ..... oz.	7,373,997	6,909,140	6,189,804	7,181,907	6,422,680	8,861,050	5,269,642	7,348,938	4,972,084	6,929,793
Tin ..... lb.	1,119,350	727,578	650,941	442,640	927,062	648,943	352,350	535,572	377,207	735,554
Zinc ..... lb.	387,951,190	45,370,891	413,430,817	51,356,376	402,863,154	53,069,163	400,796,562	58,648,561	311,249,250	48,666,933
Others	.....	676,327	.....	535,537	.....	633,389	.....	533,897	.....	1,339,389
Totals	.....	128,565,774	.....	159,627,293	.....	172,852,866	.....	180,926,329	.....	177,101,733
Industrial Minerals										
Asbestos ..... tons	45,113	8,648,503	55,133	10,297,360	63,215	11,681,337	67,460	11,714,494	85,851	14,491,195
Barite ..... tons	15,478	151,388	6,511	57,062	8,207	69,588	10,588	119,370	17,466	182,931
Diatomite ..... tons	214	8,817	211	10,228	458	16,030	1,143	64,555	82	4,420
Fluorspar ..... tons	.....	.....	.....	.....	.....	.....	.....	.....	70	2,419
Fluxes (quartz, limestone) ..... tons	53,335	190,500	62,743	228,477	60,490	223,012	73,021	237,298	59,231	240,076
Granules (quartz, limestone, granite) ..... tons	17,463	253,015	18,251	311,902	19,444	348,543	19,289	397,639	29,033	447,954
Gypsum and gypsite ..... tons	153,300	459,900	147,900	443,700	160,954	482,862	188,303	581,873	207,858	602,788
Jade ..... lb.	69,751	20,876	56,935	20,760	16,000	15,529	11,537	13,804	7,129	9,249
Mica ..... lb.	250,000	8,025	.....	.....	.....	.....	.....	.....	.....	.....
Sulphur ..... tons	242,377	3,207,284	239,191	2,934,725	254,197	3,673,997	278,385	3,860,436	341,873	4,428,617
Others	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	.....	12,948,308	.....	14,304,214	.....	16,510,898	.....	16,989,469	.....	20,409,649
Structural Materials										
Cement ..... tons	417,336	7,122,046	397,435	7,112,890	476,071	8,546,768	537,396	10,040,776	601,878	11,199,607
Clay products	.....	2,366,464	.....	2,507,438	.....	2,824,583	.....	3,008,158	.....	3,899,634
Lime and limestone ..... tons	758,882	1,864,315	559,028	1,513,579	907,203	1,723,796	1,211,320	2,055,195	1,420,085	2,482,451
Rubble, riprap, crushed rock ..... tons	1,539,640	1,016,086	1,897,272	1,284,301	1,913,906	1,259,002	1,449,449	1,285,318	2,715,411	1,938,088
Sand and gravel ..... tons	11,424,958	7,439,710	17,757,391	8,862,767	17,387,026	9,514,095	17,708,225	10,013,970	20,936,994	12,686,959
Stone ..... tons	5,400	70,300	8,023	85,290	1,827	13,946	846	25,522	2,252	118,975
Totals	.....	19,878,921	.....	21,366,265	.....	23,882,190	.....	26,428,939	.....	32,325,714
Fuels										
Coal—sold and used ..... tons	919,142	6,802,134	825,339	6,133,986	850,541	6,237,997	911,326	6,327,678	950,763	6,713,590
Crude oil ..... bbl.	1,015,568	1,900,104	8,904,938	16,827,118	12,515,137	24,900,381	11,525,476	23,396,716	13,470,757	28,693,662
Field condensate ..... bbl.	159	297	9,621	18,184	13,671	27,205	26,367	63,436	31,782	70,874
Plant condensate ..... bbl.	813,565	737,761	837,824	674,644	841,740	536,193	922,211	587,685	947,429	576,107
Natural gas delivered to pipe-line ..... MSCF	95,967,110	8,818,891	108,699,997	10,226,323	105,525,373	10,719,298	118,959,880	12,192,816	138,814,144	14,493,255
Butane ..... bbl.	321,706	102,946	387,558	124,019	409,087	130,908	461,759	147,763	477,990	152,956
Propane ..... bbl.	163,079	52,185	216,995	69,438	205,162	65,651	244,804	78,337	358,776	114,808
Totals	.....	18,414,318	.....	34,073,712	.....	42,617,633	.....	42,794,431	.....	50,815,252
Grand totals	.....	179,807,321	.....	229,371,484	.....	255,863,587	.....	267,139,168	.....	280,652,348

Description	1966		1967		1968		1969		1970	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Metals		$		$		$		$		$
Antimony lb.	1,405,681	745,011	1,267,686	671,874	1,159,960	614,779	820,122	508,476	726,474	1,104,040
Bismuth lb.	47,435	198,848	142,507	572,878	207,783	868,533	62,488	288,070	132,135	828,486
Cadmium lb.	1,169,570	3,017,491	994,365	2,784,222	1,341,437	3,823,095	1,141,133	4,016,788	939,310	3,343,944
Copper lb.	105,800,568	56,438,255	172,739,548	88,135,172	160,993,338	87,284,148	167,415,411	111,592,416	206,735,343	121,349,512
Gold—placer oz.	1,535	44,632	891	25,632	670	19,571	399	11,720	491	14,185
,, —lode, fine oz.	119,508	4,506,646	126,157	4,763,688	123,896	4,672,242	117,481	4,427,506	100,179	3,662,444
Iron concentrates tons	2,151,804	20,778,934	2,154,443	20,820,765	2,094,745	21,437,569	2,074,854	19,787,845	1,877,209	17,397,574
Lead lb.	211,490,107	34,436,934	208,131,894	31,432,079	231,627,618	32,782,257	210,072,565	33,693,539	214,838,525	35,096,021
Mercury lb.			380	2,600						
Molybdenum lb.	17,094,927	27,606,061	17,517,543	31,183,064	19,799,793	32,552,722	26,597,477	47,999,442	31,276,497	52,431,558
Nickel lb.	3,187,712	2,731,869	4,180,842	3,946,715	3,317,160	3,372,225	2,979,130	3,396,208	3,408,203	4,703,320
Platinum oz.										
Silver oz.	5,549,131	7,729,939	6,180,739	10,328,695	7,130,866	16,475,795	5,760,534	11,100,491	6,511,316	12,041,181
Tin lb.	710,752	1,130,096	437,804	621,682	358,191	497,885	288,427	470,136	263,716	421,946
Zinc lb.	305,124,440	47,666,540	262,830,908	39,248,539	299,396,264	43,550,181	296,667,033	46,639,024	275,590,749	44,111,055
Others		1,632,747		1,327,713		2,961,024		10,949,453		10,020,179
Totals		208,664,003		235,865,318		250,912,026		294,881,114		306,525,445
Industrial Minerals										
Asbestos tons	88,771	15,718,741	92,192	18,273,220	74,667	14,833,891	80,388	14,871,334	86,730	16,013,827
Barite tons	21,888	176,240	23,466	176,882	21,968	164,206	30,624	248,818	45,320	382,508
Diatomite tons	70	3,755	2,819	14,096	856	17,159			1,276	26,567
Fluorspar tons	152	4,986	80	2,464	39	1,117				
Fluxes (quartz, limestone) tons	23,913	112,314	48,052	221,212	42,259	157,679	22,342	81,917	31,626	106,533
Granules (quartz, limestone, granite) tons	23,956	424,667	31,283	305,655	30,237	436,928	34,746	654,701	25,198	622,202
Gypsum and gypsite tons	206,026	576,873	230,044	691,592	246,374	689,847	280,894	764,032	270,266	736,635
Jade lb.	11,633	13,225	20,160	24,341	49,015	105,670	26,332	42,635	262,602	250,256
Mica lb.										
Sulphur tons	342,478	5,834,523	314,490	9,654,603	320,521	9,650,285	349,122	3,824,593	336,659	3,968,294
Others								4,913		
Totals		22,865,324		29,364,065		26,056,782		20,492,943		22,106,822
Structural Materials										
Cement tons	707,519	12,918,301	709,977	13,581,850	656,363	13,634,166	795,591	16,604,688	601,893	13,485,549
Clay products		4,100,192		3,945,207		4,388,505		4,550,546		4,714,368
Lime and limestone tons	1,483,949	2,696,011	1,645,253	2,822,138	2,016,892	3,337,277	1,911,881	3,237,032	1,867,586	3,169,665
Rubble, riprap, crushed rock tons	1,590,189	1,890,992	2,287,407	2,967,195	3,385,712	3,524,439	3,756,559	4,456,211	2,692,282	3,018,242
Sand and gravel tons	24,320,013	21,959,733	23,210,746	20,643,673	22,665,961	20,271,723	29,132,650	26,553,699	23,155,989	21,679,387
Stone tons	76,720	215,043	3,577	51,425	1,654	33,366	2,177	39,352		
Totals		43,780,272		44,011,488		45,189,476		55,441,528		46,067,211
Fuels										
Coal—sold and used tons	850,821	6,196,219	908,790	7,045,341	959,214	7,588,989	852,340	6,817,155	2,644,056	19,559,669
Crude oil bbl.	16,638,181	36,268,683	19,656,799	44,748,477	22,151,353	50,082,837	25,309,036	58,176,213	25,361,336	60,405,941
Field condensate bbl.	39,571	86,265	40,570	92,357	54,163	122,408	78,147	180,520	116,637	277,829
Plant condensate bbl.	974,564	312,360	1,016,045	267,941	960,252	247,455	944,111	263,278	1,003,138	253,009
Natural gas delivered to pipe-line MSCF	161,264,334	17,339,587	198,626,177	21,667,136	224,233,203	24,531,445	256,223,244	27,897,585	272,554,221	29,804,411
Butane bbl.	500,973	160,312	588,118	188,197	527,546	168,814	417,540	133,613	308,664	98,772
Propane bbl.	334,315	106,980	413,058	132,178	400,800	128,256	327,501	104,800	420,327	134,505
Totals		60,470,406		74,141,627		82,870,204		93,573,164		110,534,136
Grand totals		335,780,005		383,382,498		405,028,488		464,388,749		485,233,614

TABLE 4—MINERAL PRODUCTION, GRAPH OF VALUE, 1887–1970

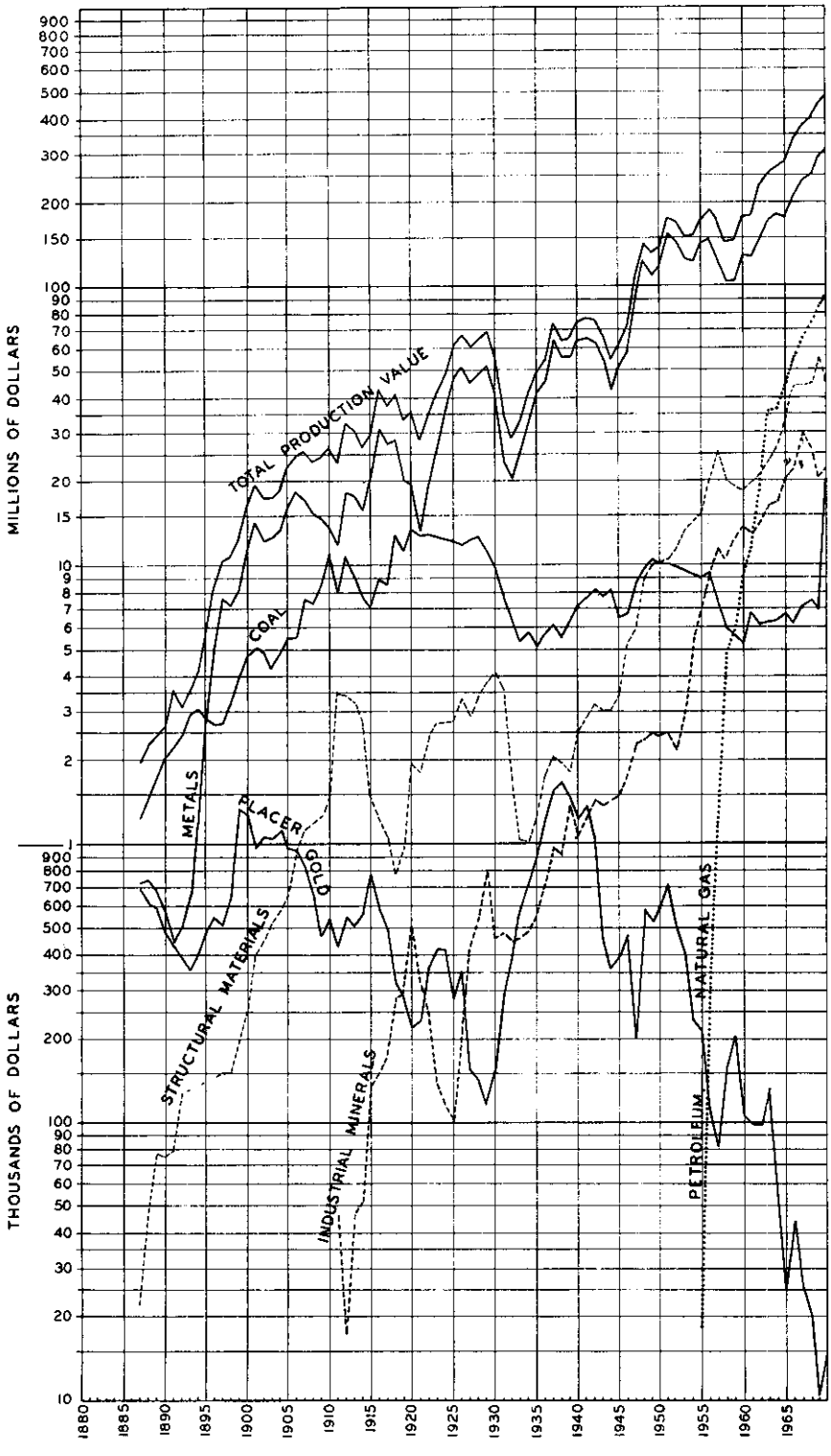


TABLE 5—PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, AND MOLYBDENUM, GRAPH OF QUANTITIES, 1893–1970

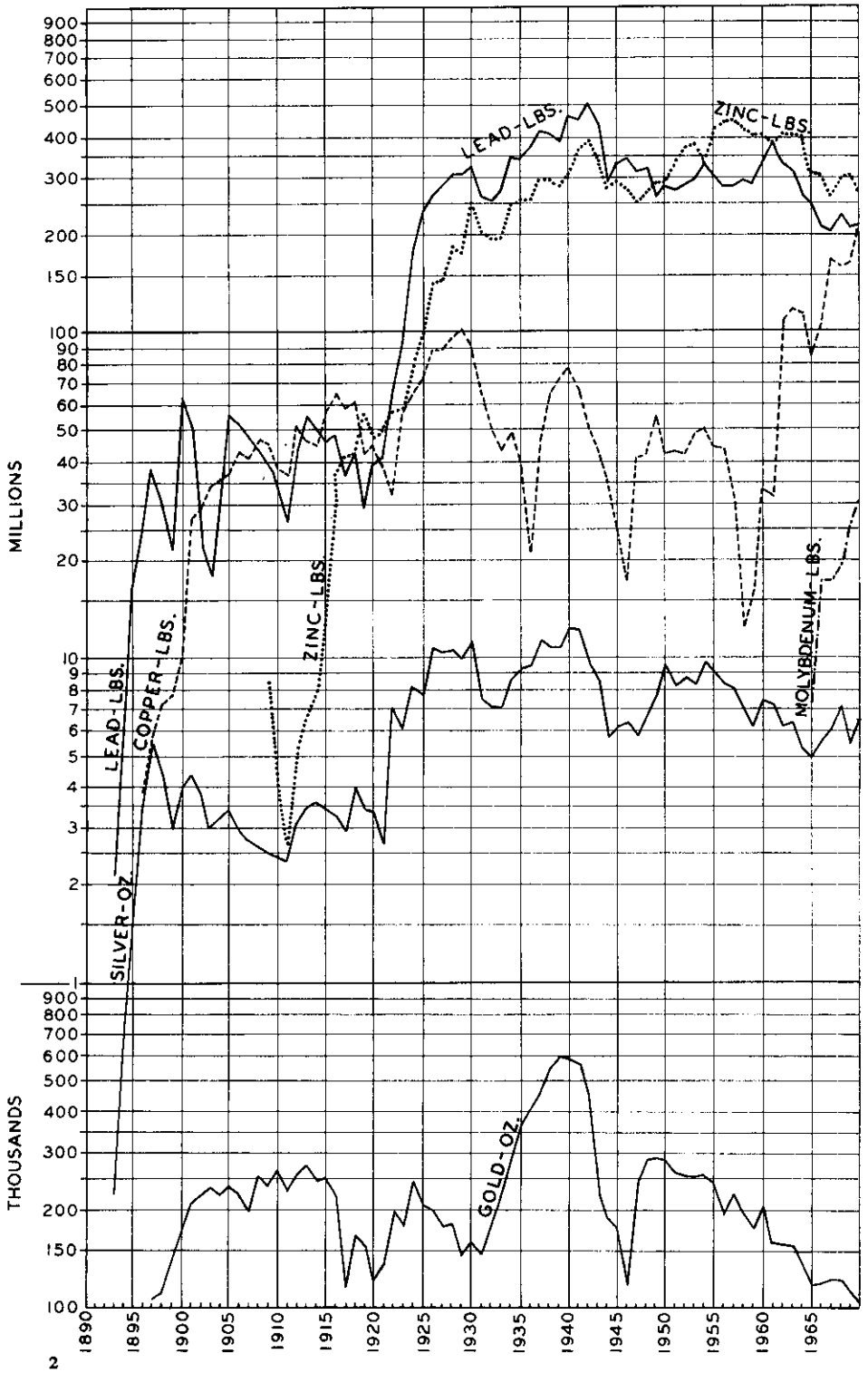


TABLE 6—PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, MOLYBDENUM, AND IRON CONCENTRATES, 1858–1970

Year	Gold (Placer)		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
1901–1910	507,580	8,628,660	2,322,118	47,998,179	31,222,548	16,973,507	379,957,091	56,384,783
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	3,498,172	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
1969	399	11,720	117,481	4,427,506	5,760,534	11,100,491	167,415,411	111,592,416
1970	491	14,185	100,179	3,662,444	6,511,316	12,041,181	206,735,343	121,349,512
Totals	5,235,408	96,957,397	17,025,851	503,792,457	485,262,219	353,174,747	4,254,041,748	1,108,799,081

TABLE 6—PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, MOLYBDENUM, AND IRON CONCENTRATES, 1858–1970—*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
1901–1910	407,833,262	17,033,102	12,684,192	894,169			19,553	68,436
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
1969	210,072,565	33,693,539	296,667,033	46,639,024	26,597,477	47,999,442	2,074,854	19,787,845
1970	214,838,525	35,096,021	275,590,749	44,111,055	31,276,497	52,431,558	1,877,209	17,397,574
Totals	15,828,315,846	1,347,940,476	14,421,058,870	1,389,884,751	119,634,910	204,271,452	26,304,064	238,773,655

TABLE 7A—MINERAL PRODUCTION BY MINING

Division	Period	Placer Gold		Metals	Industrial Minerals	Structural Materials
		Quantity	Value			
		Oz.	$	$	$	$
Alberni	1969			18,401,599		720,329
	1970			**15,555,220**		**363,083**
	To date	1,617	33,253	117,567,175	9,398	3,603,208
Atlin	1969	44	1,319	13		
	1970	**20**	**548**	**7**		**3,975**
	To date	735,810	17,388,971	38,047,192	20,325	334,866
Cariboo	1969	279	8,253	4,175,587		3,163,065
	1970	**346**	**9,908**	**3,910,401**	**26,567**	**2,098,224**
	To date	2,610,353	54,162,645	69,284,512	345,372	17,049,253
Clinton	1969					301,290
	1970					**561,979**
	To date	10,171	243,069	848,377	162,427	2,531,590
Fort Steele	1969			63,604,507	622,488	464,845
	1970			**61,290,422**	**685,894**	**654,771**
	To date	20,531	468,450	2,160,947,660	18,192,681	7,974,653
Golden	1969				1,012,850	206,873
	1970			**886,130**	**1,119,143**	**303,785**
	To date	469	11,268	62,454,737	11,714,287	3,154,467
Greenwood	1969			8,103,442	4,000	175,256
	1970			**8,937,456**		**92,154**
	To date	5,074	115,662	180,624,141	2,327,897	1,760,629
Kamloops	1969			28,590,173	6,590	1,846,785
	1970			**30,254,999**	**383**	**2,096,988**
	To date	27,595	604,785	149,613,592	6,540,538	18,931,630
Liard	1969				15,784,281	1,702,577
	1970			**5,046,177**	**16,426,654**	**1,040,933**
	To date	50,184	1,248,151	5,052,699	194,638,464	9,098,672
Lillooet	1969			1,783,316	5,237	321,635
	1970	**8**	**256**	**1,449,370**	**27,583**	**75,585**
	To date	92,946	1,925,688	147,454,166	220,195	3,022,560
Nanaimo	1969			14,697,537	143,355	3,734,777
	1970			**14,050,288**	**152,933**	**3,567,021**
	To date	866	19,300	195,436,697	1,505,820	60,146,530
Nelson	1969			8,954,030	407,141	407,632
	1970			**7,054,155**	**435,000**	**632,674**
	To date	3,586	89,026	338,573,959	1,525,831	6,246,442
New Westminster	1969	76	2,148	4,433,216	77,000	12,144,104
	1970			**5,802,046**	**65,039**	**11,395,323**
	To date	31,355	595,910	45,391,614	1,479,295	145,982,522
Nicola	1969			24,604,511		184,099
	1970			**19,924,342**		**236,443**
	To date	234	4,764	181,914,516	10,050	1,354,940
Omineca	1969			49,726,573	25,438	1,066,556
	1970	**117**	**3,473**	**40,048,501**	**213,574**	**592,819**
	To date	56,406	1,502,955	225,846,085	274,518	10,566,511
Osoyoos	1969			1,149,705	98,392	221,974
	1970			**26,320,927**	**65,590**	**235,445**
	To date	240	5,466	81,918,530	6,350,804	2,651,736
Revelstoke	1969					72,647
	1970			**1,071,796**		**109,910**
	To date	7,582	164,477	12,316,427		2,559,795
Similkameen	1969			2,942		393,486
	1970					**116,559**
	To date	45,507	878,204	120,198,200	18,558	4,028,598
Skeena	1969			31,021,577		1,698,129
	1970			**30,725,783**		**1,038,925**
	To date	4,603	105,569	318,117,205	1,240,215	13,395,769
Slocan	1969			7,966,095		203,113
	1970			**9,126,061**		**91,384**
	To date	366	9,397	262,938,601		1,832,373
Trail Creek	1969			1,441,519		239,263
	1970			**1,018,844**		**200,994**
	To date	851	24,260	88,811,411		3,185,928
Vancouver	1969			9,406,761	168,659	9,869,281
	1970			**3,283,012**	**82,138**	**6,981,639**
	To date	182	5,306	259,574,062	7,066,964	113,639,232
Vernon	1969			75,130		670,781
	1970				**9,500**	**563,811**
	To date	2,732	72,885	331,631	13,478	5,914,579
Victoria	1969				140	11,561,907
	1970				**290**	**9,787,083**
	To date	628	15,680	16,687,533	189,431	186,615,510
Not assigned	1969			16,731,161	2,137,372	4,071,124
	1970			**20,755,323**	**2,796,534**	**3,225,704**
	To date	1,525,520	17,262,256	306,623,542	55,769,581	38,093,235
Totals	1969	399	11,720	294,869,394	20,492,943	55,441,528
	1970	**491**	**14,185**	**306,511,260**	**22,106,822**	**46,067,211**
	To date	5,235,408	96,957,397	5,386,574,264	309,616,129	663,875,228

DIVISIONS, 1969 AND 1970, AND TOTAL TO DATE

Fuels								Division Total
Coal		Crude Oil and Condensates		Natural Gas Delivered to Pipe-line		Butane and Propane		
Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
Tons	$	Bbl.	$	MSCF	$	Bbl.	$	$
								19,121,928
								15,918,303
								121,213,034
								1,332
								4,530
								55,791,354
								7,346,905
								6,045,100
290	1,100							140,842,882
								301,290
								561,979
								3,785,463
842,865	6,726,731							71,418,571
2,641,625	**19,538,505**							**82,169,592**
62,600,177	300,326,522							2,487,909,966
								1,219,723
								2,309,058
								77,334,759
								8,282,698
								9,029,610
								184,828,329
								30,443,548
								32,352,370
15,087	59,765							175,750,310
		26,331,294	58,620,011	256,223,244	27,897,585	745,041	238,413	104,242,867
		26,481,111	**60,936,779**	**272,554,221**	**29,804,411**	**728,991**	**233,277**	**113,488,231**
99,433	699,521	170,503,663	357,180,987	1,892,240,528	192,568,510	8,358,875	2,674,836	763,161,840
								2,110,188
								1,552,794
								152,622,609
								18,575,669
								17,770,242
74,324,471	301,144,744							558,253,091
								9,768,803
								8,121,829
								346,435,258
								16,656,468
								17,262,408
								193,449,341
								24,788,610
								20,160,785
2,929,584	11,080,886							194,365,106
9,475	90,424							50,908,991
2,431	**21,164**							**40,879,531**
501,460	3,412,208							241,602,277
								1,470,071
								26,621,962
1,122	5,008							90,931,544
								72,647
								1,181,706
								15,040,699
								396,428
								116,559
4,617,442	19,553,725							144,677,285
								32,719,706
								31,764,708
36	116							332,858,874
								8,169,208
								9,217,445
								264,780,371
								1,680,782
								1,219,838
								92,021,599
								19,444,701
								10,346,789
								380,285,564
								745,911
								573,311
								6,332,573
								11,562,047
								9,787,373
								203,508,154
								22,939,657
								26,777,561
								417,748,614
852,340	6,817,155	26,331,294	58,620,011	256,223,244	27,897,585	745,041	238,413	464,388,749
2,644,056	**19,559,669**	**26,481,111**	**60,936,779**	**272,554,221**	**29,804,411**	**728,991**	**233,277**	**485,233,614**
145,089,102	636,283,545	170,503,663	357,180,987	1,892,240,528	192,568,510	8,358,875	2,674,836	7,645,530,896

TABLE 7B—PRODUCTION OF LODE GOLD, SILVER, COPPER, LEAD, AND ZINC BY MINING DIVISIONS, 1969 AND 1970, 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	1969	13,947	525,621	488,046	940,460	11,577,545	7,717,128			47,304,125	7,436,682	16,619,891
	1970	**11,795**	**431,214**	**383,835**	**709,815**	**13,112,057**	**7,696,515**	**1,777,201**	**290,324**	**36,966,171**	**5,916,805**	**15,044,673**
	To date	354,814	13,277,010	1,947,555	3,581,678	45,492,461	25,534,323	3,743,327	564,385	151,446,801	23,218,513	66,175,909
Atlin	1969			7	13							13
	1970			**4**	**7**							**7**
	To date	344,197	12,126,732	3,377,127	2,895,668	24,777,661	8,160,266	23,765,211	3,437,907	91,067,749	10,864,497	37,485,070
Cariboo	1969			41	79							79
	1970			**94**	**174**							**222**
	To date	1,202,251	43,347,296	146,899	109,244	2,352	920	**295** 24,855	**48** 3,772	505	19	43,461,251
Clinton	1969											
	1970											
	To date	23,390	827,328	31,586	14,237	57,548	5,905	193	7			847,477
Fort Steele	1969	172	6,482	3,087,692	5,949,952			185,563,240	29,762,488	154,683,480	24,317,790	60,036,712
	1970	**161**	**5,886**	**2,829,793**	**5,233,051**			**179,232,240**	**29,279,379**	**145,496,100**	**23,288,108**	**57,806,422**
	To date	7,520	235,244	236,727,171	166,557,715	28,592	6,193	13,260,389,689	1,088,254,024	9,900,914,305	869,877,499	2,124,930,675
Golden	1969											
	1970	**49**	**1,791**	**122,417**	**226,382**			**1,723,642**	**281,574**	**2,091,727**	**334,802**	**844,549**
	To date	219	6,673	4,255,133	3,758,589	1,171,455	367,261	255,594,763	25,542,601	326,691,238	31,618,798	61,293,922
Greenwood	1969	16,319	615,014	593,331	1,143,343	9,293,075	6,194,392	624,713	100,198	289,891	45,574	8,098,521
	1970	**13,171**	**481,520**	**577,750**	**1,068,416**	**12,347,427**	**7,247,693**	**570,801**	**93,246**	**245,272**	**39,258**	**8,930,133**
	To date	1,306,885	30,804,456	40,788,959	31,563,557	538,419,570	113,671,781	23,174,993	2,297,408	22,994,881	2,106,731	180,443,933
Kamloops	1969	2,074	78,163	155,363	299,383	42,325,712	28,212,627					28,590,173
	1970	**2,251**	**82,294**	**179,626**	**332,177**	**50,837,384**	**29,840,528**					**30,254,999**
	To date	64,725	2,241,723	1,380,451	2,061,191	284,918,222	144,995,697	538,097	45,030	438,023	29,826	149,373,467
Liard	1969											
	1970			**441**	**816**	**8,593,790**	**5,044,383**	**5,456**	**891**	**544**	**87**	**5,046,177**
	To date	114	4,120	1,028	1,323	8,593,846	5,044,405	15,877	2,667	659	105	5,052,620
Lillooet	1969	46,896	1,767,370	8,275	15,946							1,783,316
	1970	**39,300**	**1,436,789**	**6,814**	**12,901**							**1,449,370**
	To date	4,165,547	146,651,309	984,461	714,167	400	41	62,513	2,548	15	2	147,368,067
Nanaimo	1969	13,405	505,194	90,498	174,389	10,294,439	6,861,861					7,541,444
	1970	**8,743**	**319,635**	**101,911**	**188,461**	**13,592,842**	**7,978,726**					**8,486,822**
	To date	224,349	7,186,030	1,678,398	2,045,167	143,322,808	59,990,617					69,221,814
Nelson	1969	511	19,258	60,108	115,828			12,824,187	2,056,871	38,099,823	5,989,673	8,181,630
	1970	**943**	**34,475**	**236,806**	**437,918**			**8,323,373**	**1,359,706**	**28,121,367**	**4,501,106**	**6,333,205**
	To date	1,340,871	41,984,601	9,461,432	6,961,720	14,915,405	1,689,196	495,392,652	62,943,018	1,319,245,323	174,409,980	287,988,515
New Westminster	1969			2	4	1,555,755	1,037,004					1,037,008
	1970					**1,871,829**	**1,098,726**					**1,098,726**
	To date	4,466	114,164	15,117	7,726	18,534,326	7,794,914	28,425	1,119	12,755	481	7,918,404
Nicola	1969					36,912,672	24,604,511					24,604,511
	1970					**33,505,141**	**19,666,848**					**19,666,848**
	To date	8,548	235,745	276,453	135,632	419,315,511	181,183,386	2,241,499	91,282	323,889	10,977	181,657,022
Omineca	1969	14,385	542,128	165,196	318,331	24,525,650	16,347,817	83,969	13,468	34,878	5,483	17,227,227
	1970	**11,157**	**407,889**	**123,547**	**228,472**	**22,453,227**	**13,179,595**	**120,427**	**19,673**	**119,621**	**19,147**	**13,854,776**
	To date	79,892	2,828,638	10,244,097	8,874,357	100,767,211	55,805,139	29,295,034	3,747,327	32,733,945	4,084,636	75,340,097

		Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Osoyoos	1969	1,532	57,736	550,371	1,060,559	8,719	5,812	133,262	21,374	26,868	4,224	1,149,705
	1970	**3,251**	**118,853**	**325,148**	**601,286**	**25,285,455**	**14,842,056**	**24,365**	**3,980**	**10,352**	**1,657**	**15,567,832**
	To date	1,664,121	50,626,058	2,935,731	5,171,396	28,137,790	15,265,058	539,811	67,106	238,970	34,797	71,164,415
Revelstoke	1969											
	1970											
	To date	37,300	1,069,260	4,109,297	2,769,163	153,686	51,037	36,077,602	3,858,032	27,127,076	3,311,895	11,059,387
Similkameen	1969	1	38	551	1,062			9,422	1,511	2,104	331	2,942
	1970											
	To date	184,017	6,327,448	4,220,109	2,583,491	601,197,638	111,137,983	392,099	14,887	80,198	5,205	120,069,014
Skeena	1969	6,000	226,122	190,449	366,993	16,516,678	11,009,357					11,602,472
	1970	**7,172**	**262,201**	**244,960**	**452,997**	**18,564,753**	**10,897,139**					**11,612,337**
	To date	2,443,693	62,081,055	69,600,028	45,548,504	734,953,485	125,731,179	60,001,216	5,438,349	17,198,235	2,541,639	241,340,726
Slocan	1969	217	8,178	473,781	912,971			20,150,885	3,232,000	22,376,022	3,517,734	7,670,883
	1970	**601**	**21,972**	**661,472**	**1,223,240**			**22,358,453**	**3,652,477**	**24,443,296**	**3,912,394**	**8,810,083**
	To date	17,077	503,526	76,439,284	53,504,800	13,662	1,861	1,095,343,616	102,504,994	921,028,966	100,922,797	257,437,978
Trail Creek	1969											
	1970	**42**	**1,535**	**3**	**6**							**1,541**
	To date	2,984,943	63,354,381	3,673,317	2,103,072	122,561,732	18,245,404	148,787	12,628	134,426	16,366	83,731,851
Vancouver	1969	1,510	56,907	52,060	100,319	13,720,681	9,145,657			607,469	95,500	9,398,383
	1970	**553**	**20,217**	**21,546**	**39,844**	**5,413,303**	**3,177,501**	**17,424**	**2,846**	**246,157**	**39,400**	**3,279,808**
	To date	499,432	16,192,619	5,257,206	3,606,873	1,056,337,489	205,714,645	18,570,027	1,883,516	238,340,360	30,973,086	258,370,739
Vernon	1969	28	1,055	30,263	58,316			97,773	15,682	490	77	75,130
	1970											
	To date	5,265	177,627	62,856	110,689	654	100	159,186	23,829	66,010	9,354	321,599
Victoria	1969											
	1970											
	To date	42,120	980,533	923,207	575,564	55,966,545	14,792,228	210,097	19,848	3,568,709	283,923	16,652,096
Not assigned[1]	1969	484	18,240	—185,500	—357,457	684,485	456,250	—9,414,886	—1,510,053	33,241,883	5,225,956	3,832,936
	1970	**990**	**36,193**	**695,149**	**1,285,518**	**1,158,135**	**679,802**	**684,848**	**111,877**	**37,850,142**	**6,058,293**	**8,171,683**
	To date	20,095	608,881	6,725,317	7,919,224	54,401,699	13,609,542	522,606,277	47,184,192	1,367,405,832	135,563,625	204,885,464
Totals	1969	117,481	4,427,506	5,760,534	11,100,491	167,415,411	111,592,416	210,072,565	33,693,539	296,667,033	46,639,024	207,452,976
	1970	**100,179**	**3,662,444**	**6,511,316**	**12,041,181**	**206,735,343**	**121,349,512**	**214,838,525**	**35,096,021**	**275,590,749**	**44,111,055**	**216,260,213**
	To date	17,025,851	503,792,457	485,262,219	353,174,747	4,254,041,748	1,108,799,081	15,828,315,846	1,347,940,476	14,421,058,870	1,389,884,751	4,703,591,512

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

TABLE 7C—PRODUCTION OF MISCELLANEOUS METALS BY MINING DIVISIONS, 1969 AND 1970, 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	1969					176,678	621,907			125,637	1,159,801				
	1970					**139,048**	**485,011**			**4,296**	**15,536**				
	To date					541,631	1,756,555			4,732,817	49,634,711				
Atlin	1969														
	1970														
	To date					319,212	561,762								
Cariboo	1969														
	1970														
	To date														
Clinton	1969														
	1970														
	To date							126	900						
Fort Steele	1969					329,682	1,160,480			182,237	1,937,179				
	1970					**314,060**	**1,118,053**			**186,207**	**1,944,001**				
	To date					2,279,436	7,028,811			1,243,613	12,700,750				
Golden	1969														
	1970					**11,680**	**41,581**								
	To date	40,062	14,906			555,835	1,145,909								
Greenwood	1969					1,398	4,921								
	1970					**2,057**	**7,323**								
	To date					70,502	148,813	670	31,395						
Kamloops	1969														
	1970														
	To date									21,167	95,851			10,987	5,795
Liard	1969														
	1970														
	To date														
Lillooet	1969														
	1970														
	To date	13,466	4,321												
Nanaimo	1969													9,231	41,304
	1970									726,687	7,156,093				
	To date									**576,104**	**5,563,466**				
Nelson	1969									14,826,623	126,214,883				
	1970					219,432	772,400								
	To date					**202,514**	**720,950**								
New Westminster	1969					7,797,055	16,666,755								
	1970														
	To date														
Nicola	1969														
	1970														
	To date									**16,709**	**257,494**				
Omineca	1969									16,709	257,494				
	1970	**13,893**	**6,665**			359	1,264								
	To date	118,382	21,882			**1,192**	**4,244**								
						270,357	542,090							4,150,892	10,400,259

		Lb.	$	Lb.	$	Lb.	$	Tons	$	Tons	$	Tons	$	Lb.	$
Osoyoos	1969														
	1970														
	To date											16			
Revelstoke	1969														
	1970														
	To date	9,394	3,455			103,612	176,102								
Similkameen	1969														
	1970														
	To date														
Skeena	1969									1,040,293	9,534,772				
	1970									**1,093,893**	**9,617,077**				
	To date					141,890	316,764			5,462,585	49,868,041				
Slocan	1969					83,867	295,212								
	1970					**88,758**	**315,978**								
	To date	31,865	8,133			2,569,345	5,484,330					541	8,160		
Trail Creek	1969														
	1970														
	To date					115	210			550	1,925				
Vancouver	1969					2,380	8,378								
	1970					**900**	**3,204**								
	To date					566,006	1,203,323								
Vernon	1969														
	1970														
	To date					190	532								
Victoria	1969														
	1970														
	To date					7,000	10,929					1,167	24,508		
Not assigned[1]	1969	820,122	508,476	62,488	288,070	327,337	1,152,226								
	1970	**712,581**	**1,097,375**	**132,135**	**828,486**	**179,101**	**637,600**								
	To date	52,353,213	16,828,516	6,746,455	13,750,108	24,199,325	37,284,584								
Totals	1969	820,122	508,476	62,488	288,070	1,141,133	4,016,788			2,074,854	19,787,845				
	1970	**726,474**	**1,104,040**	**132,135**	**828,486**	**939,310**	**3,343,944**			**1,877,209**	**17,397,574**				
	To date	52,566,382	16,881,213	6,746,455	13,750,108	39,421,511	72,327,469	796	32,295	26,304,064	238,773,655	1,724	32,668	4,171,110	10,447,358

[1] Metals recovered from operations at the Trail smelter but not assigned to individual mines.
[2] From 1968, excludes production which is confidential.

TABLE 7C—PRODUCTION OF MISCELLANEOUS METALS BY MINING DIVISIONS, 1969 AND 1970, 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	1969														1,781,708
	1970														**510,547**
	To date														51,391,266
Atlin	1969														
	1970														
	To date														
Cariboo	1969	2,346,883	4,175,508									292	360		562,122
	1970	**2,247,135**	**3,910,179**												4,175,508
	To date	15,279,133	25,799,531					59	2,299			27,698	21,431		**3,910,179**
Clinton	1969														25,823,261
	1970														
	To date														
Fort Steele	1969									288,427	470,136				900
	1970									**263,716**	**421,946**				3,567,795
	To date									18,184,983	16,199,240			88,1841	**3,484,000**
Golden	1969														36,016,985
	1970														
	To date														**41,581**
Greenwood	1969														1,160,815
	1970														**4,921**
	To date														**7,323**
Kamloops	1969														180,208
	1970														
	To date	93,995	138,479												
Liard	1969														240,125
	1970														
	To date														
Lillooet	1969							2	79						79
	1970														
	To date	1,469	2,440												
Nanaimo	1969							3	113			32,353	37,921		86,099
	1970														7,156,093
	To date														**5,563,466**
Nelson	1969														126,214,883
	1970														772,400
	To date	15,035	18,378												**720,950**
New Westminster	1969			2,979,130	3,396,208							13,739,939	33,900,311		50,585,444
	1970			**3,408,203**	**4,703,320**										3,396,208
	To date			41,681,506	37,473,210										**4,703,320**
Nicola	1969														37,473,210
	1970														
	To date														
Omineca	1969	17,685,476	32,498,082												**257,494**
	1970	**15,565,807**	**26,182,816**												257,494
	To date	77,836,822	134,843,473					3	154			2,210,892	4,697,710	4202	32,499,346
															26,193,725
															150,505,988

		Lb.	$	Lb.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	$	$
Osoyoos	1969														
	1970	**6,394,520**	**10,753,095**												**10,753,095**
	To date	6,395,132	10,754,115												10,754,115
Revelstoke	1969														
	1970	**637,104**	**1,071,796**												**1,071,796**
	To date	637,104	1,071,796									7,784	5,687		1,257,040
Similkameen	1969														
	1970														
	To date							1,287	129,186						129,186
Skeena	1969	5,723,025	9,884,333												19,419,105
	1970	**5,867,377**	**9,496,369**												**19,113,446**
	To date	16,604,176	26,589,954									366	331	1,389[3]	76,776,479
Slocan	1969														295,212
	1970														**315,978**
	To date														5,500,623
Trail Creek	1969	842,093	1,441,519												1,441,519
	1970	**564,554**	**1,017,303**												**1,017,303**
	To date	2,766,630	5,043,786			749	30,462	53	3,177						5,079,560
Vancouver	1969														8,378
	1970														**3,204**
	To date														1,203,323
Vernon	1969														
	1970														
	To date	5,414	9,500												10,032
Victoria	1969														
	1970														
	To date														35,437
Not assigned	1969													10,949,453	12,898,225
	1970													**10,020,179**	**12,583,640**
	To date													33,874,870	101,738,078
Totals	1969	26,597,477	47,999,442	2,979,130	3,396,208					288,427	470,136			10,949,453	87,416,418
	1970	**31,276,497**	**52,431,558**	**3,408,203**	**4,703,320**					**263,716**	**421,946**			**10,020,179**	**90,251,047**
	To date	119,634,910	204,271,452	41,681,506	37,473,210	749	30,462	1,407	135,008	18,184,983	16,199,240	16,019,324	38,663,751	33,964,863	682,982,752

[1] Magnesium, page A 21. [2] Cobalt, page A 17. [3] Selenium, page A 23.

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	1969										
	1970										
	To date										
Atlin	1969										
	1970										
	To date										
Cariboo	1969										
	1970					**1,276**	**26,567**				
	To date					8,718	201,892			48	168
Clinton	1969										
	1970										
	To date										
Fort Steele	1969										
	1970										
	To date			8	80						
Golden	1969			30,624	248,818						
	1970			**45,320**	**382,508**						
	To date			373,646	3,914,483			3,259	12,612		
Greenwood	1969									200	4,000
	1970										
	To date							1,790,502	1,540,319	200	4,000
Kamloops	1969									357	6,590
	1970									**18**	**383**
	To date									625	12,230
Liard	1969	80,388	14,871,334								
	1970	**86,730**	**16,013,827**								
	To date	925,207	179,412,045								
Lillooet	1969										
	1970										
	To date										
Nanaimo	1969							22,328	81,777	3,226	61,578
	1970							**31,598**	**108,243**	**2,400**	**46,690**
	To date							879,152	1,262,921	16,009	242,899
Nelson	1969									14,540	407,141
	1970									**15,000**	**435,000**
	To date							7,601	8,174	53,298	1,461,756
New Westminster	1969									3,500	77,000
	1970									**3,706**	**65,039**
	To date									102,753	1,479,295
Nicola	1969										
	1970										
	To date										
Omineca	1969										
	1970										
	To date										
Osoyoos	1969									12,923	98,392
	1970									**3,574**	**65,590**
	To date							802,611	3,699,031	179,737	2,319,802
Similkameen	1969										
	1970										
	To date										
Skeena	1969										
	1970										
	To date										
Vancouver	1969							601,019	1,050,722		
	1970										
	To date										
Vernon	1969									29,692	418,606
	1970										
	To date									**500**	**9,500**
Victoria	1969									500	9,500
	1970							14	140		
	To date							**28**	**290**		
Not assigned	1969							187	2,125	9,606	157,080
	1970										
	To date										
Totals	1969	80,388	14,871,334	30,624	248,818			22,342	81,917	34,746	654,701
	1970	**86,730**	**16,013,827**	**45,320**	**382,508**	**1,276**	**26,567**	**31,626**	**106,533**	**25,198**	**622,202**
	To date	925,207	179,412,045	373,654	3,914,563	8,718	201,892	4,084,331	7,575,904	392,467	6,104,836

Other: *See* notes of individual minerals listed alphabetically on pages A 15 to A 25.

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

MINING DIVISIONS, 1969 AND 1970, 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	$	$	$
								9,3987	9,398
								20,3254	20,325
									26,567
				10,013,800	143,012			30012	345,372
873	6,236							156,1914 6 10	162,427
						64,775	622,488		622,488
						55,538	**685,894**		**685,894**
112,878	298,824					986,798	17,876,883	16,8949	18,192,681
280,894	764,032								1,012,850
270,266	**736,635**								**1,119,143**
2,721,965	7,785,916							1,2765 11	11,714,287
									4,000
								783,5783	2,327,897
									6,590
									383
1,246,918	6,323,178			424,700	2,075			203,0556 10	6,540,538
		5,825	11,960			44,903	900,987		15,784,281
		5,322	**9,099**			**48,028**	**403,728**		**16,426,654**
		38,370	53,546			696,540	15,172,873		194,638,464
		6,060	5,237						5,237
		14,280	**27,583**						**27,583**
		293,267	215,066					5,12911	220,195
									143,355
									152,933
									1,505,820
									407,141
									435,000
								55,9015	1,525,831
									77,000
									65,039
									1,479,295
2,407	10,050								10,050
		14,447	25,438						25,438
		243,000	**213,574**						**213,574**
		264,757	263,058					11,4601 8	274,518
									98,392
									65,590
				1,588,800	25,938			306,5331 3 6	6,350,804
250	1,700							16,8582	18,558
				634,250	10,815	41,624	178,678		1,240,215
						17,544	168,659		168,659
						6,653	**82,138**		**82,138**
						687,596	6,550,969	97,3895	7,066,964
									9,500
				160,500	3,978				13,478
									140
									290
								30,22611	189,431
						221,900	2,132,459	4,913	2,137,372
						226,440	**2,786,534**		**2,786,534**
						4,888,141	55,764,668	4,913	**55,769,581**
280,894	764,032	26,832	42,635			349,122	3,824,593	4,913	20,492,948
270,266	**736,635**	**262,602**	**250,256**			**336,659**	**3,968,294**		**22,106,822**
4,085,291	14,425,904	596,394	531,670	12,822,050	185,818	7,295,699	95,544,071	1,719,426	309,616,129

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

TABLE 7E—PRODUCTION OF STRUCTURAL MATERIALS BY MINING DIVISIONS, 1969 AND 1970, AND TOTAL TO DATE

Division	Period	Cement	Lime and Limestone	Building-stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Clay Products	Unclassified Material	Division Total
		$	$	$	$	$	$	$	$
Alberni	1969				29,760	690,569			720,329
	1970				**4,078**	**359,005**			**363,083**
	To date				329,329	3,273,879			3,603,208
Atlin	1969								
	1970				**3,975**				**3,975**
	To date		1,108		102,453	231,305			334,866
Cariboo	1969		139,485		206,882	2,810,698	6,000		3,163,065
	1970		**194,500**		**420,042**	**1,449,182**	**34,500**		**2,098,224**
	To date		495,541		2,182,728	14,180,697	190,287		17,049,253
Clinton	1969				218,772	82,518			301,290
	1970				**393,091**	**168,888**			**561,979**
	To date				1,252,183	1,279,407			2,531,590
Fort Steele	1969				241,000	223,845			464,845
	1970				**244,720**	**410,051**			**654,771**
	To date		43,873	71,941	2,303,632	5,539,289	15,918		7,974,653
Golden	1969				1,800	200,801	4,272		206,873
	1970				**69,000**	**228,435**	**6,350**		**303,785**
	To date		1,000	50,840	196,989	2,798,451	107,187		3,154,467
Greenwood	1969			38,000	1,845	135,411			175,256
	1970					**92,154**			**92,154**
	To date		42,560	134,136	273,314	1,189,336	121,283		1,760,629
Kamloops	1969		315	750	813,185	1,032,535			1,846,785
	1970	**585,653**	**12,752**		**377,915**	**1,120,668**			**2,096,988**
	To date	585,653	25,067	19,800	8,124,822	10,103,909	72,379		18,931,630
Liard	1969				392,719	1,309,858			1,702,577
	1970				**52,442**	**988,491**			**1,040,933**
	To date				842,551	8,256,121			9,098,672
Lillooet	1969				153,640	167,995			321,635
	1970				**28,293**	**47,292**			**75,585**
	To date		100	2,000	943,447	2,077,013			3,022,560
Nanaimo	1969		2,824,043		379,662	531,072			3,734,777
	1970		**2,630,587**		**123,679**	**812,755**			**3,567,021**
	To date		46,610,252	3,450,735	1,811,380	7,095,171	1,178,992		60,146,530
Nelson	1969		59,713	602	615	346,702			407,632
	1970		**61,600**			**571,074**			**632,674**
	To date		399,859	423,187	520,056	4,881,366	21,974		6,246,442
New Westminster	1969		196,728		1,521,911	6,426,303	3,999,162		12,144,104
	1970		**250,190**		**971,659**	**6,011,305**	**4,162,169**		**11,395,323**
	To date		2,975,267	20,974	14,378,058	65,577,769	63,030,454		145,982,522
Nicola	1969					184,099			184,099
	1970				**10,950**	**225,493**			**236,443**
	To date			8,000	167,646	1,179,294			1,354,940
Omineca	1969		1,535		138,709	926,312			1,066,556
	1970		**2,236**		**60,701**	**529,882**			**592,819**
	To date		6,848		1,987,322	8,567,067	5,274		10,566,511
Osoyoos	1969				11,805	210,169			221,974
	1970				**9,075**	**226,370**			**235,445**
	To date		43,774	33,018	231,528	2,343,416			2,651,736
Revelstoke	1969				16,976	55,671			72,647
	1970				**31,050**	**78,860**			**109,910**
	To date		1,000	5,575	456,848	2,096,372			2,559,795
Similkameen	1969				5,708	387,778			393,486
	1970				**12,840**	**103,719**			**116,559**
	To date	10,500	11,571	24,000	651,597	3,317,575	13,355		4,028,598
Skeena	1969				215,639	1,482,490			1,698,129
	1970				**63,876**	**975,049**			**1,038,925**
	To date		1,645,300	144,000	2,988,883	8,604,337	13,249		13,395,769
Slocan	1969				7,114	195,999			203,113
	1970				**4,335**	**87,049**			**91,384**
	To date		1,000	115,143	129,983	1,586,247			1,832,373
Trail Creek	1969				712	238,551			239,263
	1970				**525**	**200,469**			**200,994**
	To date		32,500	85,520	228,903	2,839,005			3,185,928
Vancouver	1969	7,427,418			64,348	2,377,515			9,869,281
	1970	**5,100,289**				**1,881,350**			**6,981,639**
	To date	58,729,401	40,885	4,012,560	8,186,761	41,581,033	1,088,592		113,639,232
Vernon	1969				3,750	667,031			670,781
	1970					**563,811**			**563,811**
	To date		46,499	97,852	286,974	5,322,000	161,254		5,914,579
Victoria	1969	9,177,270	15,213		14,194	1,814,118	541,112		11,561,907
	1970	**7,799,607**	**17,800**		**10,983**	**1,447,344**	**511,349**		**9,787,083**
	To date	154,482,759	932,397	55	497,807	22,211,935	8,490,557		186,615,510
Not assigned	1969				15,465	4,055,659			4,071,124
	1970				**125,013**	**3,100,691**			**3,225,704**
	To date		315,498	505,018	836,108	27,283,612	3,180,828	5,972,171	38,093,235
Totals	1969	16,604,688	3,237,032	39,352	4,456,211	26,553,699	4,550,546		55,441,528
	1970	**13,485,549**	**3,169,665**		**3,018,242**	**21,679,387**	**4,714,368**		**46,067,211**
	To date	213,808,313	53,671,899	9,204,354	49,911,302	253,415,606	77,091,583	5,972,171	663,675,228

TABLE 8A—PRODUCTION OF COAL, 1836–1970

Year	Quantity[1] (Short Tons)	Value	Year	Quantity[1] (Short Tons)	Value
1836–59	41,871	$149,548	1916	2,583,469	$8,900,675
1860	15,956	56,988	1917	2,436,101	8,484,343
1861	15,427	55,096	1918	2,575,275	12,833,994
1862	20,292	72,472	1919	2,433,540	11,975,671
1863	23,906	85,380	1920	2,852,535	13,450,169
1864	32,068	115,528	1921	2,670,314	12,836,013
1865	36,757	131,276	1922	2,726,793	12,880,060
1866	28,129	100,460	1923	2,636,740	12,678,548
1867	34,988	124,956	1924	2,027,843	9,911,935
1868	49,286	176,020	1925	2,541,212	12,168,905
1869	40,098	143,208	1926	2,406,094	11,650,180
1870	33,424	119,372	1927	2,553,416	12,269,135
1871	55,458	164,612	1928	2,680,608	12,633,510
1872	55,458	164,612	1929	2,375,060	11,256,260
1873	55,459	164,612	1930	1,994,493	9,435,650
1874	91,334	244,641	1931	1,765,471	7,684,155
1875	123,362	330,435	1932	1,614,629	6,523,644
1876	155,895	417,576	1933	1,377,177	5,375,171
1877	172,540	462,156	1934	1,430,042	5,725,133
1878	191,348	522,538	1935	1,278,380	5,048,864
1879	270,257	723,903	1936	1,352,301	5,722,502
1880	299,708	802,785	1937	1,446,243	6,139,920
1881	255,760	685,171	1938	1,388,507	5,565,069
1882	315,997	846,417	1939	1,561,084	6,280,956
1883	238,895	639,897	1940	1,662,027	7,088,265
1884	441,358	1,182,210	1941	1,844,745	7,660,000
1885	409,468	1,096,788	1942	1,996,000	8,237,172
1886	365,832	979,908	1943	1,854,749	7,742,030
1887	462,964	1,240,080	1944	1,931,950	8,217,966
1888	548,017	1,467,903	1945	1,523,021	6,454,360
1889	649,411	1,739,490	1946	1,439,092	6,732,470
1890	759,518	2,034,420	1947	1,696,350	8,680,440
1891	1,152,590	3,087,291	1948	1,604,480	9,765,395
1892	925,495	2,479,005	1949	1,621,268	10,549,924
1893	1,095,690	2,934,882	1950	1,574,006	10,119,303
1894	1,134,509	3,038,859	1951	1,573,572	10,169,617
1895	1,052,412	2,824,687	1952	1,402,313	9,729,739
1896	1,002,268	2,693,961	1953	1,384,138	9,528,279
1897	999,372	2,734,522	1954	1,308,284	9,154,544
1898	1,263,272	3,582,595	1955	1,332,874	8,986,501
1899	1,435,314	4,126,803	1956	1,417,209	9,346,518
1900	1,781,000	4,744,530	1957	1,085,657	7,340,339
1901	1,894,544	5,016,398	1958	796,413	5,937,860
1902	1,838,621	4,832,257	1959	690,011	5,472,064
1903	1,624,742	4,332,297	1960	788,658	5,242,223
1904	1,887,981	4,953,024	1961	919,142	6,802,134
1905	2,044,931	5,511,861	1962	825,339	6,133,986
1906	2,126,965	5,548,044	1963	850,541	6,237,997
1907	2,485,961	7,637,713	1964	911,326	6,327,678
1908	2,362,514	7,356,866	1965	950,763	6,713,590
1909	2,688,672	8,574,884	1966	850,821	6,196,219
1910	3,314,749	11,108,335	1967	908,790	7,045,341
1911	2,541,698	8,071,747	1968	959,214	7,588,989
1912	3,211,907	10,786,812	1969	852,340	6,817,155
1913	2,713,535	9,197,460	1970	2,644,056	19,559,669
1914	2,237,042	7,745,847			
1915	2,076,601	7,114,178	Totals	145,089,102	$636,283,545

[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, 1970

Mine	Gross Production	Net Production	Coal Used		Sales						Total Coal Sold and Used	
			Under Companies' Boilers, Etc.	Making Coke	Canada		United States	Japan	Others	Total Sales	Amount	Value
					British Columbia	Other Provinces						
Fort Steele Mining Division	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	$
Kaiser Resources Ltd.—												
Michel Colliery	3,480,631	3,161,264	43,532	240,873	115,627	314,870	11,083	1,786,855	128,785	2,357,220	2,641,625	19,538,505
Omineca Mining Division												
Forestburg Collieries Ltd.—												
Bulkley Valley Collieries	2,431	2,431	.....	.....	2,431	.....	.....	.....	.....	2,431	2,431	21,164
Grand totals for Province	3,483,062	3,163,695	43,532	240,873	118,058	314,870	11,083	1,786,855	128,785	2,359,651	2,644,056	19,559,669

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

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
Metal-mining	$94,363,110	$12,885,062	$52,474,644
Exploration and development	48,512,581	----------	----------
Coal	12,070,551	1,806,160	2,288,279
Petroleum and natural gas (exploration and production)	4,425,662	----------	----------
Industrial minerals	6,292,420	1,161,501	1,963,553
Structural-materials industry	7,293,958	3,263,949	3,119,894
Totals, 1970	$172,958,282	$19,116,672	$59,846,370
Totals, 1969	123,450,327	14,554,123	43,089,559
1968	113,459,219	13,818,326	38,760,203
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, 1901–70

Year	Metals							Coal Mines			Structural Materials				
		Mines													
	Placer	Under	Above	Exploration and Development	Concentrators	Smelters	Total	Under	Above[1]	Total	Quarries and Pits	Plants	Industrial Materials	Petroleum and Natural-gas Exploration and Development	Total
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	3,187	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	.....	2,435	1,159	.....	.....	.....	3,594	5,212	1,661	6,873	.....	.....	.....	.....	10,467
1912	.....	2,472	1,364	.....	.....	.....	3,836	5,275	1,855	7,130	.....	.....	.....	.....	10,966
1913	.....	2,773	1,505	.....	.....	.....	4,278	4,950	1,721	6,671	.....	.....	.....	.....	10,949
1914	.....	2,741	1,433	.....	.....	.....	4,174	4,267	1,465	5,732	.....	.....	.....	.....	9,906
1915	.....	2,709	1,435	.....	.....	.....	4,144	3,708	1,283	4,991	.....	.....	.....	.....	9,135
1916	.....	3,357	2,036	.....	.....	.....	5,393	3,694	1,366	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	.....	2,513	1,746	.....	.....	.....	4,259	4,145	1,821	5,966	.....	.....	.....	.....	10,225
1920	.....	2,074	1,605	.....	.....	.....	3,679	4,191	2,158	6,349	.....	.....	.....	.....	10,028
1921	.....	1,355	975	.....	.....	.....	2,330	4,722	2,163	6,885	.....	.....	.....	.....	9,215
1922	.....	1,510	1,239	.....	.....	.....	2,749	4,712	1,932	6,644	.....	.....	.....	.....	9,393
1923	.....	2,102	1,516	.....	.....	.....	3,618	4,342	1,807	6,149	.....	.....	.....	.....	9,767
1924	.....	2,353	1,680	.....	.....	.....	4,033	3,894	1,524	5,418	.....	.....	.....	.....	9,451
1925	.....	2,298	2,840	.....	.....	.....	5,138	3,828	1,615	5,443	.....	.....	.....	.....	10,581
1926	299	2,606	1,735	.....	808	2,461	7,610	3,757	1,565	5,322	493	324	124	.....	14,172
1927	415	2,671	1,916	.....	854	2,842	8,288	3,646	1,579	5,225	647	188	122	.....	14,830
1928	355	2,707	2,469	.....	911	2,748	8,885	3,814	1,520	5,334	412	368	120	.....	15,424
1929	341	2,926	2,052	.....	966	2,948	8,892	3,675	1,353	5,028	492	544	268	.....	15,565
1930	425	2,316	1,260	.....	832	3,197	7,605	3,389	1,256	4,645	843	344	170	.....	14,032
1931	688	1,463	834	.....	581	3,157	6,035	2,957	1,125	4,082	460	526	380	.....	12,171
1932	874	1,355	900	.....	542	2,036	4,833	2,628	980	3,608	536	329	344	.....	10,524
1933	1,134	1,786	1,335	.....	531	2,436	6,088	2,241	853	3,094	376	269	408	.....	11,369
1934	1,122	2,796	1,729	.....	631	2,890	8,046	2,050	843	2,803	377	187	360	.....	12,985
1935	1,291	2,740	1,497	.....	907	2,771	7,915	2,145	826	2,971	536	270	754	.....	13,737
1936	1,124	2,959	1,840	.....	720	2,678	8,197	2,015	799	2,814	931	288	825	.....	14,179
1937	1,371	3,603	1,818	.....	1,168	3,027	9,616	2,286	867	3,153	724	327	938	.....	16,129
1938	1,303	3,849	2,266	.....	919	3,158	10,192	2,088	874	2,962	900	295	369	.....	16,021
1939	1,252	3,905	2,050	.....	996	3,187	10,138	2,167	809	2,976	652	311	561	.....	15,890
1940	1,004	3,923	2,104	.....	1,048	2,944	10,019	2,175	699	2,874	827	334	647	.....	15,705
1941	939	3,901	1,823	.....	1,025	3,072	9,821	2,229	494	2,723	766	413	422	.....	15,084
1942	489	2,920	1,504	.....	960	3,555	8,939	1,892	468	2,360	842	378	262	.....	13,270
1943	212	2,394	1,699	.....	891	2,835	7,819	2,240	611	2,851	673	326	567	.....	12,448
1944	255	1,896	1,825	.....	849	2,981	7,551	2,150	689	2,839	690	351	628	.....	12,314
1945	209	1,933	1,750	.....	822	2,834	7,339	1,927	503	2,430	921	335	586	.....	11,820
1946	347	1,918	1,817	.....	672	2,813	7,220	1,773	532	2,305	827	555	679	.....	11,933
1947	360	3,024	2,238	.....	960	3,461	9,683	1,694	731	2,425	977	585	869	.....	14,899
1948	348	3,143	2,429	.....	1,126	3,884	10,582	1,594	872	2,466	1,591	656	754	.....	16,397
1949	303	3,034	2,724	.....	1,203	3,763	10,724	1,761	545	2,306	2,120	542	626	.....	16,621
1950	327	3,399	2,415	.....	1,259	3,759	10,832	1,745	516	2,261	1,916	616	660	.....	16,612
1951	205	3,785	3,695	.....	1,307	4,044	12,831	1,462	463	1,925	1,783	628	491	.....	17,863
1952	230	4,171	3,923	.....	1,516	4,120	13,730	1,280	401	1,681	1,530	557	529	.....	18,257
1953	182	3,145	2,589	.....	1,371	3,901	11,006	1,154	396	1,550	1,909	559	634	.....	15,790
1954	199	2,644	2,520	.....	1,129	3,119	9,412	1,076	358	1,434	1,861	638	584	.....	14,128
1955	103	2,564	2,553	.....	1,091	3,304	9,512	1,100	378	1,478	1,646	641	722	.....	14,102
1956	105	2,637	2,827	.....	1,043	3,339	9,846	968	398	1,366	1,598	770	854	.....	14,539
1957	67	2,393	2,447	.....	838	3,328	9,006	1,020	360	1,380	1,705	625	474	.....	13,257
1958	75	1,919	1,809	.....	625	3,081	7,484	826	260	1,086	1,488	677	446	.....	11,201
1959	99	1,937	1,761	.....	618	3,008	7,324	765	291	1,056	1,357	484	459	.....	10,779
1960	86	1,782	1,959	.....	648	3,034	7,423	894	288	1,182	1,704	557	589	.....	11,541
1961	74	1,785	1,582	.....	626	3,118	7,111	705	237	942	1,828	508	571	.....	11,034
1962	35	1,677	1,976	270	949	3,356	8,228	548	228	776	1,523	481	517	.....	11,560
1963	43	1,713	2,012	450	850	3,239	8,264	501	247	748	909	460	528	.....	10,952
1964	5	1,839	1,967	772	822	3,281	8,687	446	267	713	1,293	444	509	.....	11,645
1965	2	1,752	2,019	786	965	3,529	9,051	405	244	649	1,079	422	639	441	12,283
1966	2	2,006	2,296	1,894	1,014	3,654	10,864	347	267	614	1,269	393	582	478	14,202
1967	.....	1,928	2,532	1,264	992	3,435	10,151	260	197	457	1,309	372	584	507	13,380
1968	.....	1,823	2,369	3,990	1,072	3,283	12,537	195	358	553	1,207	380	582	400	16,212
1969	7	1,794	2,470	4,270	1,099	3,468	13,101	245	455	700	1,097	549	567	416	16,437
1970	.....	2,160	3,167	4,964	1,331	3,738	15,360	242	1,033	1,275	740	647	627	437	19,086

[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 11—EMPLOYMENT AT MAJOR METAL AND COAL MINES, 1970

	Tons		Days Operating Mill	Average Number Employed[1]					
					Mine				
	Mined	Milled		Administrative, Etc.	Surface	Underground	Mill	Others	Total
Metal Mines									
Anaconda American Brass Ltd. (Britannia)	317,442	319,262	171	87	42	195	25	20	369
Bethlehem Copper Corporation Ltd. (Bethlehem)	5,710,469	5,450,746	365	26	188	—	149	4	367
Bralorne Can-Fer Resources Ltd. (Bralorne)	76,273	76,817	203	25	21	80	11	—	137
Brenda Mines Ltd. (Brenda)	7,530,474	7,326,559	320	83	136	—	148	—	367
British Columbia Molybdenum Ltd. (B.C. Molybdenum)	2,693,228	2,693,228	361	33	120	—	60	54	267
Brynnor Mines Ltd. (Boss Mountain)	591,168	591,168	365	46	79	78	29	—	232
Canadian Exploration Ltd. (Jersey)	210,146	213,026	216	52	12	30	20	—	114
Churchill Copper Corporation Ltd. (Magnum)	168,134	170,581	270	32	34	72	13	1	152
Coast Copper Co. Ltd. (Old Sport)	290,911	290,911	365	37	54	93	13	—	197
Cominco Ltd. (Bluebell)	242,997	246,529	334	37	—	123	17	28	205
Cominco Ltd. (Sullivan)	2,120,529	2,120,529	241	201	80	449	119	—	849
Copperline Mines Ltd. (Ruth Vermont)	39,300	36,227	122[2]	—	—	17[2]	5[2]	—	22
Craigmont Mines Ltd. (Craigmont)	1,803,038	1,797,213	354	118	7	223	192	4	544
Endako Mines Ltd. (Endako)	13,864,634	10,118,000	363	121	273	—	84	—	478
Giant Mascot Mines Ltd. (Pride of Emory)	213,228	213,228	140	42	20	100	20	—	182
Granduc Operating Co. (Granduc)	105,230	105,230	60	176	124	297	11	—	602
The Granby Mining Co. Ltd. (Phoenix)	879,851	862,156	365	29	93	—	56	—	178
Granisle Copper Ltd. (Granisle)	2,400,037	2,393,161	365	33	45	—	43	46	167
Greyhound Mines Ltd. (Mother Lode)	885,520[2]	202,631	122	14	3	—	30	—	47
Kam-Kotia-Burkam Joint Venture (Silmonac)	14,958	13,232	122	6	7	20	5	5	43
King Resources Co. (Mount Copeland)	50,060	54,305	124	8	—	41	15	25	89
Leitch Mines Ltd. (Highland-Bell)	38,156	33,225	350	10	—	25	12	7	54
Red Mountain Mines Ltd. (Coxey)	200,320	212,051	242	11	13	—	18	—	42
Reeves MacDonald Mines Ltd. (Annex)	70,565	70,565	72	20	—	33	6	15	74
Reeves MacDonald Mines Ltd. (Reeves MacDonald)	107,312	107,312	179	12	—	34	7	9	62
Texada Mines Ltd. (Texada)	821,913	1,347,225	365	20	86	87	36	—	229
Utica Mines Ltd. (Horn Silver)	18,790	18,790	61	18	—	13	5	—	36
Wesfrob Mines Ltd. (Tasu)	2,275,294	2,275,294	354	55	36	—	134	—	225
Western Mines Ltd. (Lynx)	379,486	386,976	363	38	36	104	34	—	212
Other mines	—	—	—	—	—	—	—	—	116
Total	—	—	—	—	—	—	—	—	6,658
Coal Mines									
Kaiser Resources Ltd. (Michel Collieries)	3,480,631	—	331	320	708[3]	242	—	—	1,270
Forestburg Collieries Ltd. (Bulkley Valley Collieries)	7,568	—	181	1	4	—	—	—	5
Total	—	—	—	—	—	—	—	—	1,275

[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] Estimated.

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

TABLE 12—METAL PRODUCTION, 1970

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
Alberni Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Brynnor mine	Kennedy Lake	Brynnor Mines Ltd. (Kennedy Lake Division)	4,296	Iron concentrates shipped from stockpile						
Lynx mine	Buttle Lake	Western Mines Ltd.	386,976	Copper concentrates, 27,664 tons; lead concentrates, 733 tons; zinc concentrates, 38,038 tons	11,795	391,669	14,004,960	4,929,563	46,343,518	198,640
Atlin Mining Division										
Nil										
Cariboo Mining Division										
Boss Mountain mine	Big Timothy Mountain	Brynnor Mines Ltd. (Boss Mountain Division)	591,168	Molybdenite concentrates, 1,982 tons containing 2,247,135 lb. of molybdenum						
	Black Bear Creek	A. Lagace, Likely	½	Crude ore		37		301	3	
Clinton Mining Division										
Nil										
Fort Steele Mining Division										
Sullivan mine	Kimberley	Cominco Ltd.	2,120,529	Lead concentrates, 134,523 tons; zinc concentrates, 161,160 tons; tin concentrates, 253 tons containing 263,716 lb. of tin; iron sinter, 186,207 tons	161	2,887,544	522,800	191,608,800	166,449,000	448,658
Golden Mining Division										
Ruth Vermont	Parson	Copperline Mines Ltd.	36,227	Lead concentrates, 1,382 tons; zinc concentrates, 2,198 tons	49	124,915		1,758,818	2,367,296	16,686
Greenwood Mining Division										
Doorn	Beaverdell	Argentia Mines Ltd.	10	Crude ore	21	78		20	20	
Highland Bell mine	Beaverdell	Leitch Mines Ltd.	33,225	Lead concentrates, 2,077 tons; zinc concentrates, 444 tons; jig concentrates, 126 tons	539	444,269		593,387	592,903	2,938
Greyhound, Mother Lode	Greenwood	Greyhound Mines Ltd.	202,631	Copper concentrates, 2,599 tons	410	9,331	1,107,894			
Phoenix mine	Phoenix	The Granby Mining Co. Ltd. (Phoenix Copper Division)	862,156	Copper concentrates, 22,361 tons	12,201	135,863	11,350,131			
Kamloops Mining Division										
Bethlehem mine	Highland Valley	Bethlehem Copper Corp. Ltd.	5,450,746	Copper concentrates, 81,370 tons	2,251	183,292	51,651.084			

Liard Mining Division										
Magnum mine	Delano Creek	Churchill Copper Corp. Ltd.	170,581	Copper concentrates, 14,356 tons			8,737,350			
Rich	Cassiar	B. Wiseman, Cassiar	6	Crude ore		450		5,567	1,088	
Lillooet Mining Division										
Bralorne mine	Bralorne	Bralorne Can-Fer Resources Ltd.	76,817	Bullion	39,300	6,813				
Nanaimo Mining Division										
Old Sport mine	Benson Lake	Coast Copper Co. Ltd.	290,911	Copper concentrates, 21,410 tons; iron concentrates, 78,465 tons	7,279	48,882	10,208,800			
Texada mine	Texada Island	Texada Mines Ltd.	1,347,225	Iron concentrates, 497,639 tons; copper concentrates, 9,011 tons	1,464	55,109	3,688,249			
Nelson Mining Division										
Annex	Nelway	Reeves MacDonald Mines Ltd.	70,565	Lead concentrates, 1,244 tons; zinc concentrates, 11,821 tons		198,283	9,444	1,294,158	12,058,224	150,207
Burlington (Sheep Creek) Camp)	Salmo	J. A. C. Ross, Vancouver	1,472	Siliceous ore	69	421		7,938	9,441	
Edward VIII (Sheep Creek Camp)	Salmo	J. A. C. Ross, Vancouver	281	Siliceous ore	4	42		1,273	1,684	
Howard	Salmo	John Stoochnoff, Salmo	31	Crude ore	1	9		310	186	
Jersey mine	Salmo, Iron Mountain	Canadian Exploration Ltd.	213,026	Lead concentrates, 3,244 tons; zinc concentrates, 9,023 tons		18,856		4,893,834	10,672,948	83,449
Malwaaz (Sheep Creek Camp)	Salmo	J. A. C. Ross and associates, Vancouver	198	Siliceous ore	4	27		541	831	
New Arlington	Salmo, Erie Creek	G. D. Fox, Trail	1,103	Crude ore	85	1,073		18,380	11,764	
Queen (Sheep Creek Camp)	Salmo	J. A. C. Ross, Vancouver	357	Siliceous ore	10	43		715	989	
Reeves MacDonald mine	Nelway	Reeves MacDonald Mines Ltd.	107,312	Lead concentrates, 2,482 tons; zinc concentrates, 8,707 tons		20,038	6,774	2,674,042	9,432,733	55,650
Reno (Sheep Creek Camp)	Salmo	Ronald Endersby and associate, Fruitvale	3,024	Siliceous ore	541	640		9,948	13,008	
Silver Dollar	Salmo, Erie Creek	D. H. Norcross, Nelson	429	Crude ore	38	1,557		4,249	6,027	
Yellowstone (Sheep Creek Camp)	Salmo	F. R. Rotter, Salmo	66	Siliceous ore	3	7		398	265	
Ymir	Ymir	Silver Dawn Mines Ltd.	604	Crude ore	39	277		2,005	14,850	
Yosemite (Sheep Creek Camp)	Salmo	F. R. Rotter, Salmo	1,934	Siliceous ore	149	366		10,233	7,523	
New Westminster Mining Division										
Pride of Emory mine	Hope	Giant Mascot Mines Ltd.	213,228	Nickel-copper concentrates, 18,950 tons; nickel content, 3,872,958 lb.			2,202,152			

TABLE 12—METAL PRODUCTION, 1970—*Continued*

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Nicola Mining Division										
Craigmont mine	Merritt	Craigmont Mines Ltd.	1,797,213	Copper concentrates, 60,522 tons; iron concentrates, 18,565 tons			34,110,361			
Omineca Mining Division										
Cronin mine	Smithers	Kindrat Mines Ltd.	1,746	Lead concentrates, 87 tons; zinc concentrates, 104 tons	27	11,800		111,351	117,382	1,432
Endako mine	Endako	Endako Mines Ltd.	10,118,000	Molybdenite concentrates, 8,225 tons; molybdenum trioxide, 5,857 tons; ferromolybdenum, 214 tons. Total content, 15,565,807 lb. of molybdenum.						
Granisle mine	Babine Lake	Granisle Copper Ltd.	2,393,161	Copper concentrates, 33,862 tons	11,113	105,274	22,791,847			
Pinchi Lake mine	Pinchi Lake	Cominco Ltd.	(1)	Mercury						
Reiseter	Smithers	A. Mesich, Smithers	21	Hand-sorted stibnite containing 13,893 lb. of antimony						
Silver Standard mine	Hazelton	Northwestern Midland Development Co. Ltd.	486	Lead concentrates, 21 tons; zinc concentrates, 21 tons	17	8,456	1,200	14,332	22,014	271
Sunrise	Hazelton	Sunrise Silver Mines Ltd.	24	Crude ore		522		2,404	3,942	
Osoyoos Mining Division										
Brenda mine	Brenda Lake	Brenda Mines Ltd.	7,326,559	Copper concentrates, 61,125 tons; molybdenite concentrates, 5,660 tons containing 6,394,520 lb. of molybdenum	2,931	201,549	25,896,705			
Golconda	Olalla	Trent Resources Ltd.	(2)							
Horn Silver mine	Keremeos	Utica Mines Ltd.	18,790	Silver concentrates, 763 tons	320	130,274		24,863	20,703	
Revelstoke Mining Division										
Mount Copeland mine	Revelstoke	King Resources Co.	54,305	Molybdenite concentrates, 548 tons containing 637,104 lb. of molybdenum						
Similkameen Mining Division										
Nil										
Skeena Mining Division										
British Columbia Molybdenum mine	Alice Arm	British Columbia Molybdenum Ltd.	2,693,228	Molybdenite concentrates, 4,894 tons containing 5,867,377 lb. of molybdenum						
Granduc mine	Stewart	Granduc Operating Co.	105,230							
Tasu mine	Tasu Harbour	Wesfrob Mines Ltd.	2,275,294	Iron concentrates, 1,093,893 tons; copper concentrates, 48,407 tons	7,172	249,959	19,048,820			

Slocan Mining Division										
Arlington	Springer Creek	Arlington Silver Mines Ltd.	2,792	Crude ore		34,145		140,070	93,071	
Black Prince	Slocan	Delmar Hannem, Calgary	11	Crude ore		61		1,310	589	
Bluebell mine	Riondel	Cominco Ltd.	246,529	Lead concentrates, 14,978 tons; zinc concentrates, 24,847 tons	81	308,583	311,000	21,006,000	25,369,800	112,030
Bruce	Lavina Mountain	Wayne Turley & Associate, Kaslo	5	Crude ore		178		6,115	113	
Comstock	Silverton	R. H. Murphy, Nakusp	32	Clean-up		24		9	9	
Hewitt	Silverton	Surfside Explorations Ltd.	2,243	Lead concentrates, 115 tons; zinc concentrates, 221 tons	3	33,343		149,120	250,760	1,796
Homestake	Slocan City	C. Thickett, Slocan	259	Crude ore	140	15,958				
Isle	Kaslo	R. Handley & Associates, Kaslo	2	Crude ore		1		27	17	
Ottawa mine	Springer Creek	Pamicon Developments Ltd.	126	Crude ore		19,305		1,572	1,244	
Panama	New Denver	T. I. Steenhoff, New Denver	10	Crude ore		571				
Pontiac	Ainsworth	W. Matheson and H. Lind, Nelson	16	Crude ore	5	222		4,211	7,040	
Scranton	Kaslo	Silver Star Mines Ltd.	3,302	Lead concentrates, 180 tons; zinc concentrates, 202 tons	370	9,781	417	262,100	235,699	
Silmonac	Sandon	Kam-Kotia and Burkam Joint Venture	13,232	Lead concentrates, 1,384 tons; zinc concentrates, 1,345 tons		245,976		1,855,073	1,678,118	11,676
Silver Hoard	Ainsworth	R. B. Strong, Winlaw	42	Crude ore		728		1,786	4,916	
Victor	Sandon	E. Perepolkin and Associates, Sandon	11	Crude ore	1	1,174		8,805	746	
Washington	Retallack–Three Forks	Red Deer Valley Coal Co. Ltd.	807[3]	Lead concentrates, 29 tons; zinc concentrates, 151 tons	1	4,698		36,404	168,171	1,295
Winona	Retallack	Hilroy Mines Ltd.	5	Crude ore		22		516	569	
Trail Creek Mining Division										
Coxey mine	Rossland	Red Mountain Mines Ltd.	212,051	Molybdenite concentrates, 471 tons containing 564,554 lb. of molybdenum						
IXL	Rossland	J. A. and M. M. Ruelle, Rossland		High-grade ore	42	4				
Vancouver Mining Division										
Britannia mine	Howe Sound	Anaconda Britannia Mines, Division of Anaconda American Brass Ltd.	319,262	Copper concentrates, 9,307 tons; zinc concentrates, 288 tons	548	21,612	5,505,068		273,508	1,285
Callaghan	Alta Lake	Barkley Valley Mines Ltd.	90	Crude ore	5	373	3,645	17,780		
Vernon Mining Division										
Nil										
Victoria Mining Division										
Nil										

[3] Estimate.

Departmental Work

CHAPTER 3

CONTENTS

RETIREMENTS

Mathew S. Hedley retired as Chief of the Mineralogical Branch on May 31, 1970. He was born on May 2, 1905, in Nelson where his father, the late R. R. Hedley, was manager of the Hall Mine smelter. His primary education was at private schools in Vancouver and Victoria and in 1923 he matriculated from Vancouver Technical High School. He attended the University of British Columbia from 1923 to 1925 and 1927 to 1930 graduating with a B.A.Sc. in geological engineering. In 1930 and 1931 he worked as engineer and geologist at the Bell (now the Mastodon-Highland Bell) mine at Beaverdell. In the autumn of 1931 he went to the University of Wisconsin for postgraduate work in geology and mining and was awarded a M.S. in 1932 and a Ph.D. in geology and mining in 1934.

Immediately on graduation he went to work as geologist at the Bralorne mine leaving there in 1935 to work for a year for the Geological Survey of Canada in Ottawa before joining the Department of Mines on May 13, 1936 as Resident Mining Engineer for the South Central District, with headquarters in Penticton. His was the last appointment made under the *Mineral Survey and Development Act* of 1917.

He was transferred from Penticton to Victoria in 1940, and was appointed Geologist in 1950, Senior Geologist in 1954, and Deputy Chief of the Mineralogical Branch in 1964. Upon the retirement of Hartley Sargent in November 1966 he succeeded him as Chief of the Mineralogical Branch.

He worked principally in South Central British Columbia, from Princeton eastward to the Kootenays, making studies of numerous gold and base-metal properties as well as of the Camp McKinney, Whitewater and Lucky Jim, and Sandon mining areas.

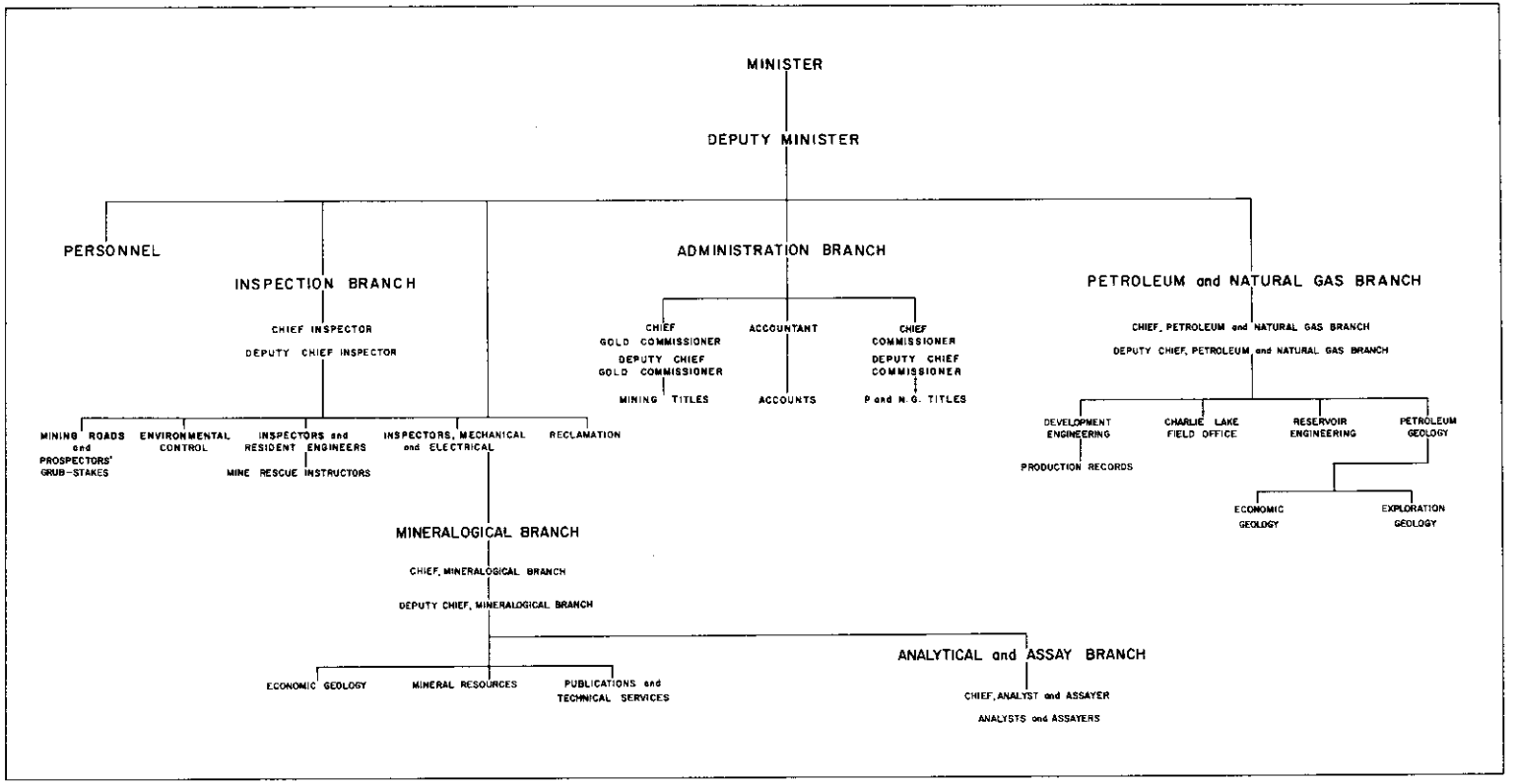
For the 15 years from 1951 to 1966 he was in charge of the technical editing of the Annual Reports of the Minister of Mines and Petroleum Resources as well as of the Bulletins published by the Mineralogical Branch of the Department.

He is a member of the Canadian Institute of Mining and Metallurgy and of the Association of Professional Engineers of British Columbia. He is married and has one son.

Dewi R. Morgan retired as Senior Inspector of Mines on June 30, 1970. Mr. Morgan was born and educated in Wales, graduating as a Mining Engineer from Treforest School of Mines. He was employed at coal mines in Wales where he obtained his first-class certificate of competency in coal mining. He held various managerial posts in Wales and was mine manager of Ocean Coal Company in Cwmpark when he came to Canada in 1947 to the Crows Nest Pass Coal Company's Blairmore mine in Alberta. He was appointed Inspector of Mines and Resident Engineer at Fernie in 1949. He was transferred to Victoria in 1967 as Senior Inspector, Coal, and in charge of administering the Department's road and trail programme and the grubstaking of prospectors. He is a member of the Association of Professional Engineers of British Columbia.

ORGANIZATION

The organization of the Department of Mines and Petroleum Resources is displayed in the diagram on page A 58.


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

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 Commisioners, 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 60.

Central Records Offices (Victoria and Vancouver)

Transcripts of all recordings in Mining Recorders' offices throughout the Province and also the names of lessees of reverted surveyed mineral claims are sent to the office of the Chief Gold Commissioner in Victoria twice each month. The 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 is plotted from details supplied by locators.

During 1970, fourteen investigations were carried out pursuant to section 80 of the *Mineral Act.* Six investigations with regard to certificates of work being wrongfully or improperly obtained resulted in 165 certificates of work being cancelled. Eight investigations with regard to mineral claims having been located or recorded otherwise than in accordance with the *Mineral Act* resulted in 300 mineral claims being cancelled.

List of Gold Commissioners and Mining Recorders

Mining Division	Location of Office	Gold Commissioner	Mining Recorder
Alberni	Port Alberni	T. S. Dobson	T. S. Dobson.
Atlin	Atlin	D. P. Lancaster	D. P. Lancaster.
Cariboo	Quesnel	D. V. Drew	D. V. Drew.
Clinton	Clinton	I. Williams	I. Williams.
Fort Steele	Cranbrook	B. J. H. Ryley	B. J. H. Ryley.
Golden	Golden	W. G. Mundell	W. G. Mundell.
Greenwood	Grand Forks	G. A. Broomfield	G. A. Broomfield.
Kamloops	Kamloops	F. J. Sell	F. J. Sell.
Liard	Victoria	E. J. Bowles	E. A. H. Mitchell.
Lillooet	Lillooet	K. J. Weir	K. J. Weir.
Nanaimo	Nanaimo	E. B. Offin	E. B. Offin.
Nelson	Nelson	G. L. Brodie	G. L. Brodie.
New Westminster	New Westminster	F. E. Hughes	J. Hoem.
Nicola	Merritt	L. P. Lean	L. P. Lean.
Omineca	Smithers	A. W. Milton	S. Matsuo.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby.
Revelstoke	Revelstoke	D. G. B. Roberts	D. G. B. Roberts.
Similkameen	Princeton	W. L. Marshall	W. L. Marshall.
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	N. A. Nelson	N. A. Nelson.
Victoria	Victoria	E. J. Bowles	E. A. H. Mitchell.

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, 1970

Licences—	
Fees	$39,264.00
Rental	55,679.00
Total	$94,943.00

During 1970, 846 coal licences were issued, totalling 509,566 acres. As of December 31, 1970, a total of 1,442 coal licences, amounting to 685,875 acres, were held in good standing.

Gold Commissioners' and Mining Recorders' Office Statistics, 1970

Mining Division	Free Miners' Certificates		Lode-mining						Placer-mining					Revenue		
	Individual	Company	Mineral Claims	Certificates of Work	Cash in Lieu	Certificates of Improvements	Bills of Sale, Etc.	Leases	Placer Claims	Leases	Certificates of Work	Cash in Lieu	Bills of Sale, Etc.	Free Miners' Certificates	Mining Receipts	Total
Alberni	90	3	1,398	3,888	$4,900.00	.....	59	8	.....	.....	.....	$250.00	.....	$1,085.00	$8,588.50	$9,673.50
Atlin	199	2	1,695	3,697	16,000.00	.....	110	7	.....	10	30	500.00	19	1,395.00	51,965.93	53,360.93
Cariboo	995	10	5,625	6,407	35,400.00	.....	234	1	.....	59	278	4,250.00	112	6,547.00	126,955.00	133,502.00
Clinton	61	.....	4,376	2,854	1,600.00	.....	96	.....	.....	7	25	.....	7	310.00	41,872.75	42,182.75
Fort Steele	267	6	1,425	3,370	16,000.00	.....	108	6	1	6	33	750.00	6	2,447.00	45,281.50	47,728.50
Golden	88	9	639	1,932	5,300.00	.....	75	3	.....	10	93	.....	9	1,940.00	26,565.50	28,505.50
Greenwood	201	6	3,461	3,427	8,736.00	.....	134	28	.....	6	13	.....	1	2,151.00	55,449.50	57,600.50
Kamloops	678	20	7,660	26,395	54,371.00	98	631	115	.....	7	19	.....	.....	6,540.00	311,259.13	317,799.13
Liard	206	.....	8,272	9,083	69,100.00	43	222	2	.....	392	38	1,000.00	294	1,021.00	229,047.75	230,068.75
Lillooet	159	5	1,500	4,400	17,740.00	4	124	11	.....	26	21	750.00	31	1,795.00	50,665.75	52,460.75
Nanaimo	312	6	2,768	8,754	8,800.00	.....	802	4	2	2	.....	.....	.....	2,060.00	80,603.50	82,663.50
Nelson	319	8	950	1,605	2,100.00	.....	119	23	.....	6	18	.....	3	2,962.00	23,995.97	26,957.97
New Westminster	551	20	2,085	3,046	8,900.00	.....	134	2	1	43	74	500.00	66	6,295.00	45,789.25	52,084.25
Nicola	109	7	3,897	3,466	23,400.00	.....	349	.....	.....	.....	.....	.....	.....	1,946.00	67,699.25	69,645.25
Omineca	552	8	12,542	22,217	64,336.00	5	618	10	.....	17	105	3,250.00	47	4,052.00	276,991.75	281,043.75
Osoyoos	231	6	1,519	1,423	28,136.00	.....	196	13	.....	.....	.....	.....	.....	2,153.00	51,687.50	53,840.50
Revelstoke	83	1	237	803	7,000.00	.....	36	16	.....	2	3	250.00	.....	615.00	15,369.50	15,984.50
Similkameen	178	3	3,005	4,432	15,900.00	.....	199	11	.....	46	95	4,812.50	59	1,580.00	72,368.75	73,948.75
Skeena	143	.....	1,404	1,692	16,908.00	.....	71	23	.....	1	3	.....	.....	725.00	44,547.50	45,272.50
Slocan	233	9	1,760	1,837	15,600.00	.....	219	53	.....	2	.....	250.00	1	2,765.00	44,749.25	47,514.25
Trail Creek	121	5	425	224	612.00	.....	13	6	.....	.....	.....	.....	.....	1,525.00	4,910.00	6,435.00
Vancouver	3,412	708	1,226	1,475	4,900.00	.....	77	3	.....	2	5	.....	.....	148,560.00	41,106.54	189,666.54
Vernon	345	11	1,149	1,354	1,400.00	.....	70	3	1	3	27	.....	1	2,180.00	16,090.50	18,270.50
Victoria	501	58	528	852	1,600.00	.....	36	6	.....	8	6	.....	13	13,001.00	15,747.50	28,748.50
Totals for 1970	10,034	911	69,546	118,633	$428,739.00	150	4,732	354	5	655	886	$16,562.50	669	$215,650.00	$1,749,308.07	$1,964,958.07
Totals for 1969	9,880	1,060	84,665	88,954	$344,562.00	82	4,411	290	12	509	999	$22,562.00	671	$243,424.00	$1,535,954.16	$1,779,378.16

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. Regulations governing geophysical operations and petroleum-development roads are also administered by this Division. 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 $16,339,801.19, a decrease of $5,306,650.35 from the record high of the previous year. A total of 413 parcels were offered and bids were accepted on 224 parcels covering 1,990,070 acres. The average price per acre was $8.21 which is an increase of 20 cents per acre over the previous year. Average bonus price per acre was respectively: Permits, $5.51; leases, $52.11; drilling reservations, $10.84.

During the year, 29 geophysical licences were renewed or issued.

During the year, five petroleum-development road applications were received and processed for approval.

A total of 132 notices of commencement of exploratory work were recorded during the year. These notices are required prior to the commencement of any geological or geophysical exploration for petroleum or natural gas.

During the year, three unit agreements and two royalty agreements were approved.

As of December 31, 1970, 29,910,495 acres or approximately 46,735 square miles, a decrease of 11,646,725 acres over the 1969 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	426	21,379,461
Natural gas licences	----	----
Drilling reservations	26	292,402
Leases (all types)	3,680	8,238,632
Total		29,910,495

Title Transaction Statistics, 1970

	Permits		Leases		Drilling Reservations		Natural Gas Licences	
	No.	Acres	No.	Acres	No.	Acres	No.	Acres
Issued	57	2,169,837	219	225,454	19	168,437	.....	.....
Cancelled or surrendered	156	12,030,080	429	1,260,649	24	236,491	.....	.....
Renewed or extended	369	.....	3,458	.....	1	.....	.....	.....
Assigned	81	.....	767	.....	4	.....	.....	.....
Acreage amendments	11	654,266	51	100,770	.....	.....	.....	.....
Crown reserve disposition	38	1,725,526	167	96,107	19	168,437	.....	.....

Petroleum and Natural Gas Revenue, 1970

Rentals and fees—		
Permits	$1,426,447.58	
Drilling reservations	48,156.20	
Natural gas licences	.....	
Petroleum, natural gas, and petroleum and natural gas leases	7,699,844.21	
Total rentals and fees		$9,174,447.99
Disposal of Crown reserves—		
Permits	$9,506,074.09	
Drilling reservations	1,825,403.90	
Leases	5,008,323.20	
Total Crown reserves disposal		16,339,801.19
Royalties—		
Gas	$3,948,355.34	
Oil	9,483,937.25	
Processed products	42,314.03	
Total royalties		13,474,606.62
Miscellaneous fees		21,843.23
Total petroleum and natural gas revenues		$39,010,699.03

ANALYTICAL AND ASSAY BRANCH

STAFF

S. W. Metcalfe ..... Chief Analyst and Assayer
N. G. Colvin ..... Laboratory Scientist
R. J. Hibberson ..... Laboratory Scientist
Mrs. E. A. Juhasz ..... Laboratory Technician
F. F. Karpik ..... Assayer
R. S. Young ..... Laboratory Scientist

ANALYTICAL AND ASSAY WORK

Samples from Prospectors

Between May 1 and September 30 five samples will be assayed without charge for any prospector who makes application for free assays and who satisfies the

Chief Analyst that prospecting is his principal occupation. A form for use in applying for free assays may be obtained from any Mining Recorder.

During 1970 the analytical laboratory in Victoria issued reports on 874 samples received from prospectors, 860 spectrographic analyses, and 2,164 assay determinations were made. A laboratory examination of a sample may consist of the following: (1) A spectrographic analysis to determine if any base metals are present in interesting percentages, (2) assays for precious metals and for base metals shown by the spectrographic analysis to be present in interesting percentages, and (3) measurement of the degree of radioactivity. The radiometric assays are not listed in the table below.

The laboratory reports were distributed between general prospectors and prospectors who were grantees under the *Prospectors' Grub-stake Act,* as follows:

	Samples	Spectrographic Analyses	Assays
Prospectors	790	776	1,950
Prospectors (grantees)	84	84	214
Totals	874	860	2,164

In addition 14 spectrographic analyses whose results were not reported were made on prospectors' samples.

Samples From the Mineralogical Branch

Reports of analyses and assays made on 309 samples received from geologists of the Mineralogical Branch are as follows:

Complete silicate analyses as well as a few trace element determinations were made on 48 samples;

The potassium content was determined in 21 samples;

Assays for gold and silver and some base metals were made on 132 samples;

Twenty-eight samples of limestone were analysed;

Specific trace elements were determined in six sulphide minerals;

Analyses for both ferrous and ferric iron were made on seven glass beads obtained by arc fusion;

Sixty-seven samples of a miscellaneous nature were analysed.

A total of 85 spectrographic analyses and 2,216 analytical and assay determinations were made.

In addition, 256 spectrographic analyses, whose results were not reported, were made on samples submitted by geologists of the Mineralogical Branch.

Other Departmental Samples

Reports on three samples submitted by the Petroleum and Natural Gas Branch are as follows: Two were tested for oil and the third was a drill-bit cutting found to consist of lead.

A report was made on the black coating on pebbles in a sample submitted by the Inspection Branch.

A sample of ore was assayed for the Minister of Mines and Petroleum Resources.

Miscellaneous Samples

Reports were issued on 168 miscellaneous samples:

For the Department of Agriculture, Field Crops Branch, one sample of sand was assayed, and copper was determined in three samples of hay.

For the Department of Finance, Purchasing Commission, reports were issued on 26 samples of coal submitted for proximate analysis and calorific value. Two samples of detergents were examined for their phosphorous pentoxide content, and three samples of soap were identified by measurement of the refractive index of the fatty acids extracted from them.

For the Department of Highways, Materials Testing Branch, two water samples were examined, and the purity of eleven samples of sodium chloride was determined.

For the Water Resources Service, Water Rights Branch, two water samples were examined for iron, and two for arsenic and cyanide, and for the Pollution Control Branch, 13 samples of water were examined for their trace metal contents.

For the Forest Service, Forest Protection Branch, hardness and pH were determined on water samples from seven British Columbia lakes, and only hardness was determined on water samples from 18 other lakes; in addition the ammonium sulphate content of a fire-control agent was determined.

For the Department of Public Works, a smoke-stack condensate was examined.

For the Department of Recreation and Conservation, Fish and Wildlife Branch, 19 water samples were examined for their trace metal contents.

For the City of Victoria, Smoke Inspection, determination was made of the weights of residue and soluble salts collected in 82 bottles of water placed in various locations in the city.

For a citizen of the Province a sample of water was analysed.

X-ray Powder Diffraction Analyses

During 1970 the X-ray laboratory made 228 X-ray powder diffraction identifications on samples submitted by geologists of the Mineralogical Branch.

Examinations for Assayers

Provincial Government examinations for certificates of efficiency were held in May and December. In the May examination, 12 candidates were examined, of whom eight passed, three failed, and one was granted a supplemental. In the December examination, 12 candidates were examined, of whom two passed, nine failed, and one was granted a supplemental.

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
A. R. C. James, Senior Inspector, Coal; Aid to Securities.....Victoria
Harry Bapty, Senior Inspector, Mining Roads.....Victoria
V. E. Dawson, Inspector, Mechanical.....Victoria

W. B. Montgomery, Inspector, Reclamation ..... Victoria
S. Elias, Senior Inspector, Environmental Control ..... Vancouver
W. C. Robinson, Inspector and Resident Engineer ..... Vancouver
J. W. Robinson, Inspector and Resident Engineer ..... Vancouver
R. W. Lewis, Inspector and Resident Engineer ..... Cranbrook
David Smith, Inspector and Resident Engineer ..... Kamloops
E. Sadar, Inspector and Resident Engineer ..... Kamloops
B. M. Dudas, Inspector and Resident Engineer ..... Prince Rupert
P. E. Olson, Inspector and Resident Engineer ..... Nelson
W. G. Clarke, Inspector and Resident Engineer ..... Prince George
A. D. Tidsbury, 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 (*see* p. A 67). 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. H. Bapty supervises the roads and trails programme and prospectors' grub-stakes. W. B. Montgomery administers the reclamation sections of the *Coal Mines Regulation Act* and *Mines Regulation Act*. A. R. C. James is Senior Inspector, Coal, and has additional duties as mining adviser to the Securities Commission.

Instructors, Mine-rescue Stations

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

Staff Changes

In May 1970, D. R. Morgan retired as Senior Inspector, Mining Roads, and was succeeded in July by H. Bapty, Inspector of Mines, Prince Rupert. B. M. Dudas transferred in August from Environmental Control inspection to Inspector of Mines, Prince Rupert.

Board of Examiners

Board of Examiners (Coal Mines Regulation Act)

J. W. Peck, Chairman ..... Victoria
A. R. C. James, member ..... Victoria
R. W. Lewis, member ..... Fernie

The Board conducts written and practical examinations for the various certificates of competency under the provisions of sections 25 and 26 of the *Coal Mines Regulation Act*, and advises the Minister on the granting of interchange certificates under this Act. Under the new Act the Board is no longer responsible for issuing coal miners' certificates; these are now issued after examination by the District Inspector.

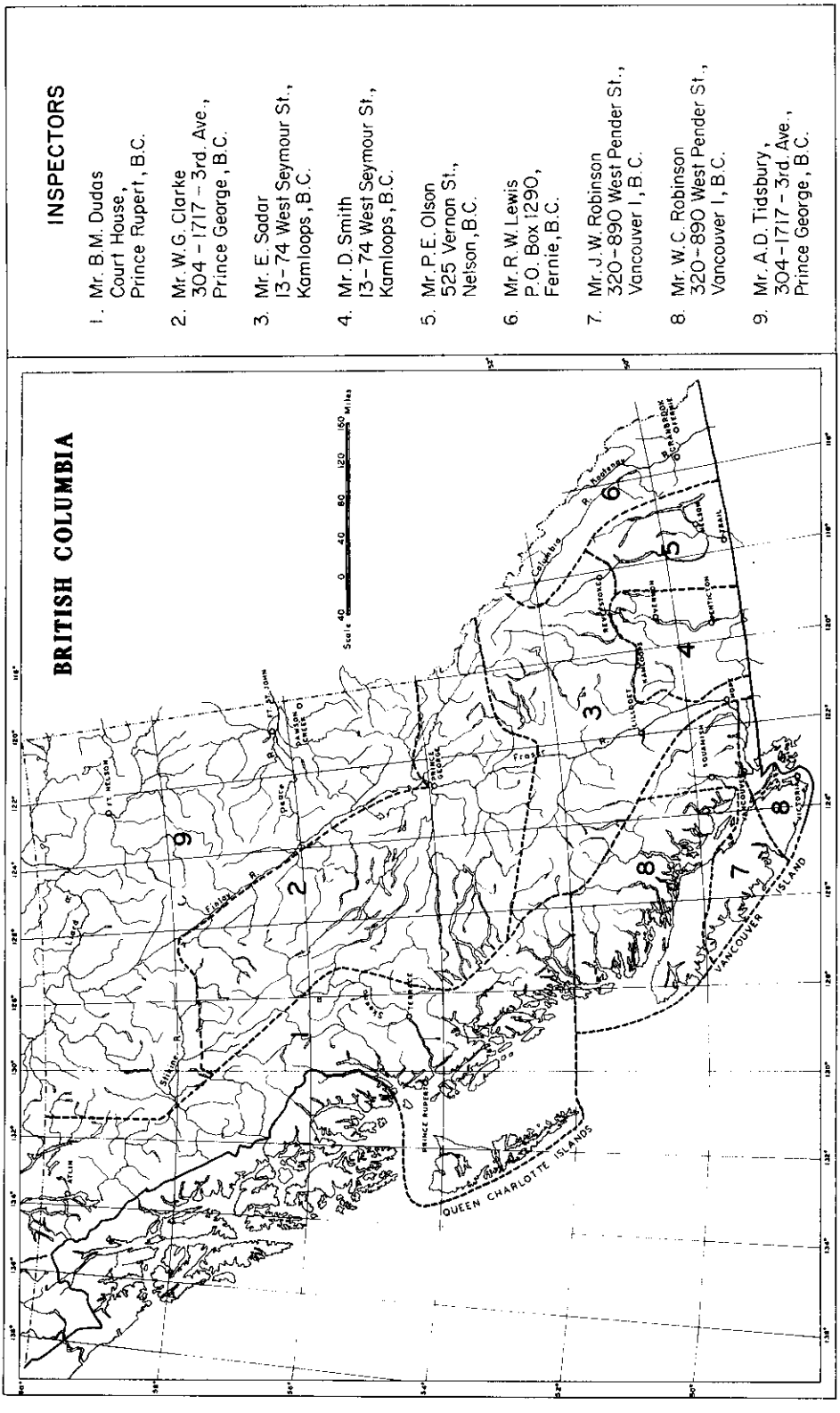


Figure 1. Index map showing inspectoral districts.

Board of Examiners (Mines Regulation Act)

J. E. Merrett, Chairman ..... Victoria
A. R. C. James, member ..... Victoria
W. C. Robinson, member ..... Vancouver

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

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.

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 expenditures under "Grants in Aid of Mining Roads and Trails" during the 1970/71 fiscal year were as follows:

	Miles	Cost
Roads—		
Construction	153.1	$275,513.66
Maintenance	251.6	46,002.74
Trails—		
Construction	9	6,000.00
Maintenance	2	3,000.00
Bridges—		
Construction		50,000.00
Maintenance		8,800.00
Total		$389,316.40

In addition to the above, work continued on the Stewart–Cassiar road. The construction is done by contract, and is supervised by the Department of Highways on behalf of the Department of Mines and Petroleum Resources.

Road construction was done under Projects 1391 and 1702. Project 1391, covering 29.08 miles of road between Burrage River and Bob Quinn Lake was completed. This contract let to Ben Ginter Construction Company was started in 1966. Project 1702 covers the construction of 38.10 miles of road between the south and north Bell-Irving River. Work by Peter Kiewit Sons Co. of Canada Ltd. began in 1968 and was completed in 1970. Contracts for two new projects, 2233 and 2234,

will be let to close the last gap of 27.81 miles of road. Project 2233 is for 16.33 miles between the north crossing of the Bell-Irving River and Beaverpond Creek and Project 2234 is for 11.48 miles between Beaverpond Creek and Bob Quinn Lake.

A major bridge, a 600-foot crossing of the north Bell-Irving River, was begun. Two concrete abutments were poured and two river piers were constructed.

Total expenditure on the road to date is $22,675,358.68. The Federal Government's commitment of $7,500,000 was expended by the end of September 1967, and since that time the whole cost of construction has been borne by the Provincial Government.

Grub-staking Prospectors

Under the authority of the *Prospectors' Grub-stake Act* the Department has provided grub-stakes each year since 1943 to a limited number of applicants able to qualify. Grub-stakes up to $500 for food, shelter, and clothing, plus a reasonable travelling allowance, are available to a limited number of qualified prospectors who undertake to prospect in British Columbia in areas considered favourable by the Department in accordance with a long-range plan for the development of the Province. Experienced prospectors may be granted a maximum of $300 for travelling expenses 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 H. Bapty, Senior Inspector, Department of Mines and Petroleum Resources, Victoria.

Samples received from grub-staked prospectors are assayed free of charge and mineralogical identifications may be made on request.

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
1969	21,758	27	151	221
1970	30,614	39	84	423

Fifty-two applications were received in 1970, and 39 grub-stakes were authorized. One grantee was unable to go out, and his initial payment was returned. Grantees who were unable to complete the terms and conditions of the grant received only partial payment. Eighteen prospectors were given grants for the first time. Four grantees proved to be unsatisfactory.

D. H. Rae interviewed applicants in Vancouver, contacted 25 grantees in the field, and gave advice and direction to those who needed it. The following notes comprise 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—Considerable prospecting was done near Kennedy Lake where a large logged-off area gave easy access for a prospecting party. Some diamond drilling was done to check the downward continuation of a strong mineralized zone exposed on the surface close to a contact between limestone and granite. The drill core showed some chalcopyrite. The area appears to be largely underlain by graphitic schist, limestone, and volcanics. Some mineralization of copper carbonates along a minor fault zone was investigated in the Canoe Creek valley and a short distance south of the Brynnor mine. Two mineral claims staked to cover these showings were sold at the end of the season.

Along the Kennedy River, halfway between Port Alberni and Ucluelet, some work was done on a rock exposure mineralized with copper sulphides and molybdenite. Heavy pyritization occurred in several places in the same area.

Atlin Mining Division—A fly camp was established about 2 miles east of Mile 88 on the Haines road, and some prospecting was done in the area. Spotty copper mineralization was reported. In the Datlasaka Creek valley, and near the Datlasaka Range the geology was reported to be interesting, and some minor occurrences of copper were investigated. A short distance west of Mile 77 on the Haines road some sulphide mineralization was noted in a small barite vein.

A short time was spent in an area south of Atlin, east of the Indian reserve, but nothing of interest was reported.

Cariboo Mining Division—A well-equipped base camp was established at the southeast end of Cariboo Lake. A boat was used and fly camps were set up at variout locations along the lakeshore. A large area was prospected and the following information was submitted. Some soil sampling was done at the southeast end of Cariboo Lake—rubianic acid tests were negative; outcrops of pyritized quartzite were examined. On a high ridge north of the base camp, outcrops of granite, pegmatite, schist, and quartzite were examined. Some signs of copper were found at Goose Creek. At the south end of the lake some copper stain was investigated, and a few barren quartz veins were examined. Near Ladies Creek, pyritized quartzite outcrops occur; soil sampling gave negative results. At Four Creek, green andesite showed minor malachite and some pyritization, but soil samples were negative. From Ladies Creek to Roaring Creek heavy brush was encountered, and some exposures of granite were observed. At Browntop Mountain a large open area of exposed granite was prospected; nothing of interest was found. The east bank of Roaring Creek is very steep, but outcrops of pyritized schist, quartzite, and barren pegmatite dykes were examined. West of N'gger Creek more pyritized quartzite was found, and north of Nigger Creek minor amounts of copper stain were observed in quartzite. The underlying rock in the Levine Creek area is mainly granite. Sinbee Creek flows along the edge of an area in which the main outcrops are limestone; some minor pegmatite dykes were seen but much of the surface is heavily covered with debris. Up Cunningham Creek considerable soil sampling was done and a

shear zone and narrow quartz veins were examined. Some prospecting was done up Nolaka Creek but nothing of interest was reported.

In the Brodman Creek area and extending 1 mile west of Fraser River sedimentary rocks were encountered near a mapped aeromagnetic anomaly. Some prospecting was done west of Beaverdyke Creek, but nothing was reported. In the Hixon Creek valley some outcrops of granite were observed, but most of the terrain is covered with deep overburden. In the vicinity of Lightning and Cottonwood Creeks heavy debris was found. Some prospecting was done between Stanley and Wells where pyritized quartz veins were examined. In the vicinity of the old Cariboo Hudson mine mineralized quartz veins were sampled but the assays were very low.

Clinton Mining Division—A few miles north of Clinton, a shear zone along a granite contact was examined. At Leon Creek west of Clinton, malachite stain was found in both limestone and andesite. Near Jesmond, a mixed assemblage of rock exposures was reported—limestone, diorite, quartz diorite, granite, and volcanics showing minor copper mineralization. At Mud Lake, in the Lytton area, gossan exposures were sampled but no values were found. Near Dome Creek, outcrops of limestone, granite, and slate mineralized with iron pyrites and small garnets were reported.

Some prospecting was done in the limestone area near Pavilion Range but nothing of interest was reported.

Greenwood Mining Division — Some work was done southwest and west of Conkle Lake where the exposed rock is mainly coarse granite. Some schist, gneiss, and greenstone were also seen, and rusty stain along a granite-volcanics contact was examined. Minor mineralization of molybdenite was seen along several fractures in the granite. Nothing of importance was reported. An old molybdenite prospect in the Mud Creek area was examined.

Kamloops Mining Division — Extensive line-cutting and soil sampling were done on a group of claims directly across Adams Lake from Skwaam Bay. No information on this work is available. The area is underlain by schist, and high up above the lake a tunnel had been driven on a vein carrying values in gold and silver.

On the west side, near the south end of Adams Lake, pyritized schist was prospected and outcrops of slate, quartzite, and limestone were examined.

Some work was done from a new logging-road leading up to and beyond Thuya Lake—pyritized granite was sampled; sericite schist, breccia, and serpentine outcrops were examined. Minor mineralization was reported where granodiorite intruded light-coloured volcanics.

Outcrops of limestone were reported in the Salmon River area, and on the Salmon River flats, north of the river, serpentinized magnetic ultramafics showed some faulting; farther up the river valley shale and limestone outcrops occur, and some serpentinization was noticed.

Up the North Thompson River, in the Mann Creek area, shale and volcanics showing traces of copper mineralization were investigated, and outcrops of vesicular basalt and skarn were examined. On the north side of Barriere River, exposures of chert, diorite, and volcanic breccia were found. Five miles east of Barriere, in the Mount Borthwick area, a large number of rock types were reported. These included chert, pyritized limestone, jasper showing copper carbonate stain, greenstone, and minor amounts of hematite and amphibole. Some work was done near both McTaggart and Dunn Lakes but nothing of interest was reported.

Liard Mining Division—A prospector chartered a float plane at Fort Nelson and established a base camp on Chesterfield Lake, 120 air miles southwesterly from

Fort Nelson. Some prospecting was done in that area, and later near another small lake a short distance to the northeast. Unfortunately no report has been submitted on this work.

A party of three prospectors was flown from near Sawmill Point on Dease Lake to a small lake (now known as May Lake) lying about 80 air miles due east from Dease Lake, and about 5 miles northwest of the centre of Cry Lake. A base camp was established there and a large area of fairly open rugged territory was prospected. An occurrence of molybdenite disseminated in coarse granite received considerable attention. The mineralization occurs over a wide area, and sampling indicates commercial values across good widths. This mineral zone warrants further work. The area within a 5-mile radius of May Lake shows a wide range of rock occurrences. Granite is predominant but outcrops of schist, gneiss, white limestone, andesite, and light-coloured dykes also occur. Scattered minor mineralization of arsenopyrite and molybdenite was noted.

A base camp was set up on the southeast side of Cry Lake about half-way up the lake. Prospecting was done up to 9 miles back from the lakeshore over a fairly wide area. No specific topographical locations were given for the following reported rock exposures—granodiorite, limestone, schist, gneiss, pyritized slate, and pyritized volcanics. Some pyrrhotite was found associated with several of the outcroppings.

Some prospecting was done a short distance east of Dease Lake, working from camps along the Cassiar–Stewart road. The following brief information was submitted. In the Laketon area there are schist outcrops with narrow barren stringers of quartz; at Serpentine Creek the rocks are talcose schist, shale, and serpentine; at Hotel Creek the rock is schist with much surface debris; at Halfmoon Creek, schist and heavy overburden; Halfmoon Lake, quartz stringers in schist, gabbro, and argillite; along the upper Dease River, outcrops of basaltic rock; up Packer Tom Creek, granite and basalt; in Beady Creek valley, a mixture of rhyolite, gneiss, quartzite with minor amounts of magnetite and pyrite, and some basalt; at Porter Landing Mountain area, a few outcrops of basalt. A few miles east of Dease Lake the Eagle River area shows many granite outcrops. At the Cottonwood River crossing, outcrops of basalt occur occasionally throughout the heavy overburden.

On Boulder Creek on the west side of Dease Lake, outcrops of rusty granite and serpentine were examined. In the Thibert Creek valley, and close to Berry Creek, exposures of serpentine, slate, shale, vesicular basalt, and schist showing copper stain were reported.

A base camp was established at Meek Lake and a short time was spent prospecting the surrounding area. Basalt, shale with narrow quartz stringers, and some heavy pyritization were reported.

Eight miles east of Telegraph Creek small garnets and minor copper stain were observed in volcanic rock, and many outcrops of sedimentary rocks were reported.

Nanaimo Mining Division—Some prospecting was done at the west end of Buttle Lake on a shear zone showing minor amounts of copper carbonates. Basalt outcrops occur in the area and have associated with them quartz stringers and scattered specks of native copper.

Some work was done in the Nimpkish Lake area where an unsuccessful attempt was made to trace down the source of molybdenite float found in a creek. A short time was spent in the vicinity of Muchalat Lake where a claim was staked on a pyritized zone, but nothing of interest was reported. Near Mount Alston, mineralized float was picked up but the source of this was not located.

A base camp was established just west of Hushamu Creek which flows into Holberg Inlet 8 miles west of Coal Harbour. Geochemical sampling and geological mapping were done on a group of 18 mineral claims. Later similar work was done

on another group of 10 claims in the same general area. All the information from this work was incorporated on maps of the claims. Several interesting anomalous areas are indicated and further work should be done. A new area on the south side of Holberg Inlet also received some attention, but nothing of interest was reported here.

Nelson Mining Division—Some prospecting was done in the Bayonne mine area, close to both Blazed and Next Creeks, but nothing of interest was reported. In the Burnette Mountain area much overburden was encountered and outcrops of granite, diorite, and schist were examined. Along Cultus Creek talus slides showed much granite and diorite plus some dark-coloured shale and schist. Near Porcupine Creek, outcrops of quartzite and schist were common, and up Active Creek an old mine diggings was examined where some mineralization occurs in limestone and quartzite.

New Westminster Mining Division—Some field work was done near Mount Agassiz where sheared granite shows some mineralization of molybdenite, sphalerite, and chalcopyrite; outcrops of diorite and quartz diorite were also examined.

In the Harrison Lake area outcrops of pyritized limestone were prospected, and in the Slollicum Creek valley sheared schist and andesite showed some signs of copper mineralization; outcrops of quartz porphyry were also examined.

About 16 miles east of Hope, close to Ross Lake, an attempt was made to uncover a vein of high-grade galena, but no progress was possible. At the south end of Chilliwack Lake heavy overburden interfered with the work that was scheduled.

Some time was spent in the Boise Creek area (Boise Creek flows into the Pitt River about 9 miles north of Pitt Lake). Considerable soil sampling was done and rock chip samples were collected for further study. Results of this work are encouraging and more work will be done in the area at a later date.

Nicola Mining Division—Near Barton Hill, exposures of serpentine and soapstone were examined close to a medium-grained granitic intrusive. Near the headwaters of Nicola River, outcrops of serpentine showed some short fibre asbestos, and outcrops of coarse-grained granite were prospected.

Omineca Mining Division—Black Mountain, at the headwaters of the west fork of Byman Creek 8 miles northwest of Perow, was examined from a prospector's cabin about 1 mile northwest of Perow, and the following brief information was submitted. On the north slope of Black Mountain, outcrops of red andesite and dark-coloured basalt showing minor amounts of chalcopyrite and some copper carbonates were found; in a swampy area on the north side of Black Mountain outcrops of grey andesite were examined. On the west side of Black Mountain the area indicated on the aeromagnetic map as anomalous was prospected; minor mineralization of arsenopyrite and hematite was reported but nothing of importance was found where outcrops of andesite and dark-coloured basalt occurred. On the southwest side of Black Mountain commercial exposures of chalcopyrite occur in grey andesite. On the south slope, interesting dissemination of chalcopyrite and minor amounts of hematite were found along fractures in the volcanic rocks. The southeast slopes are covered with heavy undergrowth. The east slopes of Black Mountain are heavily forested; a few outcrops of red and black andesite showing minor amounts of chalcopyrite were examined and a few outcrops of greenstone and basalt were recorded. The slopes of the valley of Byman Creek close to the west fork show a variety of rocks—porphyritic gabbro, narrow lamprophyre dykes, and some mixed sedimentary and metamorphic rocks. At the top of Black Mountain, outcrops of altered volcanics occur.

North of the west end of Chuchi Lake some trail cutting was done, and silt and soil sampling was completed covering a wide area. Partly as a result of this work a strong mineralized zone was located. Trenching exposed strong mineralization of bornite with minor molybdenite in a diorite intrusive, further work found feldspar dykes and quartz stringers with minor chalcopyrite mineralization; the diorite is heavily pyritized. This discovery, in part made in 1969, is now under development by a mining company.

A short distance westerly from Witch Lake a group of mineral claims has been staked covering a wide area of disseminated copper mineralization. Several gossans were opened up, and both stream and soil sampling has been done. (An aeromagnetic anomaly is shown in this area.) Chalcopyrite occurs in tuff and in fractures in dacite. No sulphides are found in fine-grained andesite. This property is now under option to a mining company.

Another party staked claims on Chuchi Lake and did some prospecting at the east end of Witch Lake. No other information was submitted.

Some exploratory work was done off the road leading from Smithers to Smithers Landing (on Babine Lake), and the following information was submitted. At Little Joe Creek, and along McKendrick Creek, disseminated arsenopyrite was found in highly altered volcanics, and some pyritized slate was examined. On the southwest slope of Mount McKendrick outcrops of volcanics, basalt, andesite, and argillaceous rocks are exposed. From the east slope of Mount Hyland as far as Cronin Creek the rocks are basic volcanics and pyroclastics; near the top of Mount Hyland, outcrops of lightly pyritized volcanics and pyritized felsite were examined, and close to Doris Lake andesitic volcanics and quartz monzonite outcrops were found. Southeast of Smithers Landing much overburden was encountered and a few outcrops of basic volcanics and porphyry dykes were reported.

Northwest of Smithers Landing outcrops of porphyritic rhyolite occur. On the west shore of Babine Lake, opposite Newman Peninsula, and as far south as Bear Island, the rocks are conglomerate, basic volcanics cut by felsite dykes, shale, and sandstone. Some prospecting was done on the east side of Babine Lake from just north of Newman Peninsula up to the north end of the lake and including country adjacent to the Babine River where passable logging roads were utilized for access. The information submitted is quoted very briefly from prospectors' diaries. On McKendrick Island, pyritized hornfels and diorite dykes outcrop; south of McKendrick Island much heavy overburden, outcrops mainly sedimentary with some volcanics; opposite Newman Peninsula, basic volcanics; farther north, outcrops of dacite porphyry, volcanics, and felsite all gave negative geochemical tests. Some Granisle-type porphyry and pinkish-coloured volcanics were noted. East of Morrison Creek there were no rock outcrops and geochemical tests were negative. At the north end of the lake along the Fort Babine road, exposures of vuggy carbonate rocks, quartz porphyry, and a few medium-sized gossans were examined. North of French Peak, pyritized porphyry, east flank of French Peak, granite, porphyritic andesite, and quartz monzonite porphyry were found. Geochemical results were poor. On the southwest flank of Old Fort Mountain, unaltered shale, sandstone, and conglomerate were seen with some basic carbonaceous volcanics. Near Nilkitkwa Lake, there were granite, quartz porphyry, some breccia and pyritized hornfels, on which some geochemical work was done. The results were not reported. The east shoreline of Babine Lake at this point shows felsite porphyry, conglomerate, shale, amygdaloidal basalt, and 2 miles south of Fort Babine, hornfels porphyry with some quartzose dykes. The hills between Nilkitkwa and Clota Lakes show outcrops of sandstone; geochemical results were negative. North and northeast of Fort

Babine mostly sedimentary rocks were observed with much overburden. Three miles west of Nilkitkwa Lake, the outcrops are of granite and pyritized hornfels. Hills on the west side of Nilkitkwa Lake are all sedimentary rocks, limestone, and greywacke cut by syenite porphyry dykes. South of Tsezakwa Creek, outcrops are of gabbro, limestone, greywacke, shale, and volcanics and a few intruding monzonite porphyry dykes. On the east side of Babine Lake just north of Smithers Landing there are outcrops of volcanics, agglomerate, felsite porphyry, some sedimentary rocks, and quartz monzonite porphyry.

Some brief exploratory work was done west of Telkwa and the following information was submitted. In Telkwa River valley as far as Howson Creek there are coal-bearing sedimentary rocks, some granodiorite float, and no sulphides. West of Winfield Creek basic volcanics and sandstone are cut by granite porphyry dykes. In Goathorn Creek valley are coal-bearing sedimentary rocks. Up the valley are basic volcanics with a few narrow copper-bearing quartz stringers.

Some prospecting was also done in the Tahtsa Lake area; from Nadina Lake along the Tahtsa Lake forestry access road traces of molybdenite were seen in bleached porphyry type rock but most rock exposures are volcanic rocks interbedded with siltstone and sandstone. Along the south shore of Tahtsa Lake as far as Kasalka Creek some pyritized outcrops of quartz diorite were examined. All inflow creeks on the south side of Tahtsa Lake were silt sampled from Laventie Creek as far as the narrows but nothing of interest was reported. At both east and south sides of Rhine Ridge exposures of granodiorite were examined but no sign of either copper or molybdenite mineralization was found. Between Whiting and Comb Creeks many outcrops of lightly pyritized porphyritic quartz monzonite occur, and in Comb Creek valley exposures of andesitic and rhyolitic volcanics were seen. Iron pyrite is present in fractures in both rock types. Three miles north of Swing Peak outcrops of pyritized granite, quartz monzonite porphyry, and rhyolite were examined. Near Twinkle Lake exposures of volcanics, pyritized hornfels, and pyritized porphyry were prospected, and near Sibola Peak a pyritized feldspar porphyry stock and several gossans were seen.

Near Tagetochlain Lake a large anomalous area was located south of a quartz monzonite stock. In the vicinity of Nadina Lake, exposures of pyritized rhyolite, quartz diorite porphyry, porphyritic basalt flows, and pyritized andesite were reported. At Hill-Tout Lake heavily pyritized volcanics and pyritized porphyry showing minor copper mineralization were carefully prospected. Between Stepp Lake and Anzac Lake minor copper mineralization was investigated in a quartz monzonite stock. North of Tableland Mountain, outcrops of rhyolitic volcanics are common. Logging access roads in the Shelford Hills area and along the north side of Whitesail Lake show some exposures of granite.

Some work was done in the Morice Lake area. East of Nanika Mountain basic volcanics are intruded by coarse-grained granite; on the northwest side of Morice Lake toward Atna Bay are coarse-grained pinkish granite and some volcanics; opposite Atna Bay, a granite stock and some porphyritic basalt; on the southwest side of Atna Bay, pinkish granite and quartz monzonite; and on a high ridge above the bay, porphyritic rhyolite; at the northeast end of Morice Lake, outcrops of acidic volcanics. At Atna Lake west of Morice Lake the rocks were reported to be pyritized volcanics and heavily pyritized quartz monzonite; granodiorite intrusive into volcanics and sediments shows pyritization along fractures; nothing of economic interest was reported. Between Atna Lake and Stepp Lake, coarse-grained volcanic breccia, minor amounts of quartz latite, some fine to coarse-grained granite,

and quartz monzonite outcrops were reported. In the Lamprey Lake area, outcrops of sedimentary rocks and lightly pyritized volcanics were reported.

A helicopter reconnaissance trip was made from Tahtsa Lake to Clore River with brief landings for rock specimens and the sampling of gossan areas; no definite information is available regarding this work.

Another group of prospectors overlapped parts of the area just mentioned, and the information received from them includes the following brief items. At Shelford Hills, some soil sampling was done and a granite plug was prospected; where loose surface rock showed traces of copper mineralization some drilling and blasting were done, but the results were discouraging; samples were taken from rock exposures showing mineralization of magnetite and pyrite on the north slope of Shelford Hills but no values were found; outcrops of basalt, diorite, and andesite showing minor sulphides were examined.

Near Lindquist Lake, float containing both molybdenite and copper was picked up but the source of this was not found. Up Lindquist Creek a granite outcrop showed minor mineralization of molybdenite in narrow quartz stringers, and at Mount Bolom a gossan area showing pyrite in narrow quartz veinlets was sampled but no commercial values were found. At Core Mountain a fault zone showed sparse copper mineralization. In the Mosquito Hills area, rusty stained outcrops of basalt were examined, and near Wells Creek numerous exposures of basalt and several small gossans were noted.

One prospector working from a base near Wistaria furnished the following information: In Eng Lake area (between Ootsa and Francois Lakes) pyritized basalt shows some copper stain; between Ootsa and Eng Lakes are basalt and some perlite; at Sand Creek andesite and granite show minor chalcopyrite.

Along the south shore of Cheslatta Lake volcanic rocks outcrop for several miles and both agatized and opalized material is common; at the west end of the lake occurrences of perlite were prospected.

A short trip was made into the Bulkley River valley and geochemical work was done on the east slope from Kwun Creek to Causqua Creek where a few outcrops of both sedimentary and volcanic rocks occur in a heavily drift-covered area. Up the Kispiox valley as far as McCully Creek, outcrops are mainly sedimentary or volcanic rocks. On the road from Hazelton to Kisgegas, along an access road to the northwest flank of Babine Range, interesting float was found in several creeks.

At the end of the prospecting season certain anomalous portions of the above-mentioned areas were revisited, further sampling and prospecting were done, and some mineral claims were staked and recorded.

A base camp was established on a good logging access road at the junction of Suskwa and Natlan Creeks. This road leads across the Bulkley River a few miles east of Hazelton. Up Natlan Creek there is much overburden and very few rocks outcrop. At Thoen Mountain, outcrops of greywacke, conglomerate, siltstone, and intrusive diorite were examined. Near Netalzul Mountain, greywacke, diorite, breccia, and volcanic rock outcrops were reported. On the northeast slope of Blunt Mountain, volcanics and granite porphyry outcrops were examined. In the Harold Price Creek valley, andesite, tuff, breccia, and rhyolite occur. Close to Natlan Mountain, outcrops of greywacke, argillite, diorite, and granite were prospected.

Some exploratory work was done in the Terrace area and the following brief information was submitted: On Legate Creek, granite, limestone, quartzite, conglomerate, and some sparse mineralization of copper were seen; on Bornite Creek there is rich copper mineralization; on Granite Creek there is much coarse granite; on Zymoetz River there is some minor copper mineralization; on the west side of

Mount Thornhill there is pyritized granodiorite; and on Glacier Creek, granite; on St. Croix Creek there are argillite, conglomerate, and quartzite. No further information was furnished.

Osoyoos Mining Division—Some prospecting was done in the Trepanier Creek valley where exposures of quartz diorite, diorite, and granite show some pyritization with minor traces of copper.

Skeena Mining Division—At mile 73 on the Nass River logging-road north of Terrace, exposures of barren granite are common. Along the east side of Kitsumgallum Lake mainly granite was found, and along the west side iron-stained granite, argillite, and quartzite were found. Some copper mineralization was observed near Onion Lake. Near Port Edward, pyritized quartz shows some signs of chalcopyrite. Just east of Prince Rupert some coarse pyritized quartz was investigated, and at Kwinitsa, barren granite is common.

Slocan Mining Division—A base camp beside the Lardeau River 42 miles north of Kaslo was used as a headquarters in prospecting the reachable vicinity. The following general information was submitted: Tenderfoot Creek valley, narrow flat-dipping quartz stringers in a carbonated matrix show very little mineralization; heavily leached limonite gossans show considerable faulting and give low values in lead, zinc, and copper. At Mount Johnson, leached quartz stringers show minor amounts of molybdenite and spots of siderite and ankerite. The lower Mount Johnson area shows some limestone and quartz stringers with ankerite but no sulphides, and some oxidized zones in greenstone. Upper Mount Johnson area is underlain by limestone, and some surface outcrops of shear zones in graphitic shale were examined; at the south end of Mount Johnson are graphitic schists. East of Lardeau River close to base camp the ridges are mainly greenstone with lesser amounts of limestone and heavy overburden between outcrops. Near Lake Creek, a pyritized shear zone was prospected, and exposures of graphitic schist were examined. At Poplar Creek, granitic dykes were found in an area underlain by greenstone and flat-dipping sedimentary rocks. In the Cascade Creek area, brownish-coloured pyritized carbonaceous material was found to carry low gold values. Craig Creek (south end of Trout Lake) shows outcrops of barren altered serpentine.

Trail Creek Mining Division—Near Mud Lake, 21 miles northwest of Rossland, traces of rare earth minerals were found in rusty stained surface debris. Close to Nancy Greene Lake, heavy overburden was encountered and traces of copper were found in a gossan exposed near an outcrop of granite.

Vernon Mining Division — Some work was done in the Bouleau Lake area where coarse-grained volcanics are common, and where encouraging results were obtained from silt sampling. In the Salmon River valley many outcrops of volcanic rocks were seen and some signs of copper were investigated. In several side streams silt sampling was done, but the results of this work were negative. In Whiteman Creek valley outcrops of granite and granite porphyry were carefully prospected.

Considerable work was done in an area within a perimeter of 5 miles around Lightning Peak, and most was done at a high elevation in an alpine environment. The underlying rocks are mainly coarse-grained granite with minor amounts of basalt; spotty mineralization of hematite was seen. Parts of this area have been burned over, and there are many rock exposures. In Rendell Creek valley, outcrops of granite, sandstone, and limestone were examined; the few quartz veins associated with the granite were barren. Heavy overburden was encountered in the valley bottoms. Close to Goatskin Creek, a few outcrops of basalt and peridotite were noticed, and some galena float was picked up, but the source of this was not found. In a deep gulch close to Rampals Creek, outcrops of granite, andesite, and basalt were examined, and more galena float was picked up but again the source was not found.

Some prospecting was done near Mabel Lake. The streams along the east side of the lake as far as Tsuius Creek were sampled and similar work was done along the road following Wap Creek from Iron Creek past Wap Lake north to South Pass Creek and on to Three Valley and Highway 1. Along Iron Creek considerable metamorphism was encountered in both gneiss and schist, and some crystalline graphite was found in these rocks. Further work is contemplated in the area if soil and stream sampling results are favourable.

Victoria Mining Division—In the Jack Elliott Creek area (close to Port Renfrew) some drilling, blasting, and sampling were done along a shear zone in volcanic rocks but assays of samples taken were very low. Some soil samples were also taken where the underlying rocks were mica schist but the results were poor. Near Harris Creek copper float was found and some soil sampling was done but nothing of interest was reported. Soil sampling was also done in the Sombrio River area; results were nil. Up Fairy Creek, slate showing minor copper mineralization was investigated. Near Lizard Lake an outcrop of coarse-grained limestone was drilled and blasted and outcrops of quarzite were prospected but nothing of interest was reported.

MINERALOGICAL BRANCH

The function of the Mineralogical Branch is to assist in the orderly exploration, development, and use of the Province's coal and mineral resources, and to provide information to Government and industry on the quantity and distribution of the coal and mineral resources of the Province. The Branch makes a variety of geological studies, publishes data concerning mineral deposits, makes mineral potential appraisals of land, collects, stores, and disseminates geological and statistical data, and records the activities of the industry. The Branch is capable of making mineral assessments and of supplying general geological information as well as specific information regarding mineral deposits, mineral resources, and the mineral industry. It provides rock and mineral identifications, contributes lectures in courses on prospecting, participates in scientific meetings, and arranges educational exhibits.

The Branch recently has been reorganized into a Mineral Resources Section, an Economic Geology Section, and a Publications and Technical Services Section.

Field work by geologists of the Branch includes areal geological mapping and study of mineral deposits principally in areas of recognized mineral potential and examination of properties of current exploration interest. Geologists may also map areas of unknown potential for the specific purposes of making assessments of mineral potential prior to establishing mineral reserves for parks or ecological reserves and for land use decisions. The results of major mapping projects are published in a series of bulletins; shorter reports are published in "Geology, Exploration, and Mining in British Columbia," a new annual publication first instituted in 1969.

Editing of the Annual Report of the Minister of Mines and Petroleum Resources and of "Geology, Exploration, and Mining in British Columbia" formerly the responsibility of Stuart S. Holland will be undertaken by J. W. McCammon. Copy for printing is prepared by and under the direction of Mrs. Rosalyn J. Moir.

STAFF

On December 31, 1970, the professional staff included the following geologists:

Stuart S. Holland	Chief of the Branch
A. Sutherland Brown	Geologist
N. C. Carter	Geologist
B. N. Church	Geologist
G. E. P. Eastwood	Geologist

James T. Fyles	Geologist
J. A. Garnett	Geologist
E. W. Grove	Geologist
E. V. Jackson	Geologist
J. W. McCammon	Geologist
W. J. McMillan	Geologist
K. E. Northcote	Geologist
V. A. G. Preto	Geologist
A. F. Shepherd	Geologist

All but three are registered professional engineers and these have applied for registration. Eight have been awarded a Ph.D. degree and two are completing work for that degree.

Staff Changes

M. S. Hedley, Chief of the Branch, retired on May 31 after 34 years' service with the Department.

Stuart S. Holland was appointed Chief of the Branch on June 1.

J. A. Garnett, geologist, a graduate of the University of New Brunswick, joined the staff on September 3, 1970.

Field Work, 1970 Season

A. Sutherland Brown examined copper-molybdenum properties in various parts of the Province.

N. C. Carter made 22 property examinations mostly in the Terrace, Smithers, and Manson River areas.

B. N. Church examined the Dusty Mac and Lexington properties in southern British Columbia and completed his study of the Owen Lake-Goosly Lake area south of Houston.

James T. Fyles made a number of property examinations in the Kootenay area and supervised R. I. Thompson's work in the vicinity of the Wigwam property.

G. E. P. Eastwood examined the Bon property near Bonanza Lake, Vancouver Island.

J. A. Garnett, for orientation, accompanied N. C. Carter while examining mineral properties in the Manson Creek area.

E. W. Grove began collecting samples for a geochemical study of the Guichon Creek Batholith and examined properties in the Stewart area.

J. W. McCammon examined gravel pits and quarries on Vancouver Island and in southern British Columbia and limestone, saline, hydromagnesite, and silica deposits throughout the Province.

W. J. McMillan with five assistants continued detailed geological mapping of the Guichon Creek Batholith in the Highland Valley area.

K. E. Northcote, with six assistants, completed the geological mapping of the area between Rupert Inlet and Cape Scott and examined four mineral properties elsewhere on Vancouver Island.

V. A. G. Preto examined mineral properties and made a geological reconnaissance in the Bonaparte Lake-Clearwater area.

Sixteen geological field assistants were employed on the various projects.

Publications

Technical reports of the Mineralogical Branch were published in *Geology, Exploration, and Mining in British Columbia, 1970*. Bulletin 57, *Jordan River Area* by James T. Fyles was also published.

Six scientific reports and papers resulting directly from their work as staff geologists were also published by officers of the Branch.

Three preliminary geological maps were released in 1970. Preliminary mineral inventory maps covering 18 N.T.S. sheets were also released during the year. Details of this material may be obtained from the Chief of the Mineralogical Branch, Department of Mines and Petroleum Resources, Douglas Building, Victoria.

Airborne Magnetometer Mapping

The programme of airborne magnetometer mapping, jointly financed by the Geological Survey of Canada and the British Columbia Department of Mines and Petroleum Resources, continued in 1970.

The 30 aeromagnetic maps released in 1970 are as follows:

Release Date	No.	Scale	Location
February 25, 1970	20	1 inch=1 mile	Central British Columbia
May 28, 1970	10	1 inch=1 mile	Central British Columbia

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 (Earth Physics 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, RR 7, Victoria.

Rock and Mineral Sets

Sets of rocks and minerals are available for sale to prospectors, schools, and residents of British Columbia. Information regarding them may be obtained from the Chief of the Mineralogical Branch, Douglas Building, Victoria.

PETROLEUM AND NATURAL GAS BRANCH

The Petroleum and Natural Gas Branch is responsible for the administration of Part XII of the *Petroleum and Natural Gas Act, 1965,* and the Drilling and Production Regulations made thereunder.

The regulations provide for the use of efficient and safe practices in the drilling, completion, and abandonment of wells; for the orderly development of fields dis-

covered within the Province; and for the conservation and prevention of waste of oil and natural gas within the reservoir and during production operations.

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 are available for study. 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.

Administration

The Petroleum and Natural Gas Branch is subdivided for administrative purposes into four sections. These sections and their supervisors are as follows: Development Engineering, W. L. Ingram; Reservoir Engineering, A. J. Dingley; Exploration Geology, S. S. Cosburn; and Economic Geology, W. M. Young.

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
W. M. Young	Senior Economic Geologist
K. A. McAdam	Economic Geologist
T. B. Ramsay	Economic Geologist
J. Y. Smith	Economic Geologist
S. S. Cosburn	Senior Exploration Geologist
D. L. Griffin (until April 30)	Petroleum Geologist

Field Office, Charlie Lake

D. L. Johnson	District Engineer
T. B. Smith	Field Engineer
D. A. Selby	Field Technician
G. T. Mohler	Field Technician
W. B. Holland	Field Technician
L. A. Gingras	Field Technician

Staff Changes

W. M. Young, Senior Economic Geologist, joined the staff on February 23.
D. L. Griffin, Petroleum Geologist, resigned, effective May 1.
K. A. McAdam, Economic Geologist, joined the staff on September 21.

Board of Arbitration

Chairman: A. W. Hobbs, Q.C., 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, 1965,* grants right of entry to 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.

In 1970, 29 applications for right of entry were submitted to the Board. Of these seven were withdrawn, 20 resulted in the issuance of one or more than one right-of-entry order and two are held on file pending further action by the applicant.

The Board of Arbitration plans a sitting at Fort St. John during the summer of 1971 after which compensation-award orders will be made which should bring all of the work of the Board completely up to date.

Conservation Committee

Chairman: K. B. Blakey, Deputy Minister of Mines and Petroleum Resources.

Member: 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 1970.

PUBLICATIONS

A list of the publications of the Department of Mines and Petroleum Resources is available free on request to the Chief of the Mineralogical Branch or Chief of the Petroleum and Natural Gas Branch, Douglas Building, Victoria.

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.

Petroleum and Natural Gas

CHAPTER 4

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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, 1965* 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 $16,339,801.19, a decrease of $5,306,650.35 from the record high of the previous year. A total of 413 parcels were offered and bids were accepted on 224 parcels covering 1,990,070 acres. The average price per acre was $8.21 which is an increase of .05 cent per acre over the previous year. Average bonus price per acre was respectively—permits, $5.51; leases, $52.11; drilling reservations, $10.84.

During the year 29 geophysical licences were renewed or issued.

During the year five petroleum development road applications were received and processed for approval.

A total of 132 notices of commencement of exploratory work was recorded during the year. These notices are required prior to the commencement of any geological or geophysical exploration for petroleum or natural gas.

During the year three unit agreements and two royalty agreements were approved.

As at December 31, 1970, 29,910,495 acres, or approximately 46,735 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	426	21,379,461
Natural-gas licences	.....	.....
Drilling reservations	26	292,402
Leases (all types)	3,680	8,238,632
Total		29,910,495

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 1961–1970, inclusive, are included in this report.

Title Transaction Statistics, 1970

	Permits		Leases		Drilling Reservations		Natural Gas Licences	
	No.	Acres	No.	Acres	No.	Acres	No.	Acres
Issued	57	2,169,837	219	225,454	19	168,437	....	.....
Cancelled or surrendered	156	12,030,080	429	1,260,649	24	236,491	....	.....
Renewed or extended	369	.....	3458	.....	1	.....	....	.....
Assigned	81	.....	767	.....	4	.....	....	.....
Acreage amendments	11	654,266	51	100,770	....	.....	....	.....
Crown reserve disposition	38	1,725,526	167	96,107	19	168,437	....	.....

Petroleum and Natural Gas Revenue, 1970

Rentals and fees—		
Permits	$1,426,447.58	
Drilling reservations	48,156.20	
Natural gas licences		
Petroleum, natural gas, and petroleum and natural gas leases	7,699,844.21	
Total rentals and fees		$9,174,447.99
Disposal of Crown reserves—		
Permits	$9,506,074.09	
Drilling reservations	1,825,403.90	
Leases	5,008,323.20	
Total Crown reserve disposal		16,339,801.19
Royalties—		
Gas	$3,948,355.34	
Oil	9,483,937.25	
Processed products	42,314.03	
Total royalties		13,474,606.62
Miscellaneous fees		21,843.23
Total petroleum and natural gas revenues		$39,010,699.03

Details of yearly revenue, 1947–1960, inclusive, are tabled on page A 61 of the Annual Report for 1960. Details of yearly revenue from 1961–1970, inclusive, are included in this report.

Administration of the *Petroleum and Natural Gas Act, 1965* 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, 1961–1970

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
	Acres	Acres	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	31,893,990	21,379,461
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	8,837,265	7,765,668
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	475,419	472,964
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	350,546	292,402
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	41,557,220	29,910,495

Petroleum and Natural Gas Revenue, 1947–1970

	Cumulative, 1947–1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	Cumulative 1947–1970
Rentals and Fees	$	$	$	$	$	$	$	$	$	$	$
Permits	32,076,856	2,138,070	1,638,748	1,302,305	1,176,501	1,661,591	1,369,232	1,184,457	1,772,064	1,426,448	45,746,272
Drilling reservations	278,196	126,149	121,632	64,800	114,483	113,496	86,303	87,759	79,796	48,156	1,120,770
Natural gas licences	56,964	2,086	4,738	———	———	1,466	———	———	———	———	65,254
Leases (all)	10,273,218	4,916,971	5,957,533	7,077,488	7,013,187	8,432,386	8,901,196	9,349,480	8,488,114	7,699,844	78,109,417
Total rentals	42,685,234	7,183,276	7,722,651	8,444,593	8,304,171	10,208,939	10,356,731	10,621,696	10,339,974	9,174,448	125,041,713
Crown Reserve Disposition Bonuses											
Permits	14,367,729	1,208,400	79,519	721,193	1,825,322	6,982,439	8,428,409	9,554,004	16,516,392	9,506,074	69,189,481
Drilling reservations	6,296,007	3,067,675	1,585,935	1,541,685	3,278,641	4,657,510	3,013,979	1,785,527	1,394,215	1,825,404	28,446,578
Leases	12,259,049	7,088,659	5,426,555	10,830,994	13,057,470	4,199,528	2,855,428	3,737,489	3,735,845	5,008,323	68,199,340
Crown Reserve disposition total	32,922,785	11,364,734	7,092,009	13,093,872	18,161,433	15,839,477	14,297,816	15,077,020	21,646,452	16,339,801	165,835,399
Crown Royalties											
Gas	3,003,560	1,260,419	1,531,977	1,583,292	1,682,444	2,256,725	2,870,656	3,217,227	3,730,634	3,948,356	25,085,290
Oil	939,891	2,265,167	3,858,985	3,502,222	3,697,668	5,449,663	6,678,245	7,677,405	9,017,352	9,483,937	52,570,535
Processed products	327,567	108,737	115,042	104,990	93,226	61,568	58,536	50,762	48,847	42,314	1,011,589
Crown royalties total	4,271,018	3,634,323	5,506,004	5,190,504	5,473,338	7,767,956	9,607,437	10,945,394	12,796,833	13,474,607	78,667,414
Miscellaneous fees	103,080	31,950	29,376	26,851	17,790	18,073	17,917	17,955	19,025	21,843	304,460
Total petroleum and natural gas revenue	79,982,117	22,214,283	20,350,040	26,755,820	31,956,732	33,834,445	34,279,901	36,662,065	44,802,884	39,010,699	369,848,986

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 Drilling and Production Regulations. 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

Moderate increases were made in all phases of British Columbia's petroleum industry during 1970. Drilling operations increased about 3 per cent over 1969, while production of natural gas continued its steady annual rise of 6 per cent. Crude oil production recorded a nominal increase of less than 1 per cent.

A significant change in the type of drilling was noted as development footage was down 12 per cent to 382,497 feet while exploratory footage gained nearly 20 per cent. Exploratory footages drilled were 223,701 feet at outpost locations and 297,470 feet for those classified as wildcat locations. A Provincial total of 903,668 feet was drilled. The distribution of the type of footage accomplished is indicative that areas for concentrated development drilling were not available and the oil companies devoted their efforts to seek new fields.

The number of well completions during 1970 was 180, consisting of 90 abandonments, 53 gas wells, 34 oil wells, and three wells drilled for other purposes. The relatively high success ratio (50 per cent) for British Columbia wells was again maintained during 1970.

Geologically the objectives of the wells drilled were Devonian gas in the northern areas with oil and gas prospects explored in the Lower Cretaceous and Triassic in the southern half of the known potential area. A notable discovery was made at ARCo Pacific FPC Grassy a-A75-D. This well found a Mississippian gas pool within the disturbed belt of the foothills area and is expected to attract considerable interest and drilling in the future.

Production of oil and gas during 1970 was 25,361,336 barrels of crude oil and 344,986,194 MSCF of natural gas respectively.

At the end of 1970 the Petroleum and Natural Gas Branch estimates of reserves were as follows:

Proved crude oil	231,159 MSTB
Probable crude oil	94,623 MSTB
Established raw gas	9,972.7 BSCF
Established residue gas	8,652.2 BSCF
Natural gas liquids	111,850 MSTB
Sulphur	4,064 MLT

FIELD OFFICE

The field office of the Department of Mines and Petroleum Resources is located at Charlie Lake, British Columbia, near Mile 52 on the Alaska Highway. A suboffice located in the Provincial Building at Fort Nelson is used periodically by the field staff.

The field office is responsible for enforcement at field level of the Drilling and Production Regulations.

The Provincial standard for subsurface pressure-gauge calibration is located at the Charlie Lake field office. During 1970, 868 pressure gauges were calibrated and the results calculated, without charge, with a copy of the said calibrations for-

warded to the respective companies. This service increased in volume by 87 per cent over 1969.

During 1970, seven vehicles were driven 141,609 miles to conduct inspections, and (or) perform surveys pertaining to the drilling and production phases of the oil and gas industry.

A specialized wireline truck was employed to conduct surveys on 95 producing wells. These surveys are used to both check and supplement pressure data submitted by operating companies.

Expanded sales of oil and gas necessitated a large number of inspections on gas meters. Complete meter calibrations were performed on 473 gas meters, for an increase of 185 per cent over 1969. In addition to this, 691 gas meters were fast checked to ensure proper meter operation and as a means of ensuring that wells were not being overproduced. Seventy-four absolute open flow potential tests were witnessed on natural gas wells, and 12 tests were carried out at oil-producing sites to verify production characteristics.

Surface production equipment, storage facilities, and production batteries were inspected on 473 occasions. During 1970, 2,442 producing or abandoned leases were inspected. This large increase of inspections, both at lease and battery sites, is largely attributable to attempts to discover possible sources of pollution and if discovered, to have the problem remedied as quickly as possible. To put this into a different perspective, it is reasonable to say that one-third of the time spent by the field staff was directed toward eliminating sources of pollution from either produced water or hydrocarbons.

Inspections were carried out at 225 drilling sites. During 1970, blow-out drills were initiated, whereby during routine rig inspections, not only were the physical components of the blow-out prevention system checked, but also a drill was performed to ensure that the rig crew was capable of operating this equipment under emergency conditions.

GEOLOGICAL SECTION

During 1970, 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 evaluations, 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 13. 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) deep-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.

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 1970, 1,206 boxes of core from 79 wells were received at the laboratory. At the end of 1970, 29,634 boxes from 1,763 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 1970 the Charlie Lake sample library contained 715,919 samples, while 714,280 samples were retained in the Victoria library.

During 1970, samples were received at the laboratory from 178 wells. A total of 48,555 10-foot samples was washed and bottled in 1970.

Core and Sample Examination

A nominal fee is charged for the use of core- and sample-examination facilities provided by the Department.

In 1970, 7,645 boxes of core from 466 wells were studied by oil company personnel and other interested individuals. Cores from 33 wells were temporarily removed from the laboratory by the operators for further studies. Samples from 49 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, 76,484 boxes of core have been removed from the racks for examination.

Exploration

In northeastern British Columbia during 1970, 24 oil and gas companies employed seismic crews for a total of 145 crew weeks. During February, the most active month, 14 crews were working. Three companies ran gravity surveys in northeastern British Columbia—one of these companies also completed a ground magnetometer survey.

In the Fernie area four companies did seismic work, one of these companies also flew an aeromagnetic survey there. One company employed a seismic crew in the Chilcotin for part of April and May.

Surface geological parties worked in northeastern British Columbia, Fernie area, Bowser Basin and on Graham Island. These exploration activities are listed in Tables 14 and 15.

During 1970, 96 work-requirement reports on oil and gas permits or leases were submitted to the Department by oil and gas companies. These reports represent exploration expenditures of over $10 million dollars for work done by the companies in sedimentary basins of British Columbia and they contain comprehensive geophysical and geologic coverage. Most of the reports were on seismic-reflection work done in northeastern British Columbia during 1969 and 1970. Other types of exploration reported on for northeastern British Columbia and other basins in the Province included seismic refraction, marine seismic, surface geology, photogeology, magnetometer, and gravity.

Except for one exploratory test in the Howell Creek area of the Fernie Basin all the drilling for oil and gas was confined to northeastern British Columbia.

Exploratory drilling resulted in a total of 11 discoveries, all of which were completed as potential gas wells.

New pool wildcat drilling for oil within the Peejay-Milligan Creek Halfway trend area resulted in four Halfway Formation gas completions. Upper Devonian gas was encountered in the Jean-Marie at the Placid Hunt Amoco Niteal a-58-E/94-I-3 well. The DiaSham IOE Kyklo b-43-F/94-I-11 wildcat was completed as a potential gas well in the Slave Point Formation.

A significant Mississippian Debolt gas discovery appears to have been made at the ARCo Pacific FPC Grassy a-A75-D/94-G-7 location. The discovery well, which encountered a considerable thickness of gas bearing section, is located within the disturbed belt of the foothills between the Pocketknife and Pink Mountain structural anticlines.

Development drilling resulted in 37 gas and 33 oil wells respectively for a total of 70 successful completions. Most of the development activity continued within the Inga and Milligan Creek fields for Inga and Halfway oil. A few Bluesky-Gething and Belloy oil completions resulted in drilling at the Beatton River West and Stoddart fields. Several oil completions also resulted from "In-fill" drilling at the Boundary Lake field.

Gas development continued in the Dahl area with six successful Bluesky-Gething gas completions. The Dunlevy of the Buick Creek field was successfully extended to the south and east with several gas completions. Eight potential gas wells were completed within the established limits of the Middle Devonian Slave and Pine Point developments. The Middle Devonian gas of the Beaver River field was extended to the southwest with one successful completion. Considerable development activity took place in the Stoddart West field which resulted in several successful Belloy gas completions. The few remaining gas wells successfully completed during the year were developed on the periphery of established Baldonnel and Halfway gas fields.

Gas Discoveries, 1970

Well Authorization No.	Well Name	Total Depth (Ft.)	Status
	Mesozoic		
2588	Pacific Kobes d-57-A/94-B-9	5,875	Charlie Lake gas.
2603	ARCo et al E Bulrush d-93-F/94-A-16	3,710	Halfway gas.
2620	Pacific N Cache 11-10-88-22	6,600	Halfway gas.
2664	Union HB Spruce d-74-E/94-A-16	3,940	Halfway gas.
2712	BO&G et al Elm d-83-C/94-H-7	3,910	Halfway gas.
2779	Pacific S Julienne b-70-K/94-B-16	6,200	Halfway gas.
2789	Apache DiaSham et al W Weasel d-18-B/94-H-2	4,030	Halfway gas.
	Palæozoic		
2777	Apache Woods W Stoddart 10-14-87-21	6,590	Belloy gas.
2687	ARCo Pacific FPC Grassy a-A75-D/94-G-7	6,585	Debolt gas.
2611	Placid Hunt Amoco Niteal a-58-E/94-I-3	8,450	Jean Marie gas.
2600	DiaSham IOE Kyklo b-43-F/94-I-11	6,340	Slave Point gas.

RESERVOIR ENGINEERING SECTION

A. 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. These parameters are used in studies to forecast the oil and gas recoverable from hydrocarbon accumulation in the Province. The results from such 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.

B. Oil Allowables, MPRs, and Improved Recovery Schemes

Maximum permissive rates (MPRs) 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 MPRs. Single-well MPRs are based on well-bore net-pay properties, while project MPRs are derived from mapped pore volume data and the estimated recovery factor for the production scheme in effect.

Monthly oil allowables are established from MPR values, and periodic checks are made to ensure that wells and projects are being produced in accordance with regulations governing overproduction. Division 74.03 of the Drilling and Production Regulations provides for the carry-forward of oil allowable underproduction from one production period to the next, provided this is due to forces outside the control of the operator involved. During the year only one request for such a carry-forward was approved.

Table 16 presents the individual well and project MPRs in effect as of December 31, 1970. The areas included into projects or units are shown on Maps 1, 2, 3, 6, 7, 9, 11, 12, 13, 17, 20, 22, 23, and 24.

During 1970, in addition to the individual well MPRs assigned or revised, modifications were made to the MPRs or operating schemes for a number of projects.

Peejay Unit 3 was enlarged at the beginning of January, to include the acreage previously operated as the Tenneco Peejay project. Lease-line drainage problems provided the impetus for this amalgamation, as discussed in the 1969 Annual Report. Following enlargement, the interim MPR for Unit 3 was increased proportionately.

In April, Pacific Petroleums Ltd. was given approval for an increase in the number of water-injection wells from one to two in Currant Unit 1. It was expected that a better balanced-withdrawal operation would be possible with this modification.

Approval was also granted, in July, for a modification to the waterflood scheme operated in Inga Unit 1. In order to achieve better areal coverage of the injected water, and to compensate for a developing pressure sink, one additional injection well was approved together with substitute injection locations for two injectors previously approved in 1968. Further modifications to the Inga Unit 1 waterflood scheme were approved during the year so that concurrent production of the main gas cap could take place. The application for this scheme was received in February, and was the outcome of the negotiations between the Branch and the working-interest owners in the area mentioned in the 1969 Annual Report. After considerable technical review and discussion approval was granted in June, subject to certain conditions. Major amongst these were requirements for: The gas-cap area to be unitized under the operatorship of Canadian Superior Oil Ltd., additional water injection into the Unit 1 area, gas production to be limited to 3650 MMSCF/Y producible from wells in the extreme north of the gas cap, and comprehensive monitoring of reservoir pressure performance in the gas cap. The first requirement was necessary in order that operations in the oil pool (Inga Unit 1) and the gas cap could be fully co-ordinated, and was effected with the formation of Inga Unit 3 on July 1, 1970. Additional injection-water volumes became available following construction of a dam across Coplin Creek in April, and in September an agreement was entered into between the owners of Inga Units 1 and 3 to provide for water injection into Unit 1 on account of Unit 3. At year-end, additional water-injection plant was being delivered, with the expectation that concurrent gas production from Inga Unit 3 would start during the first quarter of 1971.

Concurrent production of gas from the Milligan Creek Unit 1 was the subject of an application by Union Oil Company of Canada in April. The application was withdrawn in May, pending further evaluation of the scheme by Union. This was due to the fact that the gas spacing area of the proposed production well had not been pooled, and also because we had serious reservations concerning the representativeness of computer model results used in support of the application. As of year-end no further developments had occurred with respect to this proposal.

In June, an application was received from Monsanto Oils Ltd. for permission to return to the formation, gas produced with oil from the Charlie Lake oil pool, Bear Flat field. To reflect the increased recovery efficiency, a project MPR of 527 BOPD was requested, to become effective following implementation of the scheme. Following our review, the scheme was approved in July. Under the terms of the approval, all gas produced in excess of that required for lease fuel is to be injected into the pool gas cap, and credit will be granted for this gas in the calculation of gas-oil ratio penalty factors applied to oil production from the pool. A project MPR of 286 BOPD was assigned to the scheme, and this became effective on November 7, 1970, following installation of compression equipment and the commencement of gas injection. This MPR was considerably less than that applied for, since the Branch's interpretation of the reservoir data and pressure-production performance history was substantially different than that of the applicant.

Pacific Petroleums Ltd. made application in September for the removal of MPRs and gas-oil ratio penalties from wells producing from the Charlie Lake oil

pool in the Fort St. John field. The basis for this application was a simultaneous application for approval to install a gathering system to collect for sale all gas produced with the oil and previously flared. The gas-gathering scheme was approved in November; the removal of MPRs and gas-oil ratio penalties was not. It was suggested to Pacific that, subject to the formation of a unit and the implementation of the proposed gas-gathering scheme, the Branch would be receptive to an application for a project MPR of 334 BOPD and for gas-oil ratio penalties to be based on Table 2000 of the schedule of gas-oil ratio adjustment factors included in the Drilling and Production Regulations. It was pointed out that application of this schedule would be for an initial period of three years. It was considered that operation of the pool in this manner would optimise the hydrocarbon recovery. By year-end negotiations were well advanced with respect to the formation of a unit. Implementation of the gas-gathering scheme, and application for the project MPR and gas-oil ratio penalty schedule suggested, were expected during the first half of 1971.

During July, Amoco Canada Petroleum Ltd. applied, as operator of the proposed Inga Unit 2, for permission to install a waterflood scheme following unitization. By year-end, verbal approval in principle was granted, but a final decision respecting details of the proposed scheme was awaiting development of a suitable injection-water source and firm plans from the operator regarding disposition of the associated gas production. In the meantime, the unit was formed on September 1, 1970, at which time an interim primary project MPR of 3100 BOPD was assigned. This was finalised at 2876 BOPD on September 15, 1970, following detailed analysis of the relevant reservoir parameters. The unit was subsequently enlarged on December 1, 1970, at which time the project MPR was modified to 2945 BOPD.

In August, an application was received from Union Oil Company of Canada Ltd., for approval of a waterflood scheme in the proposed Crush Unit 1. The scheme was approved in September, subject to certain conditions including the successful formation of the unit. A waterflood project MPR of 1383 BOPD was assigned in October, to become effective with commencement of water injection. The unit was formed on October 1, 1970, but equipment problems in the source-water system at Peejay delayed the start of injection. At year-end injection had not started and wells in the unit were being produced in accordance with their individual primary MPRs.

An application was received in February from Wainoco Oil and Chemicals Ltd., requesting approval of an annual oil allowable for the well located in 4-23-82-22 W6M. This well is completed in the Charlie Lake pool in the two-well Moberly Lake field. Basis for the application was the difficulty being experienced in maintaining operations in the remote location, which necessitates shipping by tank truck, railcar and tank truck again. Consequently, inclement weather causes shut-in of the well and corresponding loss of revenue to the Crown and well-owner. Reserves of the pool are insufficient to support a pipe-line. It was considered that production to an annual allowable would not be detrimental to reservoir performance and would cause no inequities as far as other operators were concerned. Thus approval was granted, subject to a maximum daily limitation of 50 BOPD.

c. Associated and Solution Gas Conservation Schemes

Solution gas is always produced as a by-product of oil production. This gas is dissolved in the oil at reservoir pressure and temperature conditions, but due to decreases in these parameters as the oil is brought to the surface much of the dissolved gas is evolved. In many cases the volume of this gas, in excess of lease equipment fuel requirements, is so small that it is not economical to install gathering

facilities to market the gas. This excess gas is flared. Many oil pools are discovered in which the oil is originally overlain with gas, known as a gas cap. It is often impossible to produce the oil without also producing some gas-cap gas, in addition to the solution gas. This could be detrimental from the point of view of ultimate oil recovery, since production of the gas cap reduces the reservoir energy available to produce the oil.

Gas produced with oil can be conserved in two ways; either it can be collected and marketed, or it can be collected and injected back into the producing reservoir or a storage zone. Conservation is encouraged by incentives. In the case of schemes with marginal economics, a reduced royalty rate may be applied to gas that is sold. Wells or projects that produce with a gas-oil ratio in excess of 1000 SCF/STB have their allowable reduced by a factor which is dependent on the level of gas-oil ratio (Division 89, Drilling and Production Regulations). This factor may be modified if the gas is conserved, either by reinjection or by marketing. However in the case that gas-cap gas is to be marketed the Branch needs to be satisfied that such concurrent production will not be harmful to ultimate oil recovery, for example the case of the application to concurrently produce the gas cap to Milligan Creek Unit 1, discussed in Section B.

At the beginning of 1970, two conservation schemes were in operation that marketed solution gas, and five projects involving return of gas to the producing reservoir were active. The gas-injection projects are included in Table 16. The schemes involving gas sales were in effect in the Boundary Lake and Blueberry fields. In the latter, solution gas from the Pacific-operated Debolt pool project is collected and compressed along with gas-well gas from other pools in the field. Gas not used as fuel or flared is then either delivered to the sales gas system or used for gas-lifting individual oil wells. The Boundary Lake system comprises a gas-treating plant (for extraction of liquids), and services oil wells in the four waterflood projects producing from the Boundary Lake Sand in this field.

A previously approved gas-sales type conservation scheme involving Dunlevy Sand oil wells in a portion of the Rigel field (*see* Map 22) came on stream during March. During the year, schemes of this type were approved for Inga Unit 3 and the proposed Charlie Lake Pool Unit in the Fort St. John field, as discussed in Section B. In addition, a gas-injection type scheme was approved for the Charlie Lake oil pool in the Bear Flat field, also discussed in Section B.

At the end of 1969, two gas-conservation applications were under review by the Reservoir Engineering Section. Details were presented in the 1969 Annual Report. Basically the schemes involved the construction of the Northeast British Columbia Gas Gathering System for the express purpose of collecting associated gas production from fields along its route, and the implementation in Inga Unit 1 of a solution-gas gathering system. Both schemes were approved during January. The Inga system became operational in February.

At the end of January all operators having oil production in the area served by the Northeast British Columbia Gas Gathering System were requested to inform the Branch whether or not they intended to deliver associated gas to the system. Economic justification was requested to support nonconservation from any pool. A number of pools fell into this latter category, and our analyses confirmed the operators' contentions that collection and sale of the associated gas could not be justified, with the exception of Peejay Unit 3. The majority of the working interest owners of this unit claimed that it was not feasible to gather the associated gas for sale. On the other hand, the unit operator and ourselves were of the opinion that such a scheme could be viable. Considerable technical discussion on the subject took place during the year and at year-end the matter was still not completely resolved. Depending

on the implementation or not of a gas gathering system in Peejay Unit 3 were systems planned for Peejay Unit 1 and the Peejay Pacific/Arco project; a joint system with Unit 3 was the most economic scheme for these projects.

In the meantime gas-sales conservation schemes were approved for the Halfway pool of the Crush field, Milligan Creek Unit 1 (gas injection ceased at the end of 1969), Union Oil's Halfway project of the Wildmint field, and Peejay Unit 2. These schemes went into operation in May, June, May, and July respectively. A scheme was also approved for Weasel Unit 1, under which associated gas production was to be collected, compressed and then split into two flow streams. One stream was to carry gas to the Northeast British Columbia Gas Gathering System, while the other would connect with the existing gas-injection well in the gas cap. The compressor was placed in operation during March. Sales had not commenced by year-end, and all compressed gas was therefore injected into the gas cap.

As a result of the activity in this sphere of operations, by the end of 1970 gas-conservation schemes were in effect in oil pools which accounted for 83 per cent of the associated gas production. In these pools, on the average, 79 per cent of the gas had been conserved or used as fuel since the start of the conservation scheme (or the beginning of the year in the case of schemes already operational).

As mentioned earlier, a gas conservation scheme has been handling associated gas produced from the Debolt pool, Blueberry field, for a number of years. The operator, Pacific Petroleums Ltd., applied during 1970 for relief from gas-oil ratio penalties on this oil production, on the premise that the gas was being conserved. After extensive review relief was not granted, since it was considered that gas-cap drive was the dominant producing mechanism of the pool, and that uncontrolled associated gas production would result in a substantial decrease in the ultimate oil recovery from the pool.

D. Gas Allowables and Well Tests

The "daily gas allowables" or production rate limits (PRLs) for gas wells in the Province are established from the results of absolute open flow potential (AOF) tests. These tests are witnessed by Branch field personnel and the data collected are interpreted by the Reservoir Engineering Section to established PRLs and also for use in reservoir studies.

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 Practices" (GEP). Table 17 presents AOF test data, individual well PRLs, Project Allowables, and GEP schemes in effect at year-end 1970. The areas included in the various Project Allowable and GEP schemes are shown in Maps 4, 5, 8, 10, 14, 15, 16, 18, 19, and 21.

During 1970, well-testing schedules were examined for a majority of the gas pools in the Province, to ensure that the requisite data were being obtained in accordance with the gas-well testing guidelines issued in 1969 (discussed in the 1969 Annual Report). Where necessary for evaluation test purposes, flaring of the test-gas production was allowed (seven wells). In order to expedite the handling of gas-well test data, the calculation of well AOF and PRL from field-read temperature and pressure data were programmed for computer solution during the year. By year-end this programme was in the final "de-bugging" stage.

The three wells drilled in the Sunrise field in 1969 were granted interim PRLs at the minimum rate (2 MMSCF/D) in March. It had proved impossible to properly AOF test these wells due to high volume or erratic water production character-

istics. The interim allowables were granted to enable the production problems to be analysed and hopefully solved by the operator.

In August an application was received from Pacific Petroleums Ltd., for removal of PRLs from wells producing from the Baldonnel and Halfway pools in the Jedney field. Following advertisement of the application in the *Gazette* and detailed review of the reservoir performance by the Branch, the scheme was approved, effective November 1, 1970. Under the terms of this approval, all wells presently producing or subsequently completed, in either the Baldonnel or Halfway pools in the Jedney field, are to be produced according to good engineering practices.

Enlargements to two existing gas projects were approved effective February 1, 1970. The Slave Point Project in Clarke Lake was expanded to include the spacing area of the well located in b-76-G/94-J-10 (Map 10). This was omitted from the original project designation in March 1968 due to objections from the operator of the offsetting well in a-65-G/94-J-10. By the end of 1969 this well had been bought by the operator of the project, and thus the grounds for the objections vanished. At the request of Imperial Oil Ltd., the Dunlevy project in the Rigel field was enlarged to include two recently developed spacing units in the north of the pool (Map 21).

During the final quarter of the year the Baldonnel completion located in d-76-A/94-H-4 (Nig Creek field) was tested to determine its AOF and also to monitor liquid production. Because of mechanical difficulties the liquid-production data were unreliable. However, our interpretation of the available performance and reservoir data led us to conclude that the well was completed in a gas cap overlying the oil accumulation being produced from the offsetting well in d-87-A/94-H-4. This being the case, we were not prepared to allow continuous production of the well. The operator of the well, Texaco Exploration Company, contended that the gas and oil accumulations were separated and applied for a PRL for the well in d-76-A. At year-end the matter had not been resolved, pending submission by the operator of data in support of its contention.

Discussions continued during 1970 between the Branch, the Resource Management Division of the Canadian Department of Indian Affairs and Northern Development, and Amoco Canada Petroleum Company Ltd., concerning the operation of the Nahanni pool in the Beaver River area. As reviewed in the 1969 Annual Report, this pool underlies land in both British Columbia and the Yukon Territories. The most efficient production method for the pool entails operation as a unified project, which requires agreement between the Provincial and Federal Governments as to the distribution of royalty from production under a "pool allowable" scheme. Considerable progress was made during the year, and tentative agreement at the technical level had been reached by year-end regarding the initial distribution of reserves in the pool.

E. Hydrocarbon and Associated Sulphur Reserves

The Provincial reserves of oil, gas, and gas by-products, as of December 31, 1970, are summarized in Table 18. Details of pool-by-pool estimates are published in the Departmental Report "Oil, Natural Gas, and By-products Reserves in British Columbia, December 31, 1970." This report includes individual pool rock and fluid property data. Complementary reservoir fluid data are presented here in Tables 19 and 20, for oil and gas reservoir respectively.

The proved oil reserves in the Province as of December 31, 1970, are estimated at some 231 MMSTB. Drilling during 1970 proved-up 5.4 MMSTB of reserves, whilst revisions to previous estimates reduced these by 1.6 MMSTB. In addition,

25.4 MMSTB were produced during the year, resulting in a net decrease in proved reserves of 21.7 MMSTB when compared with reserves at the end of 1969.

Proved reserves represent oil for which it is believed there is a 90 per cent or better chance that the estimated volumes will be recovered. Probable reserves are carried where the probability is estimated to be 50 per cent or more. These include primary reserves on undrilled acreage and reserves attributable to probable increases in ultimate recovery from pools under improved recovery schemes or for which such schemes are planned. Probable oil reserves are estimated at 94.6 MMSTB, as of December 31, 1970, which is 9.6 MMSTB more than the estimate made for year-end 1969. This increase is the net result of modifications to previously estimated values of ultimate recovery factor from various pools based on analysis of performance under enhanced recovery. In addition this increase reflects the implementation during the year of waterflooding in Crush Unit 1 and gas injection in the Charlie Lake pool in Bear Flat, together with firm plans for waterflooding Inga Unit 2, and installing gas conservation in the Charlie Lake pool, Fort St. John field.

Gas and gas by-products reserves shown in Table 18 are "established" reserves. These comprise the proved reserves plus a percentage (usually 50 per cent) of the estimated probable reserves. As of December 31, 1970, the established raw-gas reserves are estimated at 10 TSCF. Adjustment for removal of a percentage of the liquid hydrocarbons and acid gases results in established residue-gas reserves of 8.7 TSCF, or 8.9 TSCF when converted to a standard-heat content of 1,000 Btu/SCF. These volumes represent increases over the corresponding estimates at the end of 1969 in the order of 10 per cent. Some 0.6 TSCF of raw-gas reserves were added as the result of drilling during 1970. Major increases were registered in the Yoyo, Kotcho, Stoddart West, Helmet, Wilder, Grassy, Spruce, and Niteal areas. Adjustments to previous estimates resulted in an increase of 0.8 TSCF in the raw-gas reserves estimates. A major increase in Clarke Lake, and a substantial increase in Sierra, far out-weighed much lesser adjustments to estimates for other areas. The increases in Clarke Lake and Sierra were due to material-balance analysis of the performance to date of the Slave Point and Pine Point reservoirs respectively.

The estimates shown in Table 18 include associated gas reserves where a gas-sales type conservation scheme was in effect. Associated gas reserves for Peejay Unit 1 were also included, since a firm commitment had been made to conserve the gas. Reserves were not included for the Pacific/Arco Project in Peejay, Peejay Unit 3, and the Charlie Lake pool in Fort St. John. Conservation was under active consideration in these areas, but by year-end 1970, firm plans had not been finalized.

Natural gas liquids reserves at year-end 1970 are estimated at 112 MMSTB, down 12 MMSTB from the 1969 estimate. This decrease was due to production of some 5 MMSTB and adjustments to previous estimates to the extent of 9 MMSTB. Major reductions were calculated for Jedney Halfway and Nig Creek Baldonnel pools, Rigel, and Boundary Lake North. The first two adjustments were the result of re-evaluation of gas in place from material balance considerations, while the final two resulted from re-evaluation of geological data. The natural gas liquids reserves did not parallel the increase in gas reserves because the major increases in gas were registered in the area serving the Fort Nelson plant, which to date has yielded dry gas.

Estimated sulphur reserves at December 31, 1970, stood at 4,064 thousand long tons. This represents an increase of 477 thousand long tons since the December 1969 estimate. Drilling during 1970 accounted for an increase of 279 thousand long tons, with the bulk of this being attributed to the Yoyo field. A further 311 thousand long tons was added through revision of previous estimates. Sulphur re-

serves were again included for all pools producing to the Fort Nelson gas plant on the strength of plans (approved during 1970 by the National Energy Board) to install a sulphur extraction plant during 1971.

It should be noted that residue gas, natural gas liquids, and sulphur production and reserves estimates are based on theoretical calculations of the quantities of these materials contained in the raw-gas reserves. Comparisons between actual and theoretical production during 1970 are included in footnotes to Table 18. The low apparent sulphur extraction efficiency is due to the fact that the theoretical values include the sulphur not in fact extracted from the gas in the Fort Nelson plant.

F. MISCELLANEOUS

During 1970, several proposals were examined which sought approval for subsurface disposal of water produced during oil and gas production operations. The following schemes were approved:

Source of Produced Water and Operator	Disposal Location and Operator	Date of Approval
Baldonnel zone, Laprise Creek, Amerada Hess Corporation	Baldonnel zone, b-68-J/94-G-1, Pacific Petroleums Ltd.	Jan. 14
Slave Point formation, Clarke Lake, Pacific Petroleums Ltd.	Slave Point formation, a-65-G/94-J-10, Pacific Petroleums Ltd.	Feb. 23
Slave Point/Elk Point formations, Kotcho Lake, Pacific Petroleums Ltd.	Elk Point formation, c-93-C/94-P-3, Pacific Petroleums Ltd.	Mar. 2
Pine Point formation, Yoyo field, Pacific Petroleums Ltd.	Pine Point formation, d-95-H/94-I-13, Pacific Petroleums Ltd.	Mar. 12
Baldonnel zone, Beg field (a-4-D/94-G-8), Pacific Petroleums Ltd.	Baldonnel zone, d-15-D/94-G-8, Pacific Petroleums Ltd.	May 25
Baldonnel and Halfway zones, Beg field central battery, Pacific Petroleums Ltd.	Halfway zone, b-42-F/94-G-8, Pacific Petroleums Ltd.	July 10
Baldonnel zone, Bubbles field, Pacific Petroleums Ltd.	Baldonnel zone, d-55-I/94-G-1, Pacific Petroleums Ltd.	June 10
Baldonnel zone, Bubbles and Laprise fields, Dome Petroleum Ltd.	Baldonnel/Charlie Lake zone, d-42-B/94-G-8, Dome Petroleum Ltd.	Sept. 10
Baldonnel and Halfway zones, Jedney field, Pacific Petroleums Ltd.	Halfway zone, a-95-C/94-G-8, Pacific Petroleums Ltd.	Sept. 30

In reviewing applications for subsurface-water disposal, factors taken into consideration are; the compatibility between injected water and receiving-zone water, the water quality in the disposal zone and the effect on this of the injected water, and whether the planned water disposal will be prejudicial to hydrocarbon reserves either in the planned disposal zone or in other zones penetrated by the disposal well. In addition, when disposition of water into a hydrocarbon productive zone is planned, consideration is given to the probable effect on reservoir performance and the flood-out pattern and time of breakthrough of injected water into adjacent producing wells. The implications regarding equity of lessees of acreage adjacent to the planned disposal well are also reviewed. The actual mechanical completion of the disposal well is approved by the Development Engineering Section.

During 1970, two applications were received from Union Oil Company of Canada Ltd. requesting approval for installation of vortex-velocity type meters. As a result use of this type of meter was approved for metering flared gas (in case of compressor shutdown) in Milligan Creek Unit 1 and the Wildmint Halfway project, and for metering individual pool-gas streams from Crush and Peejay Unit 2 prior to entering a joint-compressor suction line. In addition approval was granted for

installation of the meters on the oil-water emulsion lines at the Peejay-Crush battery. It was considered that the vortex-velocity type meters would be more accurate over a wider range, and less susceptible to damage, than bellows-type orifice meter installations, for the gas-metering service. In the case of the liquid-metering installation, it was considered that these meters would be as accurate or more than the more normal positive displacement meter, and in addition would handle larger volumes per meter.

Several comprehensive reservoir studies were made during 1970, in conjunction with the Geological Section. The reservoir characteristics of the Charlie Lake oil pools in Bear Flat and Fort St. John were determined. Predictions were made of recovery, rate of recovery, and economic feasibility under a variety of production schemes in order to determine the optimum operational plan. Material-balance analyses were made to determine the recovery mechanisms controlling oil production in the Debolt pool, Blueberry field, and also to attempt to define the extent of the oil accumulation in the Baldonnel formation in the Nig Creek field. Material-balance calculations were also made for the Baldonnel and Halfway gas reservoirs in the Jedney field. Forecasts of associated gas production and the economic feasibility of conserving the gas were made for a number of pools and projects in the vicinity of the Northeast British Columbia Gas Gathering System. A waterflood-performance calculation technique was developed which, although designed for calculation by desk calculator, takes account of variations in several parameters often neglected in computer solutions to the problem. The technique obviates the need to average relative permeability data, and enables the acceleration contrast between fluids of different mobilities to be accounted for. By the end of 1970, this technique had been applied to five major Halfway zone oil pools, and calculations were practically completed. The calculation of waterflood performance of the Inga Sand in Inga Unit 2 by this method was also partially complete by year-end. Following completion of these calculations it was planned to use the technique to predict waterflood performance of the remaining two Halfway zone pools under flood. As an offshoot from the work done in connection with the Halfway pools, a study was made of water-saturation distribution and determination in this zone.

Progress reports pertaining to the projects listed in Table 16 were reviewed during the year, together with a progress report for the Slave Point project in Clarke Lake. In addition, withdrawal balances for all injection projects were reviewed. Where necessary, items arising from these reviews were discussed with the operator.

During the year many proposed reservoir-pressure survey schedules were examined and discussed with the operators, and several segregation tests were reviewed. In the case of the well located in 10-35-88-18 W6M, commingling of Bluesky and Dunlevy zones' gas production was approved. Test data indicated that wellbore equipment would effectively segregate the zones, but that communication existed behind the casing. Since it was probable that an attempted remedy of this situation would render the Bluesky zone nonproductive the commingling approval was granted.

The Reservoir Engineering Section continued to provide assistance and information to other government and industry personnel. During 1970 details of pool-by-pool hydrocarbon and associated sulphur reserves at the end of 1969 were published in bound report form. The 1970 reserves will be published similarly in 1971. The Section provided advice to the Chief Commissioner regarding the evaluation of 18 leases that came up for renewal during the year. In addition, a memo was prepared on the general subject of lease validation in order to assist in the drafting of new legislation designed to make this process more relevant. The Section also advised the Chief Commissioner regarding reservoir engineering aspects of the unitization agreements for Crush Unit 1, Inga Unit 2, and Inga Unit 3. As discussed in the

1969 Annual Report, the Reservoir Engineering Section is no longer actively involved in routine land-sale evaluations, having prepared a set of correlations for use by the Geology Section for this purpose. During 1970, these correlations were expanded to include additional options. In 1969, all production-data records were converted for filing and retrieval by the Data Processing Division's computer systems. During 1970, the Reservoir Engineering Section assisted the Development Engineering Section in arranging for suitable programming so that these historical production data could be retrieved and displayed in a variety of formats suitable for use in reservoir-analysis work. This suite of programmes was operational by July.

An application was reviewed in May, which was submitted to the Alberta Oil and Gas Conservation Board by Imperial Oil Ltd. This requested allocation of normal drilling spacing units for oil wells in an area adjacent to the Boundary Lake field. No objection was registered to the proposal.

Several requests for general or specific reservoir fluid analysis and pressure data were dealt with during 1970. As in previous years, a map detailing maximum detected concentrations of hydrogen sulphide in produced gases was prepared. This map is on file in the Charlie Lake field office, for the benefit of people about to work in the field.

In order to help maintain the technical competence of the Reservoir Engineering Section staff, one member was enrolled in a one-week course, presented in Calgary, on the subject of waterflooding and pressure maintenance. In addition, two staff-members attended the annual technical meeting of the Petroleum Society of the Canadian Institute of Mining and Metallurgy.

DEVELOPMENT SECTION

Drilling

Over-all footage drilled during 1970 was a slight 3 per cent higher than in 1969. No indication of a recovery in the drilling activity to the level of the years 1965–1968 was evident. The oil companies still seek a significant discovery that would result in follow-up development drilling. This trend is reflected in the types of drilling completed during the year. Development footage decreased 12 per cent to 382,497 feet while the total exploratory footage gained 18½ per cent. The two classifications of exploratory drilling were about even—outpost locations gaining 18 per cent to 223,701 feet and wildcat locations increasing 19 per cent to 297,470 feet.

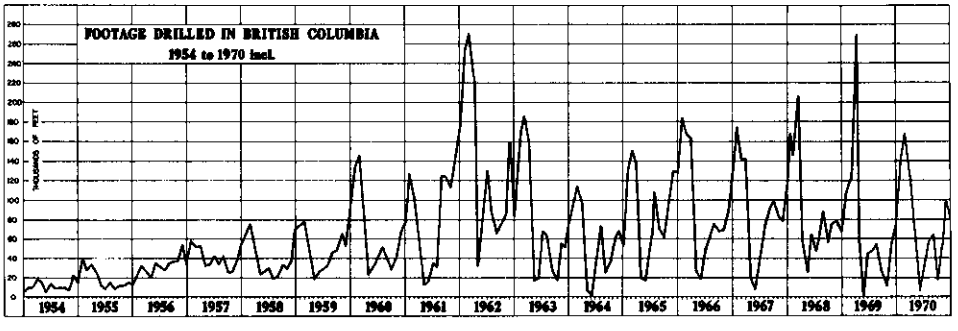


Figure 2. Footage drilled in British Columbia, 1954–1970.

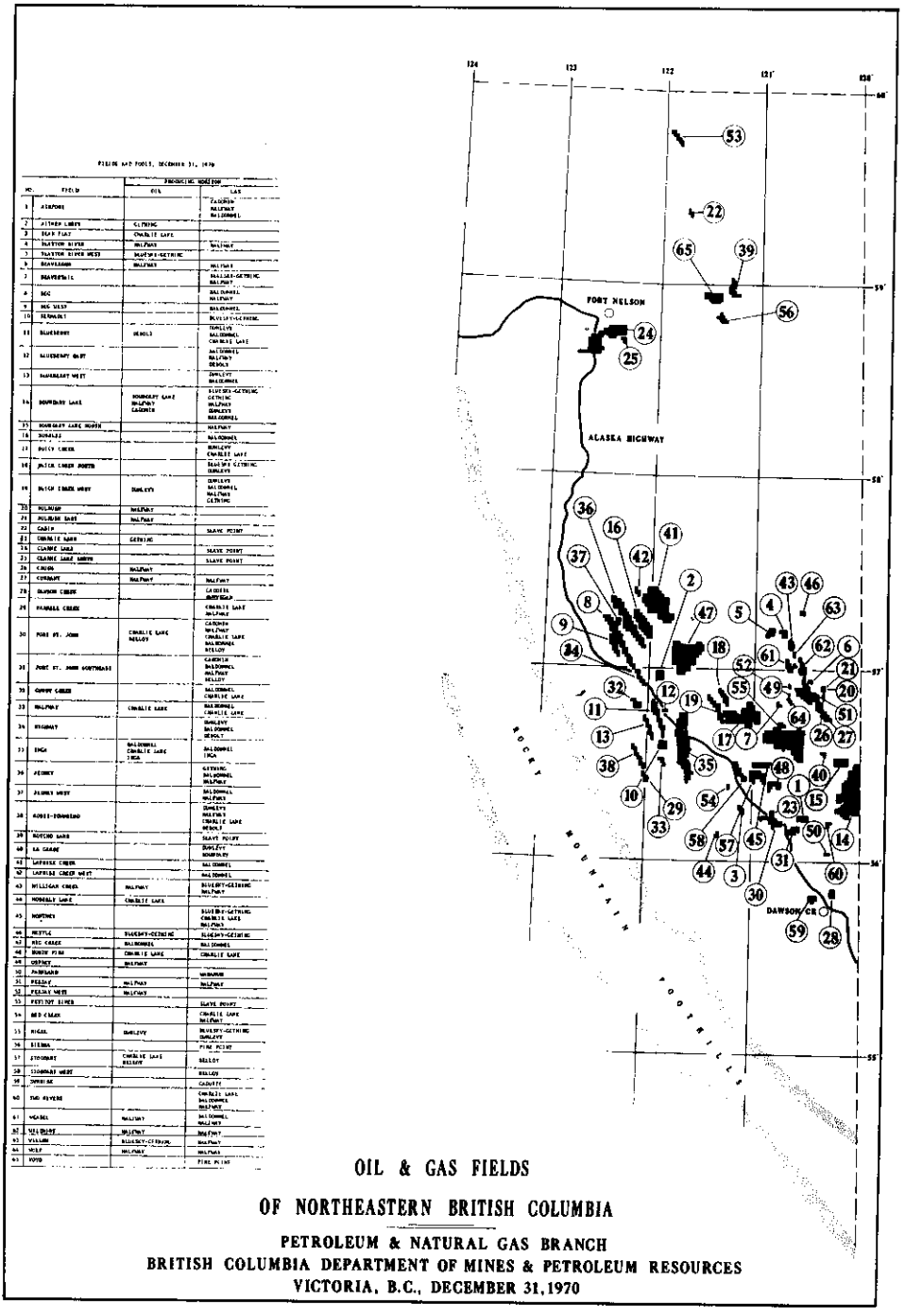


Figure 3. Petroleum and natural gas fields, 1970.

With the exception of one abandonment, CIGOL IOE et al Howell a-16-B which was drilled in the Fernie area, all drilling activity was confined to the north-eastern corner of the Province. During 1970, a total of 63 operating companies employed 49 different drilling rigs to complete the 1970 drilling.

Wells completed increased 3 per cent from 174 wells in 1969 to 180 wells in 1970. Exactly one-half of the drilling ventures were successful as 90 wells were abandoned, 34 were completed as oil wells, 53 as gas wells, and three were drilled for other purposes. The number of actively drilling wells at the end of 1970 was 27. As in previous compilations, if more than one zone is completed in a well, each productive zone is counted as one well. As three multiple completions were made in 1970, 177 wells were actually drilled. Wells drilled and drilling are listed in Table 21. Monthly footages drilled since 1954 are given graphically in Figure 2.

Well classifications were assigned by the Development Section during 1970 to each proposed well location in accordance with the Drilling and Production Regulations. A Lahee classification was also determined, which was described in the Geological Section of this report. The Branch classification system is explained by the following definitions. A development well is located within a spacing area that is contiguous to a spacing area containing a well capable of production from the same objective geological pool. Exploratory wells are divided into two types—wildcat and outpost. An exploratory wildcat well is located more than 4½ miles from any capable well, and an exploratory outpost well is located in the area between development and wildcat wells. Development wells are further classified as deep-pool or shallow-pool tests where undeveloped pools below or above the objective pool is being explored. With the revised Drilling and Production Regulations, which were effective on February 3, 1969, the Branch classification is the basis used for the release of well information. Release of data for exploratory wildcat wells is made one year after the rig release date, while the information from all other wells is available 30 days after the rig release date.

Workover operations were undertaken at many newly completed wells in addition to stimulation treatments performed on some of the declining wells. A workover is considered to be 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. A 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 productivity of the well. Changes may include perforating, acidizing, fracturing, installing a pump, or changing a choke, but do not include the replacement of equipment. During 1970, 243 workovers were performed on British Columbia potential or producing wells.

Three new fields were designated by the Branch during 1970 and field boundaries were amended on 10 occasions. The new fields were at Beavertail, Cabin, and LaGarde while the amendments involved field boundaries for Beatton River West, Buick Creek, Clarke Lake, Milligan Creek, Rigel, Stoddart, Wildmint, Yoyo, and two instances in Inga. Two previously separate fields, Buick Creek East and Jeans West were included in the Buick Creek and Inga fields respectively. At the end of 1970, there were 65 designated fields which are listed in Table 22 and shown in Figure 3.

All submissions pertaining to drilling operations are studied for approval by the Development Section. Such approvals must be obtained prior to commencement of drilling a well, changing a well name, abandoning a well, or any alteration proposed to change the physical characteristics of a well. When a submission is received by the Development Section, the information, which may include details

of the proposed programme, the title under which the petroleum and natural-gas rights are held, and any other relevant requirements of the regulations, is reviewed. With each application to drill a well, a surveyed position must be given which is examined to assure conformation with target and spacing regulations. A spacing area is assigned to the proposed well and, if the location does not meet the target-area requirements, a production penalty is calculated.

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 application are examined and given approval by the various sections of the Branch. Prior to the abandonment of a well, the operator must transmit 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.

During 1970, 231 well authorizations were issued. No cancellations were requested during the year.

The disposal of salt water produced with petroleum and natural gas was accomplished by evaporation in surface pits or injection to subsurface formations. The number of water-disposal wells was increased to 18 during 1970 providing disposal facilities in all the areas where large volumes of water are produced. In 1970 there were 4,438,647 barrels injected to the subsurface and 473,276 barrels evaporated or put into flare pits.

Water-flood operations were maintained at about the same volumes. A total of 45,182,785 barrels, including both fresh and formation water, were injected into nine producing pools in the Province. Fields receiving the largest volumes of water were Boundary Lake, 16,863,733 barrels and Peejay 10,668,204 barrels.

Nine oil spillages of varying magnitudes were reported to the Branch. In each instance field office personnel inspected the area affected and assured that a proper clean-up was accomplished. The reasons for the spills were either equipment failure or a result of corrosion in pipe-lines or tanks.

Six fires at production installations were reported—three each at oil and gas facilities. These locations were also examined by the field staff and reported to the head office in Victoria. One blowout during the servicing of a gas well occurred during 1970. Ignition of the flowing gas was prevented and the well brought under control within 12 hours. A small gas-line leak was detected from a gas-gathering pipe-line. Again ignition was avoided and repairs were undertaken immediately.

Production

Production of crude oil from British Columbia oilfields during 1970 was 25,361,336 barrels, slightly greater than the 1969 Provincial production. The major producing fields, all under active water-flood programmes were Boundary Lake, 9,404,493 barrels; Peejay, 5,097,579 barrels; Milligan Creek, 3,912,798 barrels; Inga, 2,504,601 barrels; and Weasel, 1,198,013 barrels. Of this group Boundary Lake and Milligan increased their production compared to 1969 while Peejay and Inga recorded declines. The production from the Weasel field was about equal to the 1969 production.

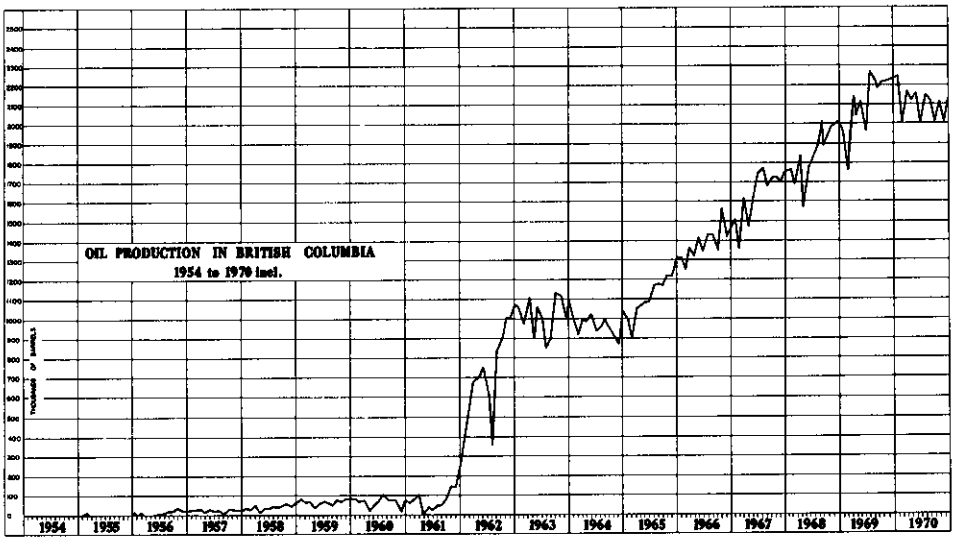


Figure 4. Oil production in British Columbia, 1954–1970.

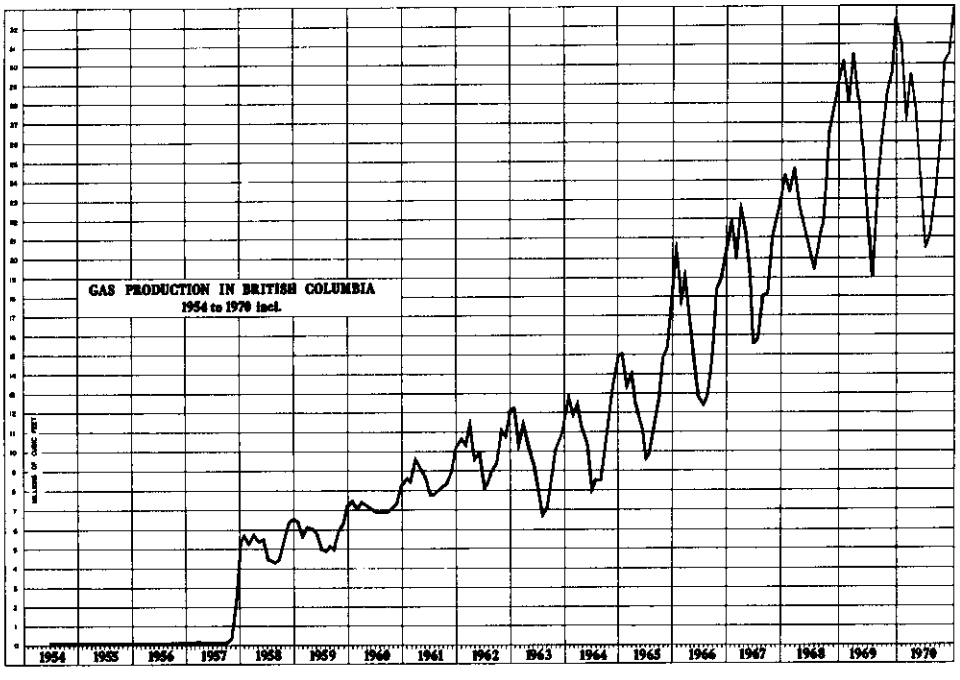


Figure 5. Gas production in British Columbia, 1954–1970.

Clarke Lake continued to lead the gas-producing fields with 104,278,387 MSCF during 1970 followed by Yoyo, 48,064,498 MSCF; Laprise Creek, 25,908,-115 MSCF; Jedney, 17,311,108 MSCF; Nig Creek, 16,550,042 MSCF; and Rigel, 16,478,229 MSCF. The 6-per-cent increase in the Provincial gas production for 1970 resulted from additional gas from fields in the Fort Nelson area. Declines were noted in several fields, notably Laprise Creek, Jedney, and Nig Creek.

Monthly crude oil and natural gas production by fields and pools for 1970 are given in Tables 24 and 25.

Graphs of monthly production for the years 1954 to 1970 are shown in Figures 4 and 5.

Moderate gains were accomplished in sales for propane and sulphur and a significant increase, primarily due to expanded markets within the Province, was made for butane.

General statistics showing well operation and production data are given in Table 26. The monthly dispositions of various petroleum products are shown in Tables 27, 28, and 29. Monthly values to the producers are given in Table 30.

PIPE-LINES

Oil-gathering System

Increased capacities for the two pipe-lines serving the Inga field were completed during 1970. The Blueberry-Taylor Pipeline Co. (formerly BCOT) and the Tenneco Oil and Minerals line, daily capacities were raised to 12,500 and 2,400 barrels respectively.

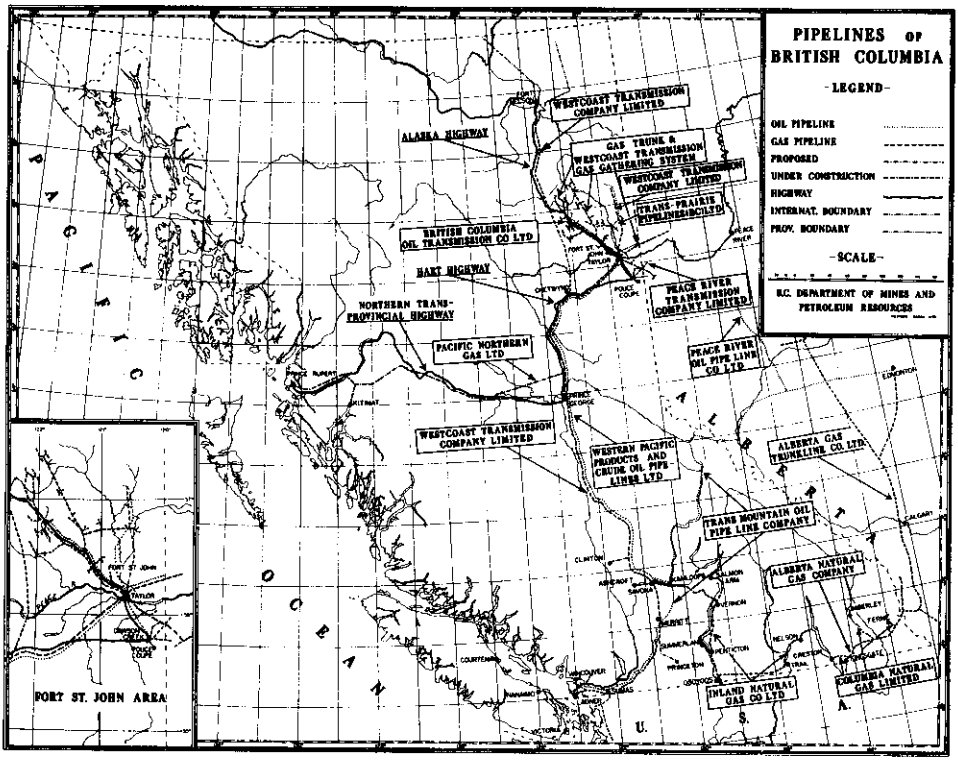


Figure 6. Petroleum and natural gas pipe-lines.

Oil-transmission System

Throughput volumes for the Trans-Prairie Pipelines (B.C.) and the Western Pacific Products and Crude Oil Pipelines were increased to 60,927 and 62,367 barrels per day to carry the production from British Columbia oilfields.

Gas-gathering System

No changes were reported to the gas-gathering systems in operation in British Columbia during 1970.

Gas-transmission System

Additional pipe-line was added to the Columbia Natural Gas Ltd. and Inland Natural Gas Ltd. transmission systems during the year.

Gas-distribution System

During 1970, extensions totalling nearly 100 miles were completed to the gas-distribution facilities of Columbia Natural Gas Ltd., Inland Natural Gas Ltd., Pacific Northern Gas Ltd., and Plains Western Gas & Electric Co. Ltd.

Oil Refineries

Four of the seven refineries located in British Columbia increased their crude-oil capacities bringing the Provincial total to 125,800 barrels per calendar day.

Gas-processing Plants

In addition to the four plants processing natural gas in the Province, a new plant went into operation in the Sierra area which has an initial capacity of 63,000 MSCF per day and delivers gas to the Westcoast Transmission pipe-line.

Sulphur Plants

No changes were reported in the operation of the sulphur plant located at Taylor.

Tables 31, 32, 33, 34, and 35 provide data on the pipe-lines, oil refineries, gas-processing plants, and the sulphur plant. Figure 6 outlines the major pipe-line systems operating in the Province.

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 Division 43 of the Drilling and Production 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 classification assigned by the Branch at the time of approval of the well authorization. Information from any well or portion of a well that is classified as wildcat is available one year after rig-release date. Data from all other classifications of wells are available 30 days after rig-release date. 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 provided by the Branch by publication, examination of Branch records, or reproduction of documents filed. 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 published reports are expanded to

meet the requirements of industry and other governmental bodies, the methods of keeping records must be altered.

The Branch has representation on the Statistical Subcommittee 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 of personel 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 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 early availability of information on all phases of the oil and gas industry.

One meeting of the Statistical Subcommittee was held in 1970, when discussions were held concerning the procedures and reports employed by the Provincial authorities. The Petroleum and Natural Gas Branch has adopted many features of the model forms prepared by this committee 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 MPR—Individual Well.
9A.	Application for MPR—Unit/Project.
10.	Report of Wells Connected to a Battery.
BC S1.	Test Data and 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 Statement.
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.

* For departmental use only.

(*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 oprators of producing wells, pipe-lines, gas plants, oil refineries, and distribution facilities. All production data are compiled and maintained by a computer application. 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.
(3) New oil- and gas-well reports received during the reported month.
(4) The number of producing and producible oil and gas wells by field and pool.
(5) Production of crude oil, condensate, natural gas, and water by individual well, project or unit, field and pool, with gas/oil and water/oil ratios calculated, where applicable. The quantities are given for the current month, the current year to date, and the all-time cumulative.
(6) Estimated oil production for the succeeding month, which is based upon the pipe-line returns reported to the Branch field office.
(7) Crude oil and condensate/pentanes plus disposition, with comparable totals for the same month of the preceding year.
(8) Tabulation of nominations and estimated requirements for British Columbia crude oil and condensate/pentanes plus.
(9) Natural gas supply and disposition, with comparable volumes for the same month of the preceding year.
(10) Value of natural gas sales to British Columbia distributors.
(11) Value of crude oil and natural gas to British Columbia producers.
(12) Production and disposition of butane, propane, and sulphur.
(13) Value of butane, propane, and sulphur to British Columbia producers.

Form No.	Form Name
29.	Monthly Water Receipts and Disposal Report.
30.	Statement of Nominations and Estimated Requirements for British Columbia Crude Oil and Condensate/Pentanes Plus.
31.	New Service Well Report.
32.	Production Allowable Report—Crude Oil.
*33.	Drilling Report.
34.	Application for Test-hole Authorization(s).
*35.	Report of Well Inspection.
*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.

REPORTS

Schedule of Wells

A second composite volume was compiled and published giving all well information released during the period January 1, 1966, to December 31, 1970.

The data are arranged geographically and provide the following information when applicable: Well authorization number, well name, location, classification, coordinates, elevation, total depth, status including geological pool, interval open to production, casing details, spud date, rig-release date, logs, core intervals, sample intervals, drill-stem test data, and geological markers determined by the Branch.

The information is 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.

(14) Water-flood operations showing the number of injection wells, and volumes of water by current month, current year, with total cumulative figures for each field and pool. The totals are also given for the same month of the preceding year.

This report is compiled and mailed to subscribers approximately three 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.
(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.
  (*k*) Total wells completed.
(3) Well authorizations approved.
(4) Locations cancelled.
(5) Well authorizations 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.
(16) Drilling and production schemes approved by the Branch during the reported month.

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 13—EXPLORATORY AND DEVELOPMENT WELLS COMPLETED, JANUARY TO DECEMBER, 1970

	Oil		Gas		Total Producers		Abandonments		Status Undetermined		Service Wells		Total	
	No.	Footage	No.	Footage	No.	Footage	No.	Footage	No.	Footage	No.	Footage	No.	Footage
New field wildcats	1	4,510	6	37,760	7	42,270	35	211,372	---	.....	---	.....	42	253,642
New-pool wildcats	---	.....	3	15,700	3	15,700	9	49,609	---	.....	---	.....	12	65,309
Deep-pool tests	---	.....	1*	220	1*	220	2*	3,311	---	.....	---	.....	3*	3,531
Outposts	1	5,364	13	62,376	14	67,740	25	111,719	1	7,665	---	.....	40	180,124
Total exploratory wells	2	9,874	22*	116,056	24*	125,930	69*	376,011	1	7,665	---	.....	94	509,606
Total development wells	32	140,974	31	144,861	63	285,835	21	99,101	---	.....	---	.....	84	384,936
Subtotal	34	150,848	53	260,917	87	411,765	90	475,112	1	7,665	---	.....	178	894,542
Other wells drilled (service wells)	---	.....	---	.....	---	.....	---	.....	---	.....	2	9,126	2	9,126
Total	34	150,848	53	260,917	87	411,765	90	475,112	1	7,665	2	9,126	180	903,668

* Three deep-pool tests are not included in the well total as they are counted under Outpost and Development.

TABLE 14—GEOPHYSICAL EXPLORATION, 1970

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			
Amerada Hess Corporation	94-N-8	1	3
Dome Petroleum Limited	94-P-7	1	3
French Petroleum Company of Canada	94-B-10	1	1
Gulf Oil Canada Limited	93-P-12, -13	1	4
Hudson's Bay Oil & Gas Co. Ltd.	94-G-6, -7	1	7.6
	94-O-15, 94-P-16		
Pacific Petroleums Limited	94-I-14, -15	1	0.1
	94-P-1, -3, -13, -16	1	5.7
Sun Oil Company	94-O-8	1	1
Texaco Exploration Company	94-P-3, -6	1	2
	94-P-5, -12	1	1.5
Union Oil Company of Canada Ltd.	94-B-9, -16	1	0.3
	93-P-7, -10, -11	1	8.4
February			
Amerada Hess Corporation	94-N-8, -9	1	3
Amoco Canada Petroleum Company	93-P-1, -2, -8	1	0.6
Canadian Delhi Oil Limited	94-O-2, -3	1	1
Central Del Rio Oils Ltd.	93-P-8	1	2
French Petroleum Company of Canada	94-B-10	1	3
Gulf Oil Canada Limited	93-P-12, -13	1	2
Hudson's Bay Oil & Gas Co. Ltd.	94-J-9, 94-I-6	1	7.3
	94-P-1, -11	1	5.1
Pacific Petroleums Limited	94-I-12, -14, -15	1	2
	93-P-1, -6, -7	1	2
	94-A-10	1	3.1
	94-J-9	1	2.3
Sun Oil Company	94-O-9	1	3
	94-P-5, -12		
Union Oil Company of Canada Ltd.	93-P-7, -10, -11	1	6.8
	94-A-14	1	1
	94-B-9, -16	1	1.3
	94-G-1, -2, -7	1	2.8

TABLE 14—GEOPHYSICAL EXPLORATION, 1970—*Continued*

Seismic Surveys—Continued

Company	Location of Survey	Number of Seismic Crews	Number of Crew-weeks
March			
Amerada Hess Corporation	94-N-8, -9	1	3
Amoco Canada Petroleum Company	93-P-1, -2, -8	1	1.9
Canadian Delhi Oil Limited	94-O-3	1	2
	94-J-15		
Central Del Rio Oils Ltd.	94-J-15, -16	1	2
Dome Petroleum Limited	94-P-7	1	1
French Petroleum Company of Canada	94-P-7	1	1
Hudson's Bay Oil & Gas Co. Ltd.	94-A-13	1	1.4
	94-B-1, 93-P-11	1	2.8
	94-I-6	1	0.5
Marathon Oil Company	94-N-10, -15, -16	1	2.1
Pacific Petroleums Limited	94-I-13	1	0.7
	94-J-9	1	0.1
Sun Oil Company	94-P-7, -8, -10	1	1
	94-P-10, -11	1	0.6
	94-P-2, -3, -7	1	2
Union Oil Company of Canada Ltd.	94-A-14	1	1.2
	93-P-7, -8, -10	1	2
April			
Hudson's Bay Oil & Gas Co. Ltd.	92-N-15, -16	1	1.7
	93-C-1, -2, -3, -4, -5, -6		
May			
Hudson's Bay Oil & Gas Co. Ltd.	92-N-15, -16	1	2.1
	93-C-1, -2, -3, -4, -5, -6		
July			
Ashland Canadian Oils Ltd.	94-P-7	1	2
Atkinson Petroleums Ltd.	94-P-7	1	1
Canadian Industrial Gas & Oil Ltd.	82-G-2, -7	1	4
Leonard Refineries Inc.	82-G-2, -7	1	2
Shell Canada Limited	82-G, -J	1	2
Texaco Exploration Canada Ltd.	94-G-2	1	2
August			
Central Del Rio Oils Ltd.	82-G	1	1
Leonard Refineries Inc.	82-G-2, -7	1	2
Shell Oil Canada Ltd.	82-G-1	1	2
September			
Atlantic Richfield Canada Ltd.	94-G-7	1	0.5
October			
Atkinson Petroleums Ltd.	94-P-7	1	1
Atlantic Richfield Canada Ltd.	94-G-2, -7	2	3
	94-B-15	1	1
Leonard Refineries Inc.	94-G-7	1	4
November			
Leonard Refineries Inc.	94-G-7	1	3
Sun Oil Company	Tp. 85, R. 23, W. of 6th M.	1	1
Scurry-Rainbow Oil Ltd.	94-G-2	1	3
Westcoast Production Co. Ltd.	94-G-15, -16	1	2
December			
Atlantic Richfield Canada Ltd.	94-I-14, -15	2	2
Banff Oil Exploration Limited	94-H-13	1	1
	94-O-1	1	0.2
Cankee Gas Company	94-O-5, -6	1	2
Hudson's Bay Oil & Gas Co. Ltd.	94-P-11, -14	1	0.5
Mobil Oil Canada Ltd.	94-J-14	1	3
Scurry-Rainbow Oil Ltd.	Tp. 88, R. 25, W. of 6th M.	1	1
Westcoast Production Co. Ltd.	94-G-7	1	1

TABLE 14—GEOPHYSICAL EXPLORATION, 1970—*Continued*

Gravity Surveys

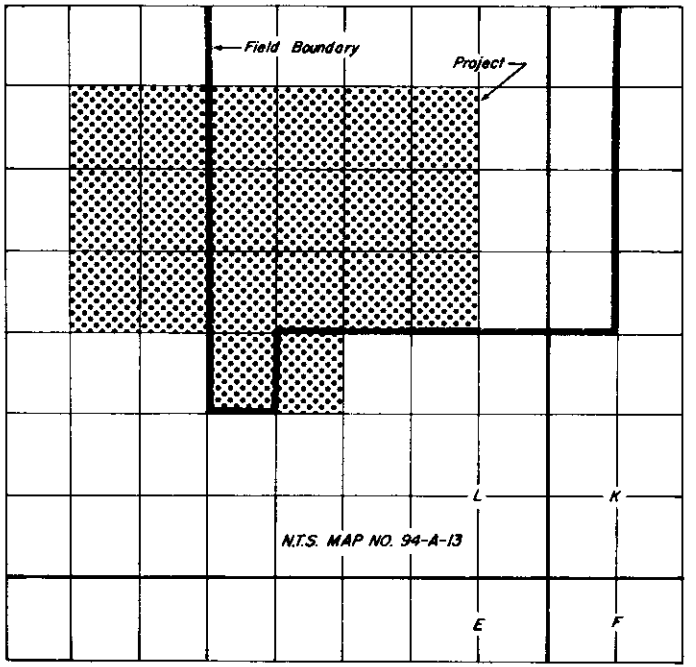
Company	Location of Survey	Number of Crews	Number of Crew-weeks
January			
Texaco Exploration Company	94-P-3, -6	1	2
	94-P-5, -12	1	1.5
	94-O-13 94-N-15, -16	2	3.5
February			
Texaco Exploration Company	94-O-5, -6, -11, -12 94-N-9	2	4
March			
Texaco Exploration Company	94-O-13 94-N-16	1	2.5
	94-O-2, -3, -6, -7 94-J-13, -14, -15	2	4.5
September			
Leonard Refineries Inc.	94-G-7	1	3
October			
Westcoast Production Co. Ltd.	94-I-, -J, -K	1	3
December			
Leonard Refineries Inc.	94-G-2, -7	1	4

Magnetometer Surveys

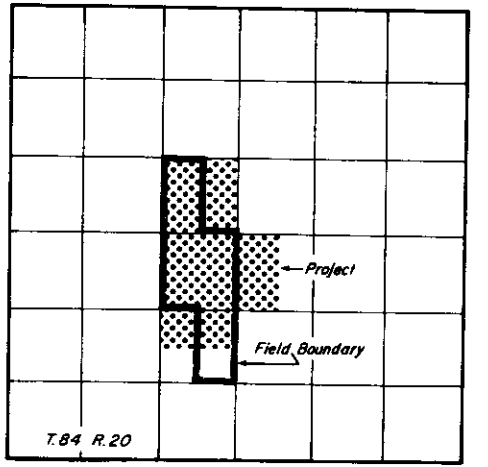
January			
Texaco Exploration Company	94-O-13 94-N-15, -16	2	3.5
February			
Texaco Exploration Company	94-O-5, -6, -11, -12 94-N-9	2	4
March			
Texaco Exploration Company	94-O-2, -3, -6, 7 94-J-13, -14, -15	2	4.5
December			
Central Del Rio Oils Ltd.	82-G	1	1

TABLE 15—SURFACE GEOLOGICAL EXPLORATION, 1970

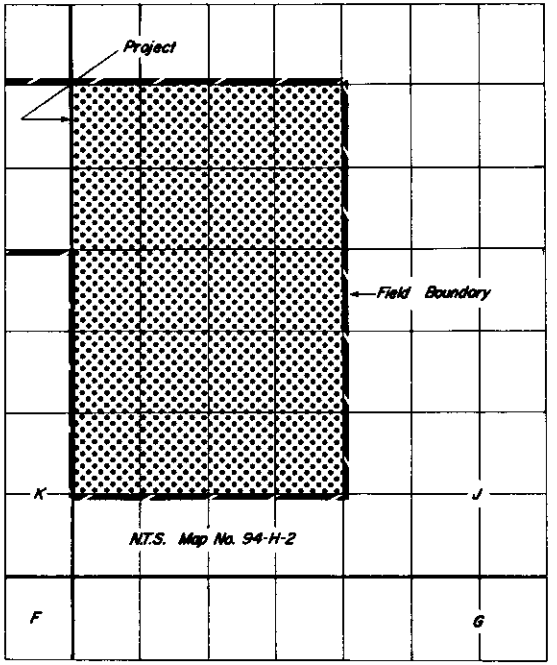
Company	Location of Survey	Number of Geologists	Two-man-party Weeks
May			
Banff Oil Ltd.	94-G	5	2
Canadian Industrial Gas & Oil Ltd.	103-I	1	2
June			
Banff Oil Ltd.	94-G	5	4
Canadian Industrial Gas & Oil Ltd.	103-I	1	4
Central Del Rio Oils Ltd.	83-E-8	10	20
July			
Amoco Canada Petroleum Company	82-G-1, -2, -3, -6, -7, -10	5	5
Banff Oil Ltd.	94-G	5	6
Chevron Standard Limited	93-O	5	4
Monsanto Oils Ltd.	94-N-11	3	3
Shenandoah Oil Corporation	104-H	4	1
United Beta Resources	93-M	5	2
	94-D, -E		
	103-P		
	104-A, -H		
August			
Amoco Canada Petroleum Company	82-G-11, -14, -15	3	2.8
Atlantic Richfield Canada Ltd.	94-N-8	2	3
Union Oil Company of Canada Ltd.	103-F	1	2
United Beta Resources	93-N, 94-D, -E	5	3
	103-P, 104-A, -H		
September			
Acroll Oil & Gas Ltd.	104-A	1	0.6
Anadarko Production Company	104-A	4	6
Trans Western Oils	104-A	1	1



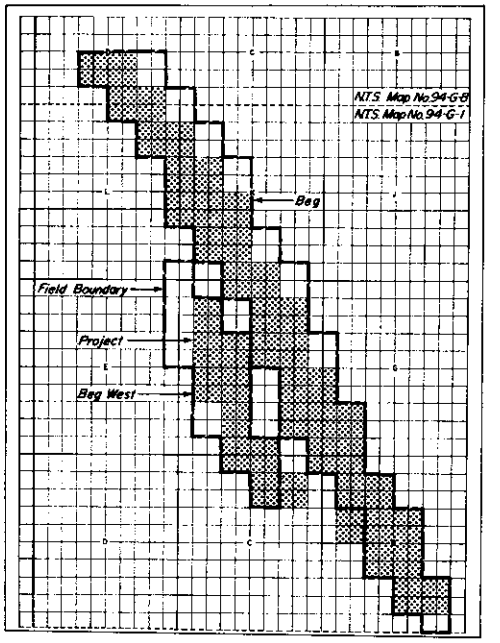
Map 1
UNION OIL PROJECT
GETHING ZONE
AITKEN CREEK FIELD



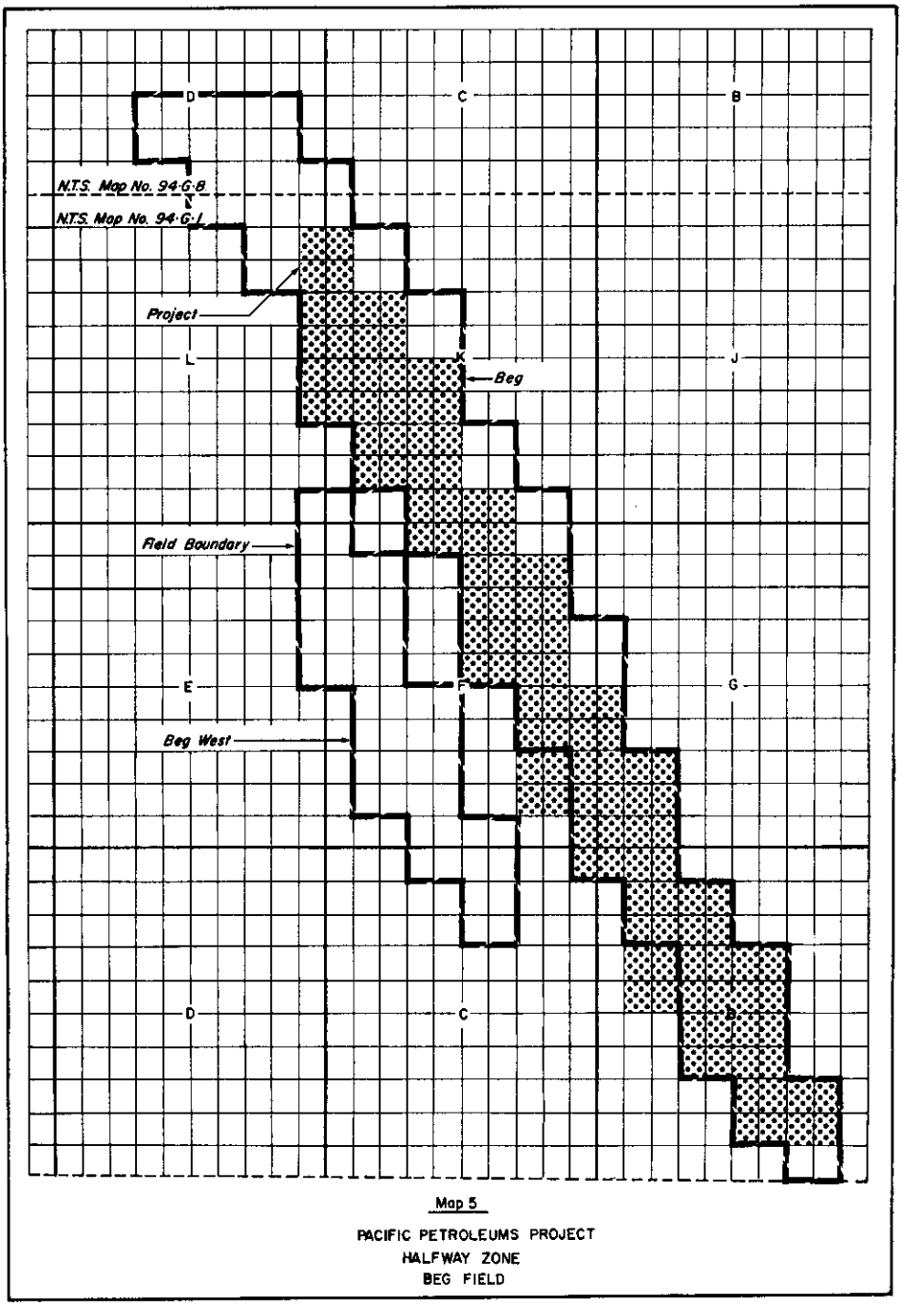
Map 2
MONSANTO PROJECT
CHARLIE LAKE ZONE
BEAR FLAT FIELD



Map 3
TRIAD OIL PROJECT
HALFWAY ZONE
BEATTON RIVER FIELD

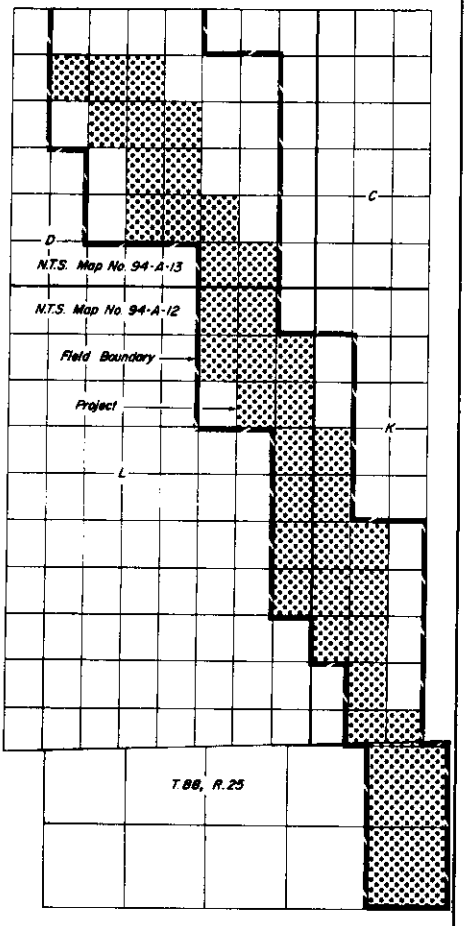


Map 4
PACIFIC PETROLEUMS PROJECT
BALDONNEL ZONE
BEG & BEG WEST FIELDS

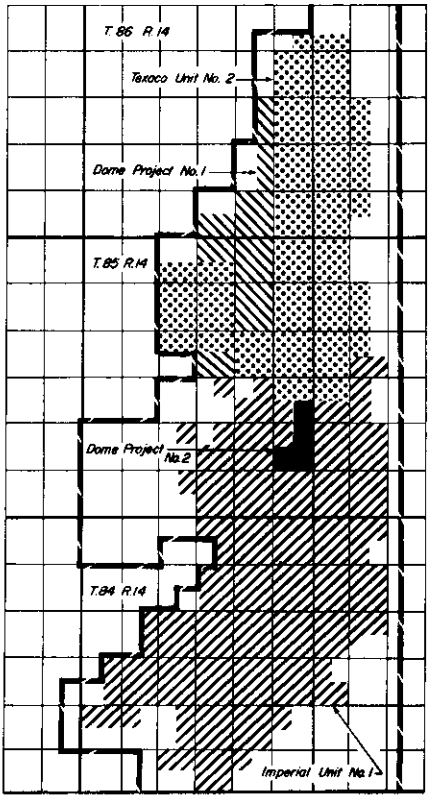


Map 5

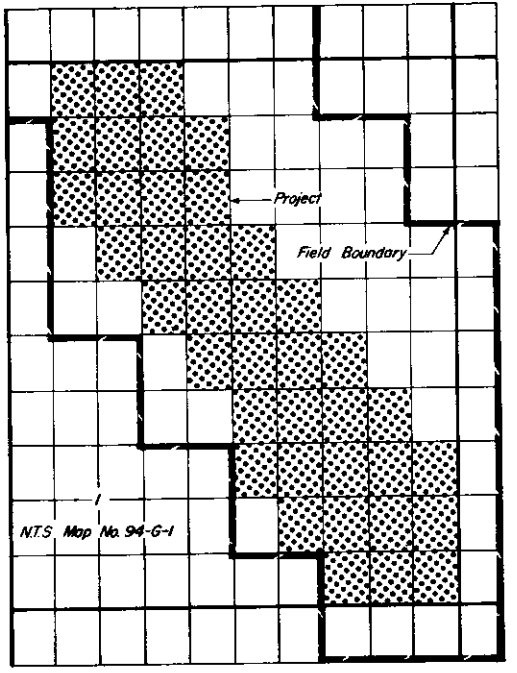
PACIFIC PETROLEUMS PROJECT
HALFWAY ZONE
BEG FIELD



Map 6
PACIFIC PETROLEUMS PROJECT
DEBOLT ZONE
BLUEBERRY FIELD

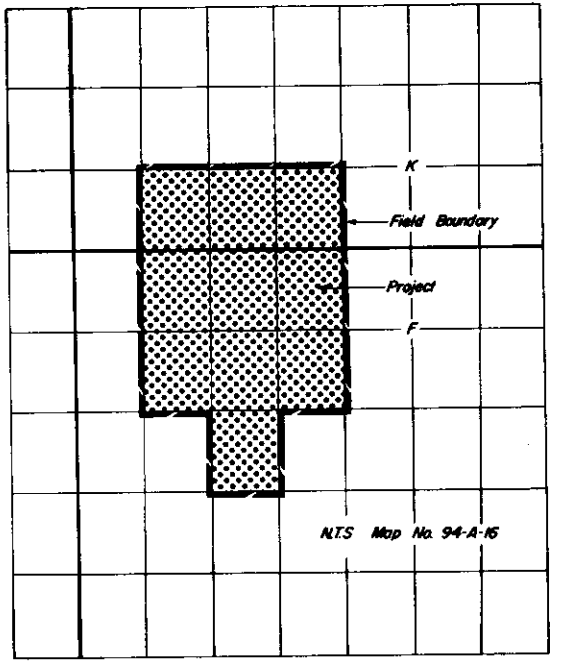


Map 7
BOUNDARY LAKE ZONE PROJECTS
BOUNDARY LAKE FIELD



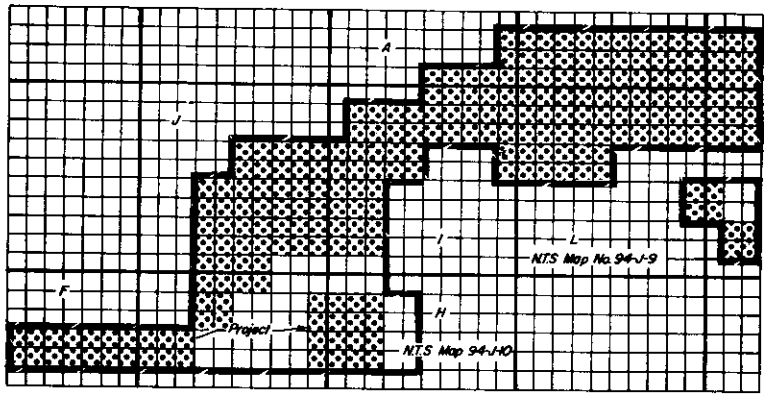
Map 8

PACIFIC PETROLEUMS PROJECT
BALDONNEL ZONE
BUBBLES FIELD



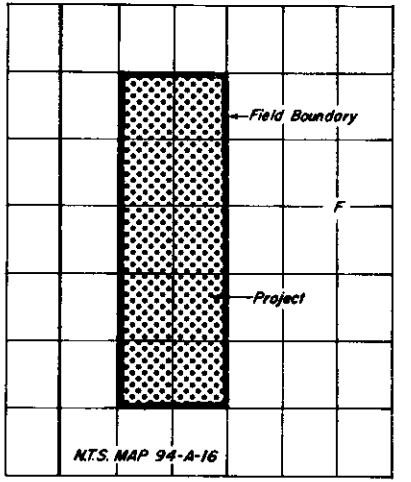
Map 9

UNION OIL PROJECT
HALFWAY ZONE
BULRUSH FIELD



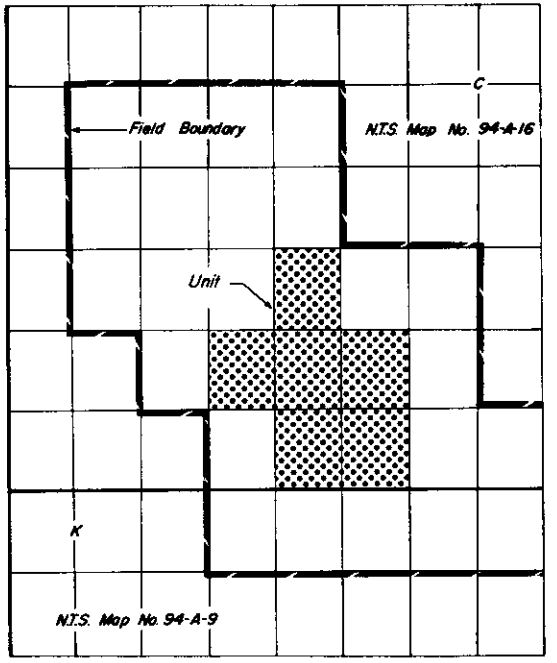
Map 10

PACIFIC PETROLEUMS PROJECT
SLAVE PT. ZONE
CLARKE LAKE AND CLARKE LAKE SOUTH FIELDS

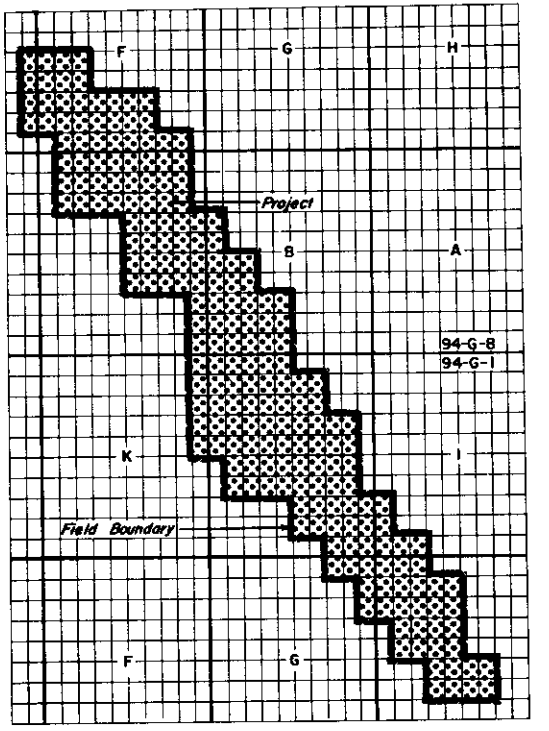


Map 11

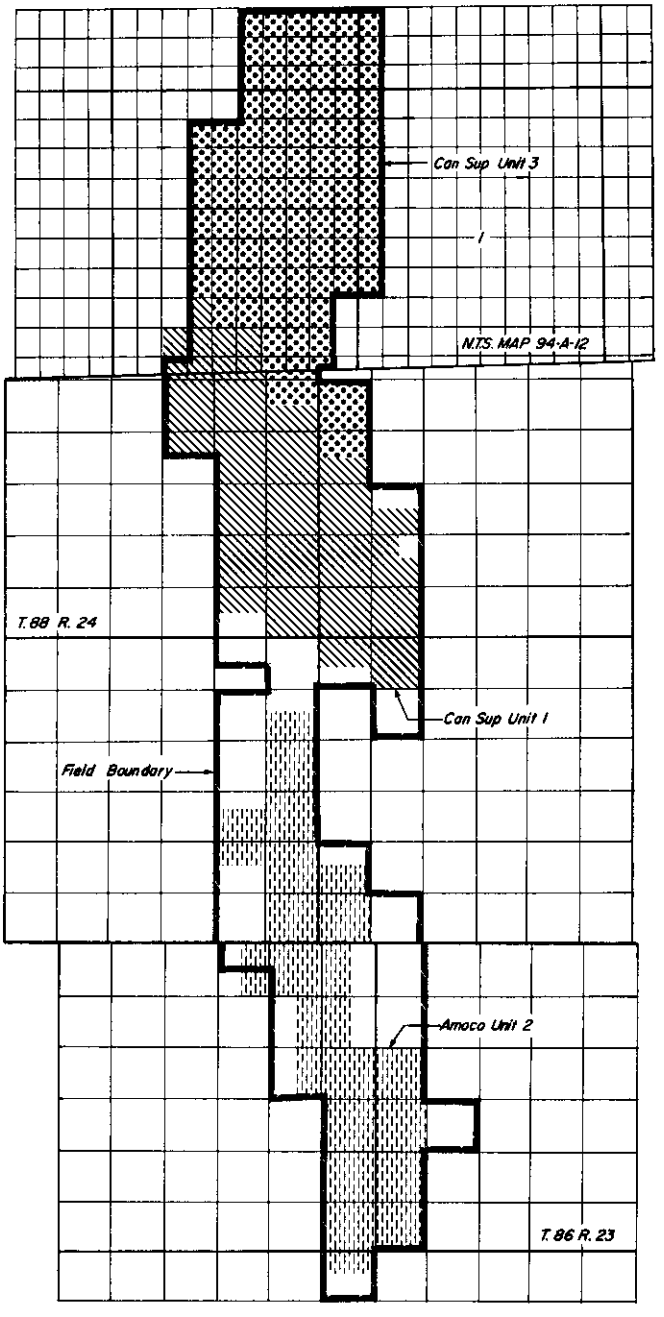
UNION OIL UNIT I
HALFWAY ZONE
CRUSH FIELD



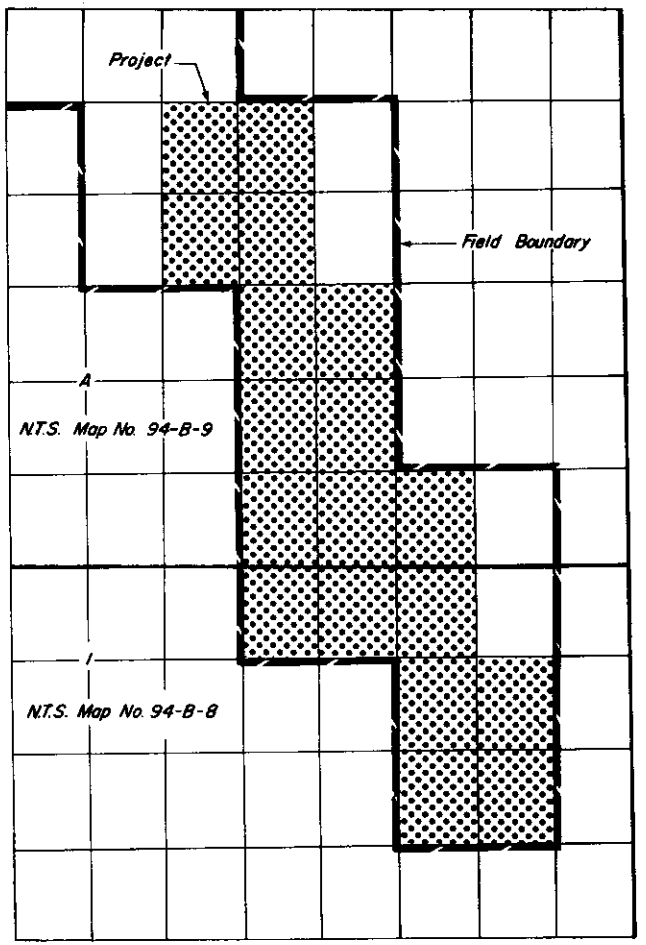
Map 12
PACIFIC PETROLEUMS UNIT I
HALFWAY ZONE
CURRANT FIELD



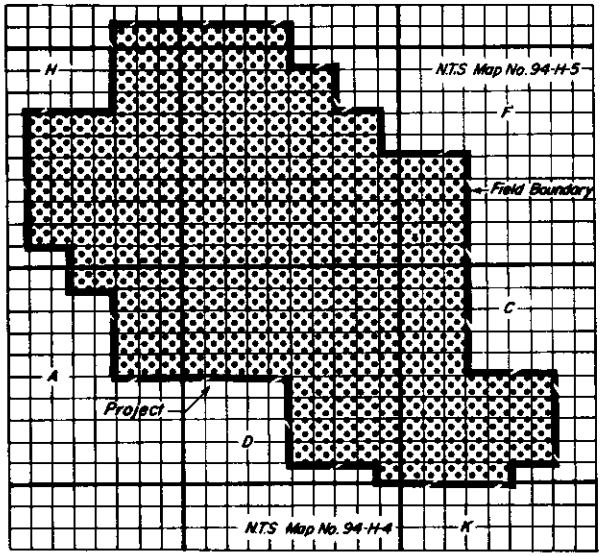
Map 14
PACIFIC PROJECTS
BALDONNEL B HALFWAY ZONES
JEDNEY FIELD



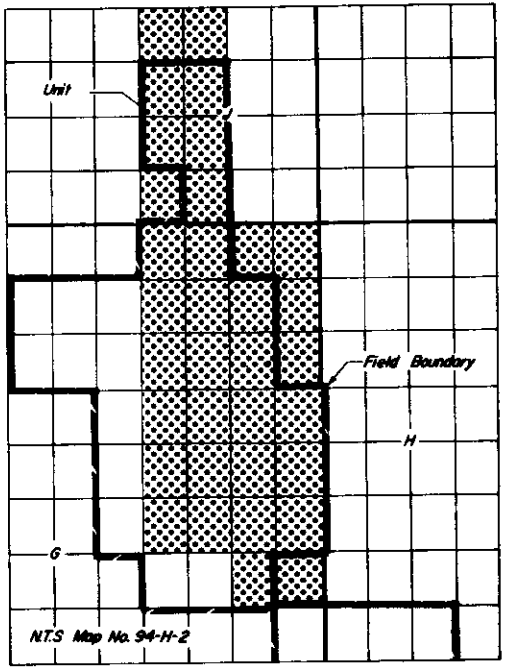
Map 13
INGA ZONE UNITS
INGA FIELD



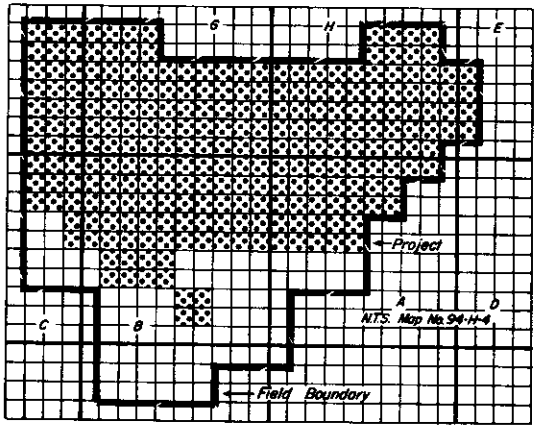
Map 15
PACIFIC PETROLEUMS PROJECT
HALFWAY ZONE
KOBES-TOWNSEND FIELD



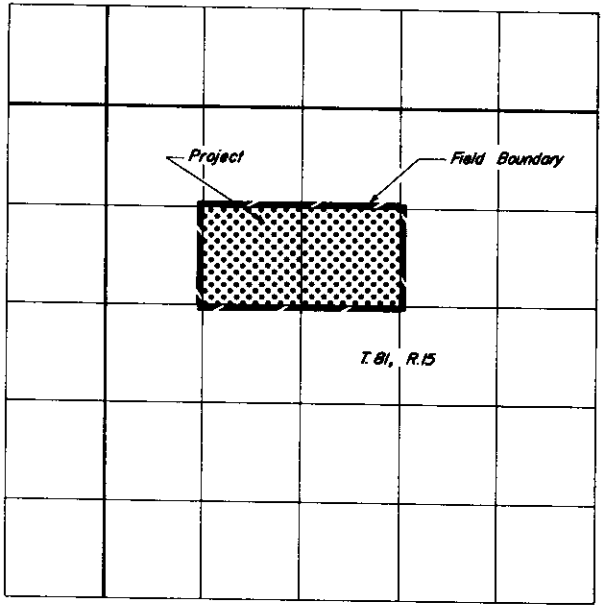
Map 16
BALDONNEL POOL PROJECT
LAPRISE CREEK FIELD



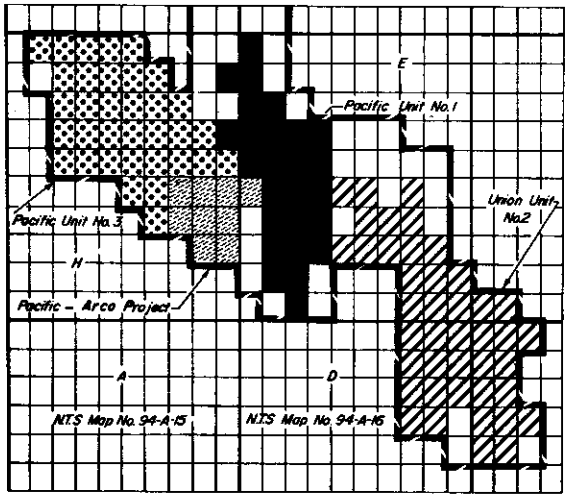
Map 17
UNION OIL UNIT I
HALFWAY ZONE
MILLIGAN CREEK FIELD



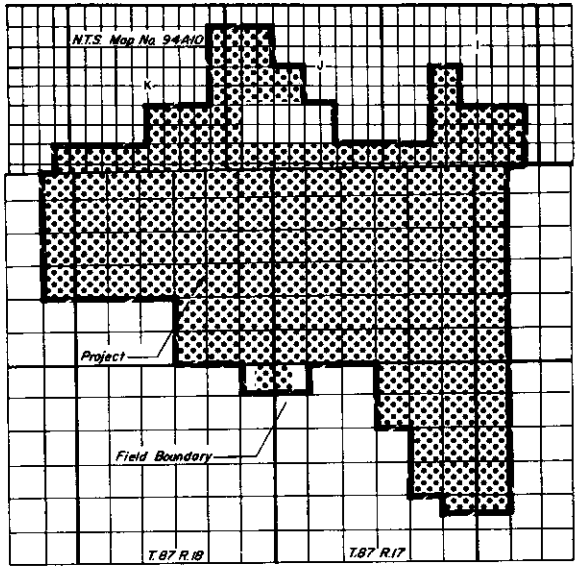
Map 18
TEXACO EXPLORATION PROJECT
BALDONNEL ZONE
NIG CREEK FIELD



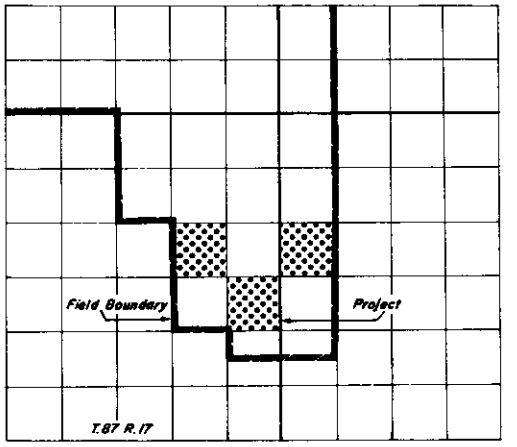
Map 19
PACIFIC PETROLEUMS PROJECT
WABAMUN ZONE
PARKLAND FIELD



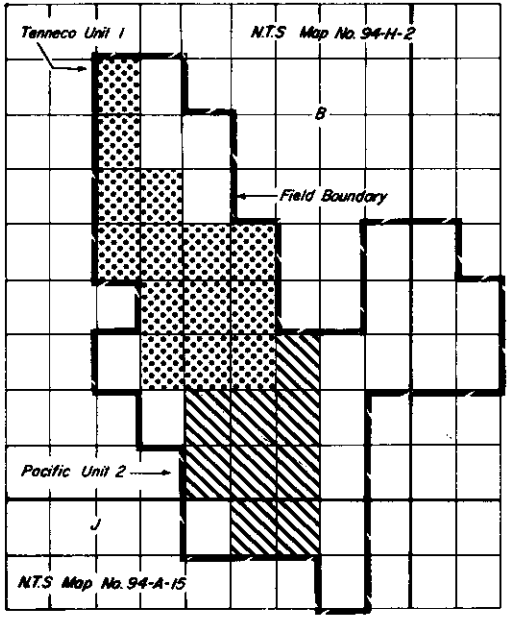
Map 20
HALFWAY ZONE PROJECTS
PEEJAY FIELD



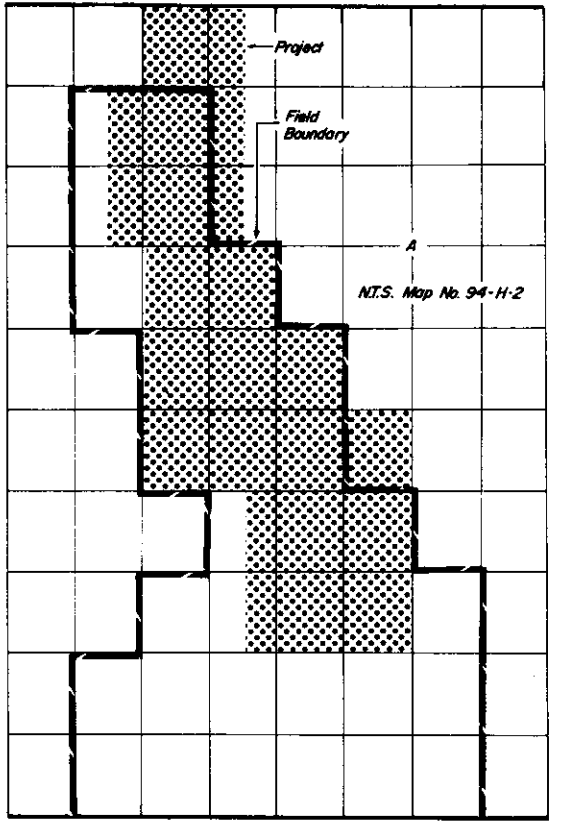
Map 21
DUNLEVY POOL PROJECT
RIGEL FIELD



Map 22
MONSANTO CONSERVATION PROJECT
DUNLEVY ZONE
RIGEL FIELD



Map 23
HALFWAY ZONE UNITS
WEASEL FIELD



Map 24
UNION OIL PROJECT
HALFWAY ZONE
WILDMINT FIELD

TABLE 16—PROJECT AND INDIVIDUAL WELL MPR DATA AT DECEMBER 31, 1970

Field	Pool	Well or Project	Well Authorization No.	MPR, STB/D	Project Data							
					Reference Map	Area (Acres)	Cumulative Injection		Number of Wells			
							MBW	MMSCF	Producers		Injectors	
									Oil	Gas	Water	Gas
Aitken Creek	Gething	Union Project	.....	1,125	1	1,009	.....	18,403	5	3	.....	1
Bear Flat	Charlie Lake	Monsanto Project	.....	286	2	1,362	.....	20	2	.....	.....	1
Beatton River	Halfway	Triad et al Beatton d-41-K/94-H-2	869	Suspended	.....	.....	.....	.....	.....	.....	.....	.....
		Triad Project	.....	2,270	3	1,838	8,739	.....	10	.....	5	.....
Beatton River West	Bluesky-Gething	Triad West Beatton River d-38-K/94-H-2	538	59	.....	.....	.....	.....	.....	.....	.....	.....
		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	.....	.....	.....	.....	.....	.....	.....	.....
		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	.....	.....	.....	.....	.....	.....	.....	.....
		Ashland Cdn-Sup W Beatton d-3-L/94-H-2	2669	59	.....	.....	.....	.....	.....	.....	.....	.....
		Whitehall Cdn-Sup W Beatton d-12-L/94-H-2	2014	93	.....	.....	.....	.....	.....	.....	.....	.....
		Whitehall Cdn-Sup W Beatton d-13-L/94-H-2	2422	93	.....	.....	.....	.....	.....	.....	.....	.....
		Whitehall et al W Beatton d-12-L/94-H-2	1408	168	.....	.....	.....	.....	.....	.....	.....	.....
		Whitehall Cdn-Sup W Beatton d-22-L/94-H-2	2304	66	.....	.....	.....	.....	.....	.....	.....	.....
		Triad et al W Beatton d-23-L/94-H-2	2465	60	.....	.....	.....	.....	.....	.....	.....	.....
		Whitehall Cdn-Sup W Beatton d-31-L/94-H-2	2465	Suspended	.....	.....	.....	.....	.....	.....	.....	.....
		Pool total	.....	869	.....	.....	.....	.....	.....	.....	.....	.....
Beaverdam	Halfway	Tenn Beaverdam d-38-L/94-A-16	1653	Suspended	.....	.....	.....	.....	.....	.....	.....	.....
Blueberry	Debolt	Mesa et al Blueberry b-18-K/94-A-12	2420	145	.....	.....	.....	.....	.....	.....	.....	.....
		Decalta Blueberry d-57-D/94-A-13	1333	53	.....	.....	.....	.....	.....	.....	.....	.....
		Pacific Project	.....	4,600	6	4,343	.....	837	18	.....	.....	1
		Pool total	.....	4,798	.....	.....	.....	.....	.....	.....	.....	.....
Boundary Lake	Cadomin	Pacific Boundary 8-15-85-14	270	79	.....	.....	.....	.....	.....	.....	.....	.....
	Boundary Lake	Imp Pac Boundary 8-32-84-13	991	Suspended	.....	.....	.....	.....	.....	.....	.....	.....
		Imp Pac Boundary 8-17-85-13	2568	119	.....	.....	.....	.....	.....	.....	.....	.....
		Imp Pac Boundary 16-17-85-13	2641	127	.....	.....	.....	.....	.....	.....	.....	.....
		Decalta Boundary Lake 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	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 16—PROJECT AND INDIVIDUAL WELL MPR DATA AT DECEMBER 31, 1970—*Continued*

Field	Pool	Well or Project	Well Authorization No.	MPR, STB/D	Project Data							
					Reference Map	Area (Acres)	Cumulative Injection		Number of Wells			
							MBW	MMSCF	Producers		Injectors	
									Oil	Gas	Water	Gas
Boundary Lake —*Continued*	Boundary Lake —*Continued*	Texaco NFA Boundary 16-30-86-13	1482	20	---	---	---	---	---	---	---	---
		Dome Project 1	---	4,919	7	1,793	8,152	---	25	---	7	---
		Dome Project 2	---	1,484	7	652	2,854	---	6	---	2	---
		Imperial Unit 1	---	38,657	7	25,754	43,928	---	132	---	32	---
		Texaco Unit 2	---	22,723	7	14,833	34,892	---	101	1	22	---
		Pool total	---	68,183	---	---	---	---	---	---	---	---
	Halfway	Texaco NFA Boundary 8-30-85-13	1097	83	---	---	---	---	---	---	---	---
		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	---	462	---	---	---	---	---	---	---	---
		Field total	---	68,724	---	---	---	---	---	---	---	---
Buick Creek	Dunlevy	Texaco NFA Buick c-32-A/94-A-14	1500	144	---	---	---	---	---	---	---	---
		Decalta et al Buick c-74-A/94-A-14	1345	---	---	---	---	---	---	---	---	---
Buick Creek West	Dunlevy	Pacific West Buick Creek c-83-K(13A)/94-A-11	271	---	---	---	---	---	---	---	---	---
		Pacific West Buick Creek b-76-C(15)/94-A-14	280	---	---	---	---	---	---	---	---	---
Bulrush	Halfway	Union Project	---	389	9	1,173	---	1,860	4	---	---	2
Bulrush East	Halfway	Dome Provo Co-op E Bulrush d-5-K/94-A-16	1843	43	---	---	---	---	---	---	---	---
Charlie Lake	Gething	Imp Pac Charlie 13-5-84-18	269	Suspended	---	---	---	---	---	---	---	---
Crush	Halfway	Union Unit 1	---	---	11	1,474	---	---	9	1	---	---
		Union et al Crush d-28-F/94-A-16	2096	Suspended	---	---	---	---	---	---	---	---
		Union et al Crush d-29-F/94-A-16	2288	175	---	---	---	---	---	---	---	---
		Union HB Sinclair Crush d-38-F/94-A-16	2253	29	---	---	---	---	---	---	---	---
		Union HB Sinclair Crush d-39-F/94-A-16	2214	199	---	---	---	---	---	---	---	---
		Union HB Sinclair Crush b-48-F/94-A-16	2532	50	---	---	---	---	---	---	---	---
		Union HB Sinc Crush d-49-F/94-A-16	2220	122	---	---	---	---	---	---	---	---
		Union HB Crush b-58-F/94-A-16	2364	13	---	---	---	---	---	---	---	---
		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 d-69-F/94-A-16	2386	---	---	---	---	---	---	---	---	---
		Pool total	---	814	---	---	---	---	---	---	---	---

Currant	Halfway	Union HB Currant d-28-C/94-A-16	1768	Suspended								
		Pacific Unit 1		627	12	547	1,106		4		2	
Fort St. John	Charlie Lake	Pacific Ft St John 3-14-83-18 (9)	34	48								
		Pacific Ft St John 10-14-83-18 (76)	214	13								
		Pacific Ft St John 1-23-83-18 (81)	225	24								
		Pacific Ft St John 9-23-83-18 (78)	216	65								
		Pool total		150								
	Belloy	Imp Pac Ft St John 9-19-83-18 (45)	171	Suspended								
Halfway	Charlie Lake	West Nat et al Halfway 14-11-87-25	1986	Suspended								
Inga	Baldonnel	Hunt Sands Pac Imp Inga 7-16-86-23	933	Suspended								
	Charlie Lake	Texaco Inga 6-25-87-24	2294	Suspended								
	Inga	IOE Pac Inga 6-28-87-23	2743	111								
		IOE Pac Inga 16-30-87-23	2658	63								
		IOE Pac Inga 6-31-87-23	2755	58								
		Texaco Inga 16-13-87-24	2255	112								
		Texaco Inga 16-24-87-24	2274	109								
		Texaco Inga 16-25-87-24	2209	98								
		IOE Pac Inga 16-36-87-24	2720	77								
		West Nat et al Inga 8-1-88-24	2764	57								
		Canadian Superior Unit 1		7,246	13	11,057	4,188		24	1	14	
		Amoco Unit 2		2,945	13	11,293			32			
		Pool total		10,876								
Milligan Creek	Halfway	Union HB Milligan b-65-G/94-H-2	1493	157								
		Union HB Milligan d-65-G/94-H-2	1518	58								
		Ipex Milligan b-75-G/94-H-2	2721	148								
		Baysel SR Milligan d-76-G/94-H-2	2659									
		Ipex Milligan b-85-G/94-H-2	2765	110								
		Duncan Milligan d-86-G/94-H-2	2566	52								
		Union Unit 1		10,000	17	2,952	37,729	3,398	20		13	1
		Pool total		10,525								
Moberly Lake	Charlie Lake	JBA Moberly 10-15-82-22	2019	61								
		JBA Moberly 4-23-82-22	2463	38								
		Pool total		99								
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								
Nig	Baldonnel	Texaco NFA Nig d-87-A/94-H-4	2152	165								
North Pine	Charlie Lake	Texaco N Pine 6-15-85-18	2264	50								
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	42								
		Pool total		61								

TABLE 16—PROJECT AND INDIVIDUAL WELL MPR DATA AT DECEMBER 31, 1970—*Continued*

Field	Pool	Well or Project	Well Authorization No.	MPR, STB/D	Project Data							
					Reference Map	Area (Acres)	Cumulative Injection		Number of Wells			
							MBW	MMSCF	Producers		Injectors	
									Oil	Gas	Water	Gas
Peejay	Halfway	Pacific SR CanDel Peejay d-71-H/94-A-15	1851	59	---	----	----	----	----	---	----	---
		Pacific SR West Cdn-Peejay d-33-I/94-A-15	725	5	---	----	----	----	----	---	----	---
		Decalta Ranger Peejay d-51-D/94-A-16	2023	25	---	----	----	----	----	---	----	---
		Texcan Texaco Peejay d-61-D/94-A-16	1683	Suspended	---	----	----	----	----	---	----	---
		Pacific Unit 1	----	4,430	20	3,734	15,251	----	23	---	12	---
		Union Unit 2	----	8,229	20	6,627	18,754	----	35	---	10	---
		Pacific Unit 3	----	6,865	20	5,423	13,941	----	27	---	12	---
		Pacific Arco Project	----	2,717	20	1,338	4,883	----	8	---	3	---
		Pool total	----	22,330	---	----	----	----	----	---	---	---
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	65	---	----	----	----	----	---	---	---
		Monsanto IOE Fina Rigel 11-19-87-16	1616	47	---	----	----	----	----	---	---	---
		Monsanto Rigel 16-19-87-16	1781	66	---	----	----	----	----	---	---	---
		Monsanto Rigel 6-13-87-17	1555	98	---	----	----	----	----	---	---	---
		Monsanto Rigel 6-23-87-17	1942	100	---	----	----	----	----	---	---	---
		Monsanto Rigel 6-31-87-17	1714	46	---	----	----	----	----	---	---	---
		IOE et al Rigel b-44-J/94-A-10	2565	34	---	----	----	----	----	---	---	---
		Pool total	----	456	---	----	----	----	----	---	---	---
Stoddart	Charlie Lake	Apache Dunbar Stoddart 11-23-85-19	2548	69	---	----	----	----	----	---	---	---
	Belloy	Uno-Tex et al Stoddart 6-31-85-19	2218	32	---	----	----	----	----	---	---	---
		Uno-Tex et al Stoddart 10-31-85-19	1519	42	---	----	----	----	----	---	---	---
		Uno-Tex Triad Stoddart A11-5-86-19	1983	Suspended	---	----	----	----	----	---	---	---
		Pool total	----	74	---	----	----	----	----	---	---	---
		Field total	----	143	---	----	----	----	----	---	---	---
Weasel	Halfway	Pacific SR CanDel Weasel d-82-J/94-A-15	2055	206	---	----	----	----	----	---	---	---
		Pacific Sinclair Weasel d-30-A/94-H-2	1631	Suspended	---	----	----	----	----	---	---	---
		Dome Provo Weasel d-2-B/94-H-2	1734	56	---	----	----	----	----	---	---	---
		Tenneco Unit 1	----	2,551	23	1,847	4,776	1,519	10	---	6	1
		Pacific Unit 2	----	1,143	23	1,081	1,412	----	7	---	4	---
		Pool total	----	3,956	---	----	----	----	----	---	---	---

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								
		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		3,315	24	1,869	14,521	11,278	12		5	2
		Pool total		3,529								
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	118								
		Baysel Sinclair Wolf b-92-B/94-A-15	1972	37								
		Baysel Sinclair Wolf d-93-B/94-A-15	1815	129								
		Frontier Pembina Wolf d-14-G/94-A-15	2062	Suspended								
		Pool total		284								
Other Areas	Bluesky-Gething	Union HB Gulf Canuck d-39-G/94-H-1	2616	Suspended								
		Union HB BA Ladyfern d-48-H/94-H-1	1433	Suspended								
		Sierra Patrick W Beatton d-4-L/94-H-2	2802	74								
		Pacific et al Wargen d-37-C/94-H-6	2324	Suspended								
	Inga	IOE Pac Inga 6-20-87-23	2798	27								
		IOE Pac Inga 6-21-87-23	2778	119								
		IOE Pac Inga 6-29-87-23	2770									
		Texaco Texcan Inga 8-36-87-24	2766	58								
		Pool total		204								
	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								
		Cankee Terrebonne Woodrush d-47-H/94-H-2	1840	Suspended								
	Belloy	CDR Eagle 8-29-84-18	2543	39								
		CDR Eagle 11-29-84-18	2502	285								
		Apache et al Stoddart 6-36-85-20	2757	61								
		Pool total		385								
		Other areas total		663								

TABLE 17—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Airport—							
Cadomin	Pacific Airport 8-32-83-17 (3)	27	8-70	1,393	0.753	830	Suspended.
Baldonnel	Pacific Airport 9-32-83-17 (97)	287	7-68	1,168	0.500	1,855	Suspended.
Halfway	Pacific Airport 12-34-83-17 (10)	35	5-70	1,868	1.000	1,514	Suspended.
Beavertail—							
Bluesky-Gething	Pacific Sinclair Beavertail d-71-C/94-A-15	1893	-----	-----	-----	-----	-----
	Pacific Sinclair Beavertail d-73-C/94-A-15	1915	3-69	1,108	0.758	15,564	3,891
	Pacific ARCo Beavertail c-92-C/94-A-15	2610	-----	-----	-----	-----	-----
Halfway	Pacific Sinclair Beavertail d-71-C/94-A-15	1893	-----	-----	-----	-----	-----
Beg—							
Baldonnel project	Pacific Imperial Beg c-24-B/94-G-1	1359	8-70	1,567	0.500	1,458	Disposal.
	Pacific Imperial Beg d-35-B/94-G-1	1154	8-70	1,117	0.500	2,015	-----
	Pacific Imperial Beg d-46-B/94-G-1	806	7-68	1,252	0.500	2,033	-----
	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	7-70	1,611	0.500	650	Suspended.
	Pacific et al Beg b-42-F/94-G-1	748	12-66	1,524	0.925	1,535	Zone ab'd.
	Pacific et al Beg d-64-F/94-G-1	733	6-70	1,153	1.000	3,931	-----
	Pacific et al Beg b-84-F/94-G-1	741	6-70	1,291	1.000	3,462	-----
	Pacific et al Beg b-95-F/94-G-1	747	6-70	1,097	1.000	3,046	-----
	Pacific et al Beg d-10-G/94-G-1	541	6-70	1,044	1.000	2,162	-----
	Pacific et al Beg b-6-K/94-G-1	740	6-70	1,326	1.000	2,025	-----
	Pacific et al Beg b-17-K/94-G-1	539	6-70	1,218	0.661	3,715	-----
	Pacific et al Beg a-28-K/94-G-1	749	6-70	1,342	0.500	3,254	-----
	Pacific et al Beg b-59-K/94-G-1	786	-----	-----	-----	-----	-----
	Pacific et al Beg b-82-L/94-G-1	1132	8-70	1,221	0.577	2,202	-----
	Pacific Pan Am Dome Beg a-4-D/94-G-8	766	8-68	908	0.625	15,600	-----
	Pacific Pan Am Dome Beg d-15-D/94-G-8	855	6-63	1,332	0.600	3,600	Disposal.
Baldonnel project total		-----	-----	-----	-----	-----	GEP.
Halfway project	Richfield Sohio Beg d-13-B/94-G-1	1268	8-70	863	0.500	4,880	-----
	Pacific Imperial Beg c-24-B/94-G-1	1359	8-70	973	0.500	3,325	-----
	Pacific Imperial Beg d-35-B/94-G-1	1154	8-70	857	0.725	4,432	-----
	Pacific Imperial Beg d-46-B/94-G-1	806	7-68	1,126	0.725	8,577	-----
	Pacific Imperial Beg d-57-B/94-G-1	1095	7-68	1,223	0.550	11,800	-----
	Richfield Sohio Beg d-77-B/94-G-1	1233	11-63	1,816	0.537	2,030	Suspended.
	Pacific et al Beg b-88-B/94-G-1	1350	6-70	1,234	0.610	4,995	-----
	Pacific et al Beg b-A99-B/94-G-1	739	9-70	1,011	0.664	3,521	-----
	Pacific et al Beg a-21-F/94-G-1	711	6-70	1,346	0.500	4,441	-----
	Pacific et al Beg b-42-F/94-G-1	748	8-61	1,536	0.842	2,100	Disposal.
	Pacific et al Beg d-64-F/94-G-1	733	6-70	810	1.000	3,172	-----

	Pacific et al Beg b-84-F/94-G-1	741	6-70	888	0.508	1,554	.....
	Pacific et al Beg b-95-F/94-G-1	747	6-70	987	0.500	2,193	.....
	Pacific et al Beg d-10-G/94-G-1	541	9-70	887	0.531	4,455	.....
	Pacific et al Beg b-6-K/94-G-1	740	6-70	1,067	0.500	5,287	.....
	Pacific et al Beg b-A17-K/94-G-1	2387	6-70	1,240	0.642	2,962	.....
	Pacific et al Beg b-59-K/94-G-1	786	.....	.....	.....	.....	.....
Halfway project total	.....	.....	.....	.....	.....	.....	GEP.
Field total	.....	.....	.....	.....	.....	.....	GEP.
Beg West—							
Baldonnel project	Pacific et al W Beg c-84-C/94-G-1	622	9-70	1,407	0.550	2,130	.....
	Pacific et al W Beg c-58-F/94-G-1	772	.....	.....	.....	.....	.....
	Pacific et al W Beg a-79-F/94-G-1	620	9-70	1,308	0.726	2,298	.....
Baldonnel total	.....	.....	.....	.....	.....	.....	GEP.
Bernadet—							
Bluesky-Gething	West Nat et al Bernadet 8-1-88-25	1106	7-68	322	0.754	309	2,000
Blueberry—							
Dunlevy	West Nat et al Blueberry 16-24-88-25	279	8-70	1,166	1.000	1,578	2,000
	West Nat et al Blueberry a-29-K/94-A-12	330	8-70	1,342	0.675	531	Suspended.
	West Nat et al Blueberry d-A50-K/94-A-12	357	8-70	1,314	1.000	879	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	.....	.....	.....	.....	2,000[1]
	West Nat et al Blueberry d-A87-D/94-A-13	94	8-70	1,178	0.577	1,684	2,000
	West Nat et al Blueberry d-97-D/94-A-13	581	8-70	739	0.571	2,026	2,000
Dunlevy total	.....	.....	.....	.....	.....	.....	8,000
Baldonnel	West Nat et al Blueberry c-65-D/94-A-13	71	8-70	1,628	0.577	925	Suspended.
	West Nat et al Blueberry d-87-D/94-A-13	64	8-70	1,340	0.577	830	2,000
	West Nat et al Blueberry d-97-D/94-A-13	581	9-60	1,653	1.000	5,600	Suspended.
Charlie Lake	West Nat et al Blueberry a-61-L/94-A-12	525	10-60	2,089	.....	.....	Suspended.
	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	.....	.....	.....	.....	.....	.....	10,000
Blueberry East—							
Baldonnel	West Nat et al E Blueberry b-38-C/94-A-13	103	8-70	1,762	0.820	1,869	Suspended.
Debolt	West Nat et al E Blueberry b-36-C/94-A-13	331	8-59	1,380	1.000	838	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	G Basins et al W Blueberry a-7-L/94-A-12	2435	4-69	1,718	0.980	9,100	2,275
	West Nat et al W Blueberry d-19-L/94-A-12	241	11-69	1,752	0.543	1,488	Suspended.
	G Basins et al W Blueberry d-39-L/94-A-12	2551	3-70	1,786	1.000	4,714	2,000
Baldonnel total	.....	.....	.....	.....	.....	.....	4,275
Field total	.....	.....	.....	.....	.....	.....	8,275

[1] Lease and camp fuel.

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
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	11-69	927	0.839	4,223	Suspended.
	Pacific Boundary 12-10-85-14	352	6-68	859	0.839	8,127	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	5-70	661	0.605	2,050	2,000
	Pacific Boundary Lake 11-14-85-14	667	11-69	1,176	0.674	1,528	Suspended.
	Pacific Boundary 8-15-85-14	270	11-69	1,254	0.725	3,443	2,000
	Sun Boundary Lake 8-23-85-14	652	9-70	915	0.767	7,995	2,606
	Amerada Boundary A6-24-85-14	1454	.....	.....	.....	.....	.....
	Texaco NFA Boundary Lake 6-25-85-14	687	5-70	846	0.850	3,778	2,000
Baldonnel total	.....	.....	.....	.....	.....	.....	8,606
Basal Boundary	Pacific 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.
Field total	.....	.....	.....	.....	.....	.....	13,411
Boundary Lake North—							
Halfway	Texaco NFA N Boundary 7-3-87-14	1395	.....	.....	.....	.....	.....
	Texaco NFA N Boundary 6-8-87-14	1529	5-70	1,218	1.000	92,879	23,220
	Texaco NFA N Boundary 10-9-87-14	1451	5-70	1,349	0.804	24,000	6,000
	Texaco NFA N Boundary 7-15-87-14	1881	3-66	1,556	0.850	2,300	Suspended.
Halfway total	.....	.....	.....	.....	.....	.....	29,220
Bubbles—							
Baldonnel	Dome Basco Bubbles b-19-A/94-G-8	464	7-70	833	0.518	2,470	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	.....	.....	.....	.....	.....
	Dome Bubbles d-42-B/94-G-8	791	8-70	1,400	.....	.....	Disposal.
	McCoy Dome Bubbles b-A62-B/94-G-8	674	7-70	929	0.591	2,940	2,000
Baldonnel project	Pacific Sunray Imp Bubbles b-22-I/94-G-1	467	6-70	1,459	.....	.....	Suspended.
	Pacific Imperial Bubbles b-33-I/94-G-1	451	6-70	781	0.754	10,266	4,283
	Pacific Imperial Bubbles b-44-I/94-G-1	466	6-70	704	0.884	10,534	4,445
	Pacific Sunray Imp Bubbles d-55-I/94-G-1	479	11-69	1,336	.....	.....	Disposal.
	Pacific Imperial Bubbles b-66-I/94-G-1	480	6-70	751	0.686	3,617	2,000
	Pacific Imperial Bubbles d-77-I/94-G-1	478	6-70	909	0.500	2,990	2,000
	Pacific Imperial Bubbles d-88-I/94-G-1	462	6-70	826	0.925	19,826	8,003
	Pacific Dome et al Bubbles d-99-I/94-G-1	615	8-70	777	0.500	1,478	2,000*
Baldonnel project total	.....	.....	.....	.....	.....	.....	22,731
Baldonnel total	.....	.....	.....	.....	.....	.....	26,731

Buick Creek—							
Bluesky-Gething—							
Pool A	Texaco NFA Buick c-98-L/94-A-10	1088	----	----	----	----	----
	Mic Mac et al Buick d-17-D/94-A-15	1286	3-70	891	0.870	3,943	2,000
Pool B	Texaco NFA Buick c-80-D/94-A-15	1087	7-70	767	0.500	550	Suspended.
Dunlevy—							
Pool A	Woods Buick a-65-I/94-A-11	2785	----	----	----	----	----
	Decalta et al Buick d-73-I/94-A-11	1344	----	----	----	----	----
	Pacific Buick a-85-I/94-A-11	1323	7-70	860	0.963	8,150	2,306
	Texaco et al Buick c-94-I/94-A-11	2693	3-70	898	0.933	18,655	4,664
	Texaco NFA Buick d-96-I/94-A-11	787	6-70	844	0.700	12,322	4,388
	Texaco NFA Buick Creek d-98-I(1)/94-A-11	45	6-70	800	0.980	3,106	2,000
	Texaco NFA Buick Creek c-10-A(2)/94-A-14	65	6-70	897	0.506	179	2,000
	Whitehall Buick c-34-A/94-A-14	1336	8-69	714	0.712	1,519	2,000
	Texaco NFA Buick b-A46-A/94-A-14	1508	7-70	679	0.630	550	2,000
Pool A total		----	----	----	----	----	19,358
Pool B	Texaco NFA Buick c-98-L/94-A-10	1088	7-70	829	0.566	763	2,000
	Texaco NFA Buick a-31-A/94-A-14	295	7-70	878	0.661	12,337	3,406
	Whitehall Buick b-62-A/94-A-14	1303	8-69	907	1.000	3,725	2,000
	Texaco NFA Buick d-93-A/94-A-14	1346	7-70	1,208	0.694	----	Observation.
	Texaco NFA Buick c-18-D/94-A-15	1185	7-70	798	0.600	3,478	2,000
	Texaco NFA Buick c-80-D/94-A-15	1087	7-70	767	0.920	4,992	2,000
Pool B total		----	----	----	----	----	11,406
Pool C	Texaco NFA Buick Creek c-79-J(6)/94-A-11	110	6-70	540	0.700	1,485	2,000
	Texaco NFA Buick Creek d-83-J(4)/94-A-11	96	6-70	455	1.000	12,210	5,552
	Texaco NFA Buick d-93-J/94-A-11	728	6-70	464	0.938	8,649	3,870
	Pacific Buick Creek b-4-B/94-A-14	457	7-70	608	0.931	1,656	2,000
	Texaco NFA Buick b-10-B/94-A-14	1179	6-70	587	0.862	632	2,000
	Pacific Buick Creek c-14-B/94-A-14	469	7-70	662	0.869	1,689	2,000
	Sun Buick c-16-B/94-A-14	744	6-70	707	0.767	1,785	2,000
	Sun Buick d-19-B/94-A-14	756	6-70	603	1.000	1,544	2,000
	Texaco NFA Buick c-40-B/94-A-14	1213	6-70	647	0.940	919	2,000
	Sun Buick d-11-C/94-A-14	818	6-70	592	0.900	6,012	2,842
	Sun et al Buick c-32-C/94-A-14	1360	6-70	527	0.996	6,382	3,379
Pool C total		----	----	----	----	----	29,643
Charlie Lake	Texaco NFA Buick Creek d-83-J(4)/94-A-11	96	6-66	490	0.700	1,500	Suspended.
Field total		----	----	----	----	----	64,407
Buick Creek North—							
Bluesky-Gething	Pacific West Prod N Buick c-22-F/94-A-14	1753	7-70	863	0.636	11,102	3,604[2]
	Pacific West Prod N Buick b-44-F/94-A-14	1799	----	----	----	----	----
Dunlevy	Pacific West Prod N Buick a-81-C/94-A-14	2069	7-70	951	0.603	6,408	2,000
	Texaco NFA N Buick d-91-C/94-A-14	2174	6-70	957	0.736	11,556	4,492
	Pacific West Prod N Buick b-2-F/94-A-14	2026	7-70	952	0.700	2,871	2,000
	Pacific West Prod N Buick c-22-F/94-A-14	1753	----	----	----	----	[2]
	Pacific West Prod N Buick b-44-F/94-A-14	1799	----	----	----	----	----
	Pacific West Prod N Buick b-86-F/94-A-14	1830	7-70	1,274	0.500	1,354	Suspended.
Dunlevy total		----	----	----	----	----	8,492
Field total		----	----	----	----	----	12,096

* Lease line well restricted to 2,000 MSCF/D.
[2] Commingled production. Bluesky-Gething and Dunlevy not segregated.

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Buick Creek West—							
Dunlevy—							
Pool A	Pacific West Buick Creek d-95-K(4)/94-A-11	99	7-70	375	0.790	4,028	2,570
	Pacific West Buick Creek c-5-C(11)/94-A-14	264	7-70	376	0.906	2,758	2,000
	Pacific West Buick Creek c-14C(3)/94-A-14	95	7-70	619	0.975	6,514	Suspended.
	Pacific West Buick Creek d-17-C(17)/94-A-14	384	7-70	364	0.837	14,031	7,024
Pool A total		-----	-----	-----	-----	-----	11,594
Pool B	Pacific West Buick Creek b-78-C(2)/94-A-14	89	7-70	792	0.712	3,692	2,000
	Pacific West Buick Creek c-80-C(10)/94-A-14	261	7-70	534	-----	-----	-----
	Pacific West Buick Creek d-89-C(12)/94-A-14	268	7-70	732	1.000	1,637	2,000
	Pacific West Buick Creek b-91-D(9)/94-A-14	255	7-70	588	1.000	2,036	2,000
	Pacific West Buick Creek c-2-E(6)/94-A-14	239	7-70	562	0.686	4,645	2,000
Pool B total		-----	-----	-----	-----	-----	8,000
Dunlevy total		-----	-----	-----	-----	-----	19,594
Baldonnel	Pacific West Buick Creek d-58-C(8)/94-A-14	249	7-70	1,365	-----	-----	Suspended.
	Pacific West Buick Creek a-78-C/94-A-14	644	7-70	800	0.699	2,269	2,000
Halfway	Pacific West Buick Creek b-23-E(1)/94-A-14	86	7-62	699	0.712	2,450	Suspended.
Field total		-----	-----	-----	-----	-----	21,594
Cabin—							
Slave Point	General American Cabin a-61-F/94-P-5	2665	-----	-----	-----	-----	-----
	West Nat Cabin a-19-G/94-P-5	1406	2-64	2,645	0.554	32,100	Suspended.
	Pacific Cabin a-49-G/94-P-5	2058	-----	-----	-----	-----	-----
Clarke Lake—							
Slave Point	Pacific et al Clarke a-65-G/94-J-10	1528	8-68	2,823	0.570	10,400	Disposal.
	Cankee Cdn-Sup Clarke d-72-G/94-J-10	2176	12-70	2,734	0.786	78,098	20,451
	Gulf Shell Clarke c-76-H/94-J-10	2458	3-69	2,877	0.500	8,400	Suspended.
	Husky et al Clarke c-100-H/94-J-10	2506	2-70	2,762	-----	-----	2,000
Slave Point project	Pacific Imp Clarke c-56-L/94-J-9	1833	9-70	2,535	0.552	58,218	-----
	Pacific Imp Clarke b-69-L/94-J-9	2240	-----	-----	-----	-----	Disposal.
	Pacific Imp Clarke b-72-L/94-J-9	2540	10-70	2,588	0.637	102,443	-----
	West Nat Imp Clarke Lake d-88-L/94-J-9	344	9-70	2,553	0.620	112,389	-----
	West Nat Imp Clarke Lake d-91-L/94-J-9	585	9-70	2,569	0.854	16,628	-----
	West Nat Imp Clarke Lake c-94-L/94-J-9	397	9-70	2,559	1.000	57,862	-----
	Pacific et al Clarke c-54-F/94-J-10	1932	5-70	2,752	0.575	11,733	-----
	Pacific Apache Clarke a-61-F/94-J-10	1578	9-70	2,693	0.695	36,311	-----
	Pacific Apache Clarke b-76-G/94-J-10	1071	9-70	2,529	0.674	9,588	-----
	Pacific et al Clarke d-69-H/94-J-10	1866	3-70	2,802	0.500	39,051	-----

	Pacific et al Clarke b-18-I/94-J-10	2316	9-70	2,698	0.567	22,745	.....
	Pacific et al Clarke c-20-I/94-J-10	2107	5-70	2,731	0.535	41,823	.....
	Pacific et al Clarke b-38-I/94-J-10	1933	4-70	2,703	.....	.....	.....
	Pacific et al Clarke c-69-I/94-J-10	2249	9-70	2,594	0.587	53,830	.....
	West Nat et al Clarke b-70-I/94-J-10	688	9-70	2,630	0.655	43,862	.....
	West Nat et al Clarke c-78-I/94-J-10	505	9-70	2,604	1.000	135,998	.....
	Pacific Imp Clarke c-85-I/94-J-10	2310	.....	.....	.....	.....	.....
	Pacific Imperial Clarke c-92-I/94-J-10	1554	9-70	2,589	0.500	98,798	.....
	Pacific et al Clarke b-22-J/94-J-10	1796	4-70	2,759	.....	.....	.....
	Pacific et al Clarke b-26-J/94-J-10	2776	.....	.....	.....	.....	.....
	Pacific et al Clarke c-43-J/94-J-10	2239	9-70	2,696	0.649	37,194	.....
	Pacific et al Clarke b-46-J/94-J-10	2162	5-70	2,715	0.550	16,916	.....
	West Nat et al Clarke c-47-J/94-J-10	211	.....	.....	.....	.....	.....
	West Nat et al Clarke a-52-J/94-J-10	856	9-70	2,669	0.733	24,533	.....
	Pacific et al Clarke a-55-J/94-J-10	1966	9-70	2,741	0.715	98,738	.....
	West Nat Imp Clarke Lake c-8-D/94-J-16	503	9-70	2,600	1.000	144,612	.....
	Pacific Imp Clarke b-10-D/94-J-16	2509	9-70	2,569	0.591	83,104	.....
	PRL	.....	.....	.....	.....	.....	400,000
Slave Point total	.....	.....	.....	.....	.....	.....	422,451
Clarke Lake South—							
Slave Point	West Nat IOE S Clarke d-29-K/94-J-9	1274	5-69	2,666	0.500	135,164	(3)
	Pacific IOE S Clarke c-50-K/94-J-9	1913	5-70	2,620	0.781	13,922	(3)
Currant—							
Halfway	Texaco NFA Currant a-3-C/94-A-16	1607	.....	.....	.....	.....	.....
Dawson Creek—							
Dunvegan	Horizon Dawson B3-22-79-15	2216	.....	.....	.....	.....	.....
Cadotte	Pacific Sc Dawson Ck 3-22-79-15 (2)	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	10-69	1,941	0.595	1,750	2,000
Field total	.....	.....	.....	.....	.....	.....	6,000
Fort St. John—							
Cadomin	Pacific Ft St John A3-29-83-18 (31)	75	5-70	1,330	1.000	28,827	Suspended.
	Pacific Ft St John A9-19-83-18 (58)	190	.....	.....	.....	.....	.....
Baldonnel	Pacific Ft St John 14-15-83-18 (7)	32	5-70	990	0.700	3,118	Suspended.
	Pacific Ft St John 16-8-83-18 (83)	233	5-67	676	0.820	2,557	2,000
	Pacific Ft St John 9-14-83-18 (71)	204	.....	.....	.....	.....	.....
	Pacific Ft St John 13-14-83-18 (54)	194	5-70	906	0.993	2,272	Suspended.
	Pacific Ft St John A6-16-83-18 (73	212	8-70	562	0.733	1,623	2,000
	Pacific Ft St John 6-17-83-18 (72)	210	6-68	655	0.851	4,940	2,327
	Pacific Ft St John 8-20-83-18 (43)	170	8-70	523	0.850	2,926	2,000

[3] Part of Clarke Lake project PRL.

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Fort St. John—*Continued*							
Baldonnel—*Continued*	Pacific Ft St John B14-21-83-18 (62)	193	8-70	483	0.625	2,373	2,000
	Pacific Ft St John 14-22-83-18 (32)	76	8-70	536	0.782	3,237	2,000
	Pacific Ft St John 13-23-83-18 (34)	82	7-70	599	0.726	3,386	2,000
	Pacific Ft St John C3-29-83-18 (56)	186	8-70	588	0.565	2,400	2,000
	Pacific Ft St John 4-32-83-18 (26)	67	8-70	801	1.000	394	2,000
Baldonnel total							18,327
Charlie Lake	Pacific Ft St John B3-29-83-18 (52)	179					
Halfway	Pacific Ft St John 1-20-83-18 (30)	74	8-70	412	0.839	1,440	2,000
	Pacific Ft St John 2-21-83-18 (46)	172	8-70	413	0.818	1,591	2,000
	Pacific Ft St John A14-21-83-18 (51)	178	8-70	396	0.916	1,761	2,000
	Pacific Ft St John A14-22-83-18 (61)	192	5-70	578	1.000	88	Suspended.
	Pacific Ft St John B3-29-83-18 (52)	179	8-70	436	0.856	1,800	2,000
	Pacific Ft St John 10-30-83-18 (53)	181	8-70	461	0.868	614	2,000
	Home W Ft St John 10-27-83-19	2391					
	Pacific et al Ft St John 11-34-83-19	2138	7-69	1,772	0.833	4,250	2,000
Halfway total							12,000
Belloy	Pacific Ft St John 14-21-83-18 (4)	29	8-70	544	0.624	1,145	2,000
	Pacific Ft St John 3-29-83-18 (23)	58	8-70	462	0.542	2,605	2,000
	Pacific Ft St John 3-30-83-18 (6)	31					Disposal.
Belloy total							4,000
Field total							34,327
Fort St. John Southeast—							
Cadomin	Pac Ft St John SE 10-31-82-17 (80)	220	5-70	1,219	0.854	1,349	Suspended.
Baldonnel	Pac Ft St John SE 13-2-83-17 (74)	213	6-68	756	0.766	3,101	2,000
	Pac Ft St John SE A4-10-83-17 (55)	184	5-70	1,053	0.500	2,227	2,000
Baldonnel total							4,000
Charlie Lake	Pacific Ft St John SE 7-3-83-17 (49)	174	5-70	1,339			Suspended.
	Pacific Ft St John SE 8-5-83-17 (20)	52					
Halfway	Pac Ft St John SE 10-33-82-17 (22)	60	5-70	1,451	1.000	5,009	Suspended.
	Pacific Ft St John SE 7-3-83-17 (49)	174	11-69	818	1.000	1,253	Zone ab'd.
	Pac Ft St John SE 16-3-83-17 (66)	197	6-70	505	0.795	6,183	3,612
	Pac Ft St John SE A10-4-83-17 (60)	191	5-70	864	0.649	2,300	2,000
	Pac Ft St John SE 7-5-83-17 (69)	202	5-70	1,797	1.000	1,490	Suspended.
	Pac Ft St John SE A10-10-83-17 (98)	320	5-70	735	0.845	2,122	Suspended.
Halfway total							5,612

Belloy	Pac Ft St John SE 11-32-82-17 (68)	201	5-70	497	0.745	5,597	4,303
	Pac Ft St John SE 10-4-83-17 (47)	173	6-70	799	0.810	5,879	3,467
	Pacific Ft St John SE 8-5-83-17 (20)	52	10-53	2,805	1.000	4,980	Zone ab'd.
	Pacific Ft St John SE 4-9-83-17 (44)	166	5-70	866	1.000	4,217	Suspended.
	Pac Ft St John SE 4-10-83-17 (12)	42	5-70	1,825	0.500	6,263	Suspended.
	Pac Ft St John SE 10-10-83-17 (79)	219	5-70	733	0.726	1,231	2,000
Belloy total							9,770
Field total							19,382
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
Charlie Lake	West Nat et al Halfway 8-11-87-25	182	6-70	2,035	0.781	759	Suspended.
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(1)/94-B-16	112	8-58	1,653	1.000	6,600	Suspended.
	Pacific Highway a-47-I(2)/94-B-16	180	11-57	1,680	0.754	3,600	Suspended.
	Pacific Highway a-69-I(3)/94-B-16	274	11-57	1,691	0.812	3,150	Suspended.
	Pacific Highway a-90-I(4)/94-B-16	229	11-64	1,388	0.535	920	Suspended.
Debolt	Pacific Highway a-90-I(4)/94-B-16	229	7-66	880	0.553	6,885	Suspended.
Inga—							
Baldonnel	Pacific Inga 6-29-86-23	2327	7-68	1,789	0.864	9,000	2,250
	Pacific Inga 6-32-86-23	2401	12-68	1,778	0.687	3,780	2,000
	Pacific Inga 6-4-87-23	2412	1-69	1,767	0.875	16,300	4,075
Baldonnel total							8,325
Inga—							
Inga Unit 3	West Nat et al Inga d-42-J/94-A-12	2000	----	----	----	----	Observation.
	Cdn-Sup Whitehall Inga b-44-J/94-A-12	2461	----	----	----	----	Observation.
	Pioneer Cabot Inga b-82-J/94-A-12	2241	9-70	2,293	0.981	23,184	----
	West Nat et al Inga b-10-A/94-A-13	470	1-69	2,278	0.824	2,715	----
	Pioneer et al Inga a-5-B/94-A-13	2320	9-70	2,285	0.851	4,722	----
	West Nat et al Inga a-22-B/94-A-13	412	11-70	2,264	1.000	3,220	----
Unit total							10,000
Field total							18,325
Jedney—							
Gething	Pacific Imperial Jedney a-95-C/94-G-8	1366	10-63	1,142	0.531	13,600	Suspended.
Baldonnel project	Pacific Imperial Jedney c-78-H/94-G-1	1129	8-69	1,113	0.726	955	----
	Pacific Imperial Jedney b-99-H/94-G-1	1054	8-69	1,072	0.535	3,428	----
	Pacific Imperial Jedney c-100-H/94-G-1	1082	8-69	1,106	0.500	2,448	----
	Pacific Sunray Imp Jedney b-44-J/94-G-1	492	8-70	1,510	----	----	----
	Pacific Imperial Jedney b-66-J/94-G-1	475	8-70	1,006	0.839	5,711	----

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Jedney—*Continued*							
Baldonnel project—*Continued*	Pacific et al Jedney b-68-J/94-G-1	498	6-66	1,358	0.685	.....	Disposal.
	Pacific Imperial Jedney d-77-J/94-G-1	484	8-70	911	0.532	1,842	.....
	Pacific et al Jedney b-88-J/94-G-1	427	8-68	879	0.818	19,500	.....
	Pacific Imp Jedney d-99-J/94-G-1	382	8-70	870	0.531	1,759	.....
	Pacific Imperial Jedney b-10-B/94-G-8	473	8-70	839	0.766	15,025	.....
	Pacific Imperial Jedney b-30-B/94-G-8	460	8-70	918	0.588	3,528	.....
	Pacific Imperial Jedney d-31-C/94-G-8	1178	8-70	1,202	0.931	2,504	.....
	Pacific Imperial Jedney d-44-C/94-G-8	1375	8-70	1,297	0.685	4,295	.....
	Pacific Imperial Jedney d-53-C/94-G-8	820	8-70	1,313	0.880	1,909	.....
	Pacific Imperial Jedney b-73-C/94-G-8	868	8-70	1,335	0.500	2,625	.....
	Pacific et al Jedney c-86-C/94-G-8	778	8-70	1,119	0.500	1,969	.....
	Pacific et al Jedney d-97-C/94-G-8	651	8-68	1,190	0.595	11,470	.....
	Pacific Pan Am Dome Jedney c-8-F/94-G-8	1152	8-70	1,330	0.594	1,268	.....
	Pacific Pan Am Dome Jedney b-28-F/94-G-8	944	8-70	1,269	0.500	2,038	.....
	Skelly Jedney a-39-F/94-G-8	1334	12-69	(4)	1.000	(4)	.....
	Pacific et al Jedney b-50-F/94-G-8	1907	.....	.....	.....	.....	.....
Baldonnel project total		.....	.....	.....	.....	.....	GEP.
Halfway project	Pacific Imperial Jedney c-57-H/94-G-1	1183	8-70	1,368	0.500	2,095	.....
	Pacific Imperial Jedney d-68-H/94-G-1	1256	6-70	1,084	0.500	3,265	.....
	Pacific Imperial Jedney c-78-H/94-G-1	1129	6-70	1,058	0.853	4,370	.....
	Pacific Imperial Jedney b-99-H/94-G-1	1054	7-69	1,058	0.726	12,381	.....
	Pacific Imperial Jedney c-100-H/94-G-1	1082	8-69	1,167	0.738	11,312	.....
	Pacific Imperial Jedney a-65-J/94-G-1	461	8-70	893	0.543	3,280	.....
	Pacific Imperial Jedney b-66-J/94-G-1	475	8-70	963	0.649	7,683	.....
	Pacific Imperial Jedney d-77-J/94-G-1	484	8-70	872	0.869	10,594	.....
	Pacific Imp Jedney d-99-J/94-G-1	382	8-70	897	0.740	5,897	.....
	Pacific Imp Jedney d-19-B/94-G-8	2171	.....	.....	.....	.....	.....
	Pacific Imperial Jedney d-31-C/94-G-8	1178	8-70	863	0.500	4,111	.....
	Pacific Imperial Jedney d-42-C/94-G-8	453	8-70	903	0.684	2,934	.....
	Pacific Imperial Jedney d-44-C/94-G-8	1375	.....	.....	.....	.....	.....
	Pacific Imperial Jedney d-53-C/94-G-8	820	8-70	696	0.587	2,201	.....
	Pacific Imperial Jedney b-73-C/94-G-8	868	8-70	790	0.588	3,252	.....
	Pacific Imperial Jedney b-84-C/94-G-8	691	8-70	723	0.500	2,621	.....
	Pacific et al Jedney c-86-C/94-G-8	778	8-70	808	0.649	2,495	.....
	Pacific Imperial Jedney a-95-C/94-G-8	1366	8-70	1,444	0.500	.....	Disposal.
	Pacific et al Jedney d-97-C/94-G-8	651	9-70	955	0.742	4,450	.....
	Pacific Pan Am Dome Jedney c-8-F/94-G-8	1152	12-69	1,536	0.677	1,576	.....
	Pacific et al Jedney a-17-F/94-G-8	779	8-70	832	0.837	3,272	.....
	Pacific Pan Am Dome Jedney b-28-F/94-G-8	944	8-70	726	0.554	2,521	.....
	Skelly Jedney a-39-F/94-G-8	1334	12-69	1,091	0.926	1,633	.....
	Pacific et al Jedney b-50-F/94-G-8	1907	.....	.....	.....	.....	.....
Halfway project total		.....	.....	.....	.....	.....	GEP.
Field total		.....	.....	.....	.....	.....	GEP.

Jedney West—							
Baldonnel	Pacific et al W Jedney b-84-K/94-G-1	1081	8-70	1,564	0.500	1,157	2,000
Halfway	Pacific et al W Jedney b-84-K/94-G-1	1081	8-70	1,305	0.500	1,299	2,000
	Pacific et al W Jedney b-6-C/94-G-8	1276	8-70	1,256	0.500	875	Suspended.
Field total							4,000
Kobes-Townsend—							
Dunlevy	Pacific Kobes b-82-I/94-B-8	496	7-70	991	1.000	704	2,000
	Pacific Kobes a-3-A(4)/94-B-9	372	7-70	1,093	0.704	2,239	2,000
	Pacific Kobes b-24-A/94-B-9	489	7-70	890	1.000	591	2,000
Dunlevy total							6,000
Charlie Lake	Pacific Kobes c-73-I(2)/94-B-8	299	7-70	1,179	0.500	1,254	2,000
	Pacific Kobes d-94-I(1)/94-B-8	141	9-68	1,056	0.824	2,543	2,000
	Pacific Kobes b-35-A(A-1)/94-B-9	177	7-70	1,358	0.564	1,691	2,000
	Pacific Kobes d-57-A/94-B-9	2588	.....	.....	.....	.....	.....
	Pacific Kobes a-99-A(B-1)/94-B-9	314	8-68	1,265	0.500	553	2,000
	Pacific Townsend d-21-G(A-2)/94-B-9	251	9-68	1,187	0.864	1,248	2,000
Charlie Lake total							10,000
Halfway project	Pacific Kobes d-94-I(1)/94-B-8	141	8-68	1,952	0.627	9,850	GEP.
	Pacific Kobes b-35-A(A-1)/94-B-9	177	10-70	1,819	0.588	5,717	GEP.
Halfway project total							GEP.
Debolt	Pacific Kobes a-99-A(B-1)/94-B-9	314	9-68	1,583	0.869	8,250	3,385
	Pacific Townsend a-20-H(A-1)/94-B-9	164	8-65	1,378	0.700	497	Suspended.
Field total							19,385
Kotcho Lake—							
Slave Point	West Nat Kotcho Lake d-39-J/94-I-14	532	.....	.....	.....	.....	.....
	West Nat Kotcho b-54-K/94-I-14	879	.....	.....	.....	.....	.....
	West Nat Kotcho Lake c-67-K/94-I-14	404	2-60	2,562	0.843	825,000	206,250
	Pacific Kotcho b-86-K/94-I-14	2097	3-70	2,366	0.623	90,957	Suspended.
	West Nat Kotcho d-12-C/94-P-3	1147	3-70	2,495	0.605	57,000	14,511
	Pacific Kotcho b-44-C/94-P-3	562	4-60	2,566	0.565	105,000	Suspended.
Slave Point total							220,761
La Garde—							
Dunlevy	Texaco NFA La Garde 7-21-87-15	145	5-70	945	0.859	2,572	2,000
Boundary Lake	Texaco NFA La Garde 10-29-87-15	1194	5-70	983	0.964	8,952	2,238
Field total							4,238
Laprise Creek—							
Baldonnel project	Dome Basco Laprise Creek a-81-A/94-G-8	490	7-70	1,137	0.500	3,541	.....
	Dome Provo Laprise Creek d-91-A/94-G-8	653	7-70	1,051	0.500	1,392	.....
	Dome Provo Laprise Creek b-2-H/94-G-8	483	7-70	1,132	0.720	8,181	.....
	Dome Provo Laprise d-4-H/94-G-8	1852	7-70	1,029	0.500	3,278	.....
	Dome Basco Laprise Creek d-13-H/94-G-8	474	7-70	1,106	0.500	4,878	.....
	Dome Provo Laprise Creek a-25-H/94-G-8	654	7-70	1,044	0.500	1,474	.....
	Dome Provo Laprise Creek a-33-H/94-G-8	666	7-70	1,046	0.615	4,228	.....
	Dome Basco Laprise Ck a-35-H/94-G-8	327	7-70	1,130	0.544	7,051	.....

[4] Not available.

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Laprise Creek—*Continued*							
Baldonnel project—*Continued*	Dome Provo Laprise a-46-H/94-G-8	665	7-70	1,176	0.645	2,858	.....
	Dome Provo Laprise a-52-H/94-G-8	1445	7-70	1,092	0.500	3,030	.....
	Dome Provo Laprise a-81-H/94-G-8	837	7-70	1,113	0.500	4,045	.....
	Dome Provo Laprise d-91-H/94-G-8	809	7-70	1,077	0.579	6,022	.....
	Dome Provo Laprise c-92-H/94-G-8	1056	7-70	1,011	0.578	2,316	.....
	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	6-69	1,200	0.720	4,643	.....
	Pacific Imp Laprise b-90-C/94-H-5	1970	6-70	1,267	0.740	9,743	.....
	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	6-69	1,307	0.662	12,908	.....
	Amerada Laprise d-77-D/94-H-5	1378	6-69	1,345	0.521	4,946	.....
	Pacific IOE Laprise a-85-D/94-H-5	1948	6-70	1,262	0.500	4,974	.....
	Amerada Laprise d-95-D/94-H-5	1477	6-69	1,397	0.500	1,142	.....
	Pacific IOE Laprise d-3-E/94-H-5	1979	6-70	1,358	.....	.....	.....
	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	.....	.....	.....	.....	.....
	Pacific Imperial Laprise a-22-E/94-H-5	715	6-70	1,213	0.554	3,724	.....
	Pacific Imperial Laprise c-24-E/94-H-5	1511	6-70	1,166	0.594	1,982	.....
	Pacific IOE Laprise a-29-E/94-H-5	1938	6-70	1,442	.....	.....	.....
	Dome Provo Laprise b-30-E/94-H-5	1837	7-70	1,074	0.649	9,540	.....
	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	7-70	1,155	0.770	13,145	.....
	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	7-70	1,132	0.713	10,330	.....
	Pacific Imperial Laprise c-56-E/94-H-5	650	6-70	1,137	0.577	5,349	.....
	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	7-70	1,079	0.510	5,535	.....
	Pacific Imperial Laprise c-78-E/94-H-5	551	6-70	1,177	0.700	6,266	.....
	Pacific Imperial Laprise a-99-E/94-H-5	1341	7-68	1,293	0.767	12,500	.....
Baldonnel total	.....	.....	.....	.....	.....	.....	GEP.
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—							
Bluesky-Gething	Union HB Milligan d-62-G/94-H-2	1001	.....	.....	.....	.....	2,000
	Baysel SR Milligan d-76-G/94-H-2	2659	.....	.....	.....	.....	.....
	Ashland Homestead Milligan d-85-G/94-H-2	2644	4-70	1,024	0.880	3,535	2,000
Halfway	Whitehall et al Milligan d-75-G/94-H-2	689	.....	.....	.....	.....	.....
Field total	.....	.....	.....	.....	.....	.....	4,000

Montney—							
Bluesky-Gething	Pac Sunray Montney 16-32-86-19 (3)	119	9-58	1,123	1.000	814	Suspended.
Charlie Lake	Pac Sunray Montney 14-36-86-19 (2)	104	7-58	1,116	1.000	2,200	Suspended.
Halfway	Pac White Rose Sec Montney 6-5-87-18	801	8-69	1,282	0.529	1,587	2,000
	Pac Sunray Montney 14-31-86-19 (5)	289	7-61	1,185	0.932	2,250	Suspended.
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	7-70	1,212	0.520	1,307	Suspended.
	Pacific Nig b-4-B/94-H-4	1728	7-70	1,180	0.637	2,934	2,000
	Whitehall Nig b-6-B/94-H-4	1613	7-69	1,369	0.841	7,647	2,087
	Monsanto Nig d-13-B/94-H-4	1004	7-70	1,217	0.500	1,950	2,000
	Monsanto Nig a-21-B/94-H-4	1475	7-70	1,175	0.677	3,669	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	7-70	1,255	0.595	4,900	2,000
	Tenn Monsanto Nig c-A32-C/94-H-4	1484	10-64	1,589	.....	.....	Abandoned.
Baldonnel project	Texaco NFA Nig a-69-A/94-H-4	819	8-70	1,420	0.500	1,144	2,000
	Texaco Gulf Nig d-76-A/94-H-4	2761	9-70	1,540	0.905	4,378	.....
	Texaco NFA Nig d-15-B/94-H-4	1180	7-70	1,258	0.686	5,681	2,012
	Texaco NFA Nig c-36-B/94-H-4	729	8-70	1,252	0.660	5,723	2,000
	Texaco et al Nig b-68-B/94-H-4	2784	.....	.....	.....	.....	.....
	Texaco NFA Nig Creek b-70-B(9)/94-H-4	383	8-70	1,178	0.500	2,478	2,000
	Texaco NFA Nig d-71-B/94-H-4	790	8-70	1,075	1.000	1,646	.....
	Texaco NFA Nig d-75-B/94-H-4	1681	7-70	1,123	0.587	6,415	.....
	Texaco NFA Nig a-77-B/94-H-4	1762	7-70	1,059	0.663	7,054	.....
	Texaco NFA Nig Creek a-79-B(1)/94-H-4	61	7-70	1,128	0.611	10,401	.....
	Texaco NFA Nig c-90-B/94-H-4	1161	7-70	1,136	0.594	3,016	.....
	Texaco NFA Nig Creek a-31-F(7)/94-H-4	294	.....	.....	.....	.....	Disposal.
	Texaco NFA Nig Creek a-1-G/94-H-4	456	7-70	1,026	0.898	19,214	.....
	Texaco NFA Nig Creek b-2-G/94-H-4	447	7-70	1,092	0.564	14,869	.....
	Texaco NFA Nig a-6-G/94-H-4	1740	7-70	1,119	0.571	8,830	.....
	Texaco NFA Nig a-8-G/94-H-4	967	7-70	1,159	0.806	29,342	.....
	Texaco NFA Nig Creek a-12-G(6)/94-H-4	131	7-70	1,065	1.000	13,591	.....
	Texaco NFA Nig c-14-G/94-H-4	2178	3-70	1,357	0.670	393	.....
	Texaco NFA Nig b-44-G/94-H-4	852	3-70	1,470	0.530	360	.....
	Texaco NFA Nig c-6-H/94-H-4	1654	8-70	1,132	0.793	4,391	.....
	Texaco NFA Nig c-14-H/94-H-4	1707	3-70	1,166	0.631	3,489	.....
	Texaco NFA Nig c-33-H/94-H-4	1742	8-70	1,102	0.557	3,707	.....
	Texaco NFA Nig b-41-H/94-H-4	1976	3-70	1,265	1.000	381	.....
Baldonnel project PRL	.....	.....	.....	.....	.....	.....	80,300
Baldonnel total	.....	.....	.....	.....	.....	.....	90,387
North Pine—							
Charlie Lake	Pacific et al N Pine 6-24-85-18	1994	8-70	1,495	0.583	9,037	2,616
	Pacific et al N Pine 6-27-85-18	1958	8-70	1,794	0.625	25,263	Suspended.
Parkland—							
Wabamun project (2)	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 PRL	.....	.....	.....	.....	.....	.....	20,000

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
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 (36)	93	5-65	1,267	1.000	3,308	Suspended.
Halfway	Pacific Red Creek 5-27-85-21 (36)	93	7-65	1,437	1.000	2,434	Suspended.
Rigel—							
Bluesky-Gething	Imp et al Rigel 10-35-88-18	2593	———	———	———	(5)	———
	ARCo Rigel d-33-I/94-A-10	1763	11-70	981	———	———	———
	IOE et al Rigel d-39-J/94-A-10	2686	10-70	1,118	0.509	55	2,000
Dunlevy	IOE Fina Rigel 7-35-87-18	2707	7-70	1,015	0.500	11,150	2,788
	IOE et al Rigel d-39-J/94-A-10	2686	10-70	1,073	0.826	9,298	2,325
Dunlevy project	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	3-70	1,035	1.000	2,650	Suspended.
	Wintershall Rigel 10-34-87-17	1365	7-70	965	0.560	8,609	———
	Pacific Rigel 6-35-87-17	1293	8-70	983	1.000	3,364	———
	Monsanto Rigel 6-36-87-17	1354	8-70	995	0.565	9,815	———
	Whitehall Rigel 11-18-88-16	1234	———	———	———	———	———
	IOE Fina Rigel 7-30-88-16	2258	———	———	———	———	———
	Imp Fina Rigel 8-1-88-17	1312	———	———	———	———	———
	Imp Fina Rigel 6-3-88-17	1187	7-70	851	0.553	7,635	———
	Imp Fina Rigel 6-8-88-17	1208	7-70	988	0.675	2,343	———
	Imp Fina Rigel 6-10-88-17	1090	7-70	889	0.582	6,712	———
	Whitehall Rigel 6-14-88-17	1149	———	———	———	———	———
	Whitehall Rigel 6-15-88-17	1148	7-70	900	0.669	29,527	———
	Imp Fina Rigel 6-16-88-17	1168	7-70	1,232	———	———	———
	Imp et al Rigel 7-19-88-17	1107	7-70	934	0.500	12,847	———
	IOE Fina Rigel 10-25-88-17	2127	12-69	1,039	0.500	3,600	Suspended.
	Imp Fina Rigel 4-27-88-17	130	7-70	899	0.634	4,159	———
	Imp Fina Rigel 6-28-88-17	1385	7-70	1,255	———	———	———
	Imp et al Rigel 6-30-88-17	1032	7-70	964	0.793	11,756	———
	IOE Fina Rigel 11-2-88-18	2597	2-70	1,026	0.581	10,890	———
	Imp Fina Rigel 11-3-88-18	1593	———	———	———	———	———
	IOE Fina Rigel 11-11-88-18	1494	7-70	978	0.663	19,968	———
	Imp et al Rigel 7-13-88-18	1978	7-70	941	0.669	12,520	———
	Imp Fina Rigel 10-14-88-18	1465	7-70	985	0.663	7,538	———
	Pacific Rigel 11-15-88-18	2572	12-69	1,056	1.000	2,420	———
	Sierra Rigel 10-17-88-18	2725	10-70	1,072	0.700	1,070	———

	Richfield et al Rigel 10-19-88-18	1381	----	----	----	----	----
	Imp et al Rigel 6-21-88-18	1118	7-70	1,000	0.952	7,264	----
	Imp et al Rigel 7-23-88-18	1163	7-70	998	0.693	4,646	----
	Sun Rigel 10-24-88-18	1324	9-70	1,000	0.675	6,267	----
	Imp et al Rigel 6-27-88-18	828	7-70	890	0.699	5,417	----
	Texaco NFA Rigel 10-29-88-18	1222	2-63	1,166	0.620	4,850	Suspended.
	Texaco NFA Rigel 9-31-88-18 (10)	195	7-70	837	0.685	8,102	----
	Imp et al Rigel 10-35-88-18	2593	2-70	1,087	0.781	5,750[5]	----
	ARCo Rigel a-27-I/94-A-10	1620	8-70	989	0.777	10,240[5]	----
	ARCo Rigel d-33-I/94-A-10	1763	----	----	----	----	----
	IOE Fina Rigel d-57-I/94-A-10	1537	7-70	937	0.676	3,448	----
	Imp IOE Fina Rigel a-21-J/94-A-10	2054	7-70	795	0.760	11,584	----
	IOE et al Rigel c-56-J/94-A-10	2537	7-70	1,097	0.684	10,961	----
	IOE Fina Rigel c-60-J/94-A-10	2400	7-70	1,105	0.644	9,881	----
	IOE Fina Rigel a-89-J/94-A-10	2354	7-70	1,178	0.788	1,836	----
	Imp et al Rigel b-22-K/94-A-10	1003	----	----	----	----	----
	Texaco NFA Rigel a-28-K/94-A-10	1370	7-70	914	0.660	1,449	----
	IOE Fina Rigel d-71-K/94-A-10	2726	8-70	1,173	0.740	13,304	----
Dunlevy project total		----	----	----	----	----	GEP.
Field total		----	----	----	----	GEP plus	7,113
Sierra—							
Pine Point	Socony Mobil Sierra c-78-C/94-I-14	1602	2-68	3,450	0.662	610,000	Abandoned.
	Mobil Sierra c-A78-C/94-I-14	2596	3-70	3,404	0.689	366,246	91,562
	Socony Mobil Sierra c-91-D/94-I-14	1659	3-70	3,398	0.500	75,508	18,877
Pine point total		----	----	----	----	----	110,439
Stoddart—							
Belloy	Pacific et al Stoddart 6-29-85-18	2262	8-70	2,298	0.892	1,352	2,000
	Mesa et al Stoddart 6-31-85-18	2539	8-69	2,326	0.747	6,600	2,000
	Apache Dunbar Stoddart 11-23-85-19	2548	10-69	2,384	0.920	3,140	Zone ab'd.
	Apache Dunbar Stoddart 6-26-85-19	2409	12-70	2,119	0.751	14,689	4,021
	Jeff Lake Mesa Stoddart 11-34-85-19	1959	----	----	----	----	----
	Pacific et al Stoddart 10-35-85-19	2182	8-70	1,905	0.718	25,942	7,632
	Pacific Stoddart 11-2-86-19	2155	8-70	1,861	0.621	24,324	7,137
	Dome Provo Stoddart 11-8-86-19	1902	7-70	1,258	0.649	5,032	2,000
	Pacific Stoddart 6-10-86-19	2078	8-70	1,362	0.880	1,066	2,000
	Jeff Lake Altair Stoddart 6-11-86-19	1841	7-70	1,845	0.754	44,455	13,461
	Pacific et al Stoddart 11-16-86-19	1473	8-70	1,571	0.630	2,821	2,000
	Whitehall Stoddart 6-17-86-19	1770	6-69	1,395	1.000	3,341	2,000
	Pacific et al Stoddart 11-18-86-19	2562	10-69	1,531	0.773	7,400	2,000
	Pacific Stoddart 6-19-86-19	2575	1-70	1,568	0.684	14,082	3,521
	Pacific et al Stoddart 10-1-86-20	438	----	----	----	----	----
	Pacific Stoddart 2-13-86-20 (90)	262	2-70	1,496	0.756	19,894	7,014
	Pacific Stoddart 4-24-86-20 (85)	244	7-70	1,438	0.927	37,789	14,716
Belloy total		----	----	----	----	----	71,502

[5] Bluesky and Dunlevy without segregation.

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Stoddart West—							
Belloy	Pacific W Stoddart 11-10-86-20	1190	5-70	1,284	0.625	5,942	Suspended.
	Woods W Stoddart 11-19-86-20	2737	8-70	2,422	0.784	2,218	2,000
	Jeff Lake W Stoddart 11-20-86-20	2553	.....	.....	.....	.....	.....
	Pacific et al W Stoddart 11-30-86-20	2199	7-68	2,439	0.615	12,423	3,106
	Pacific et al W Stoddart 7-5-87-20	2338	9-69	2,445	0.550	5,100	2,000
Belloy total		.....	.....	.....	.....	.....	7,106
Sunrise—							
Paddy	Horizon Sunrise 11-6-79-16	2560	.....	.....	.....	.....	.....
Cadotte	Pacific Sunrise 11-31-78-16(6A)	19	.....	.....	.....	.....	.....
	Horizon Sunrise 11-4-79-16	2569	8-70	770	.....	.....	Suspended.
	Horizon Sunrise 11-5-79-16	2559	8-70	683	.....	.....	Suspended.
	Pacific Sunrise 10-7-79-16(3)	15	8-70	734	.....	.....	Suspended.
	Horizon Sunrise 10-8-79-16	2538	12-69	714	.....	.....	Suspended.
	Pacific Sunrise 10-9-79-16(4)	17	.....	.....	.....	.....	.....
	Horizon Sunrise 11-9-79-16	2564	8-70	730	.....	.....	Suspended.
Two Rivers—							
Baldonnel	Champlin et al Two Rivers 6-9-83-16	2139	3-69	.....	.....	.....	2,000
Charlie Lake	Champlin Two Rivers 10-5-83-16	2064	5-70	1,609	0.924	7,256	2,000
Halfway	Champlin et al Two Rivers 6-9-83-16	2139	5-70	1,985	0.912	43,327	11,373
Field total		.....	.....	.....	.....	.....	15,373
Weasel—							
Baldonnel	Sinclair Pacific Weasel d-93-J/94-A-15	1790	12-65	1,113	0.675	6,050	2,000
Charlie Lake	Tenn Ashland Weasel d-27-B/94-H-2	1703	10-65	1,248	0.754	1,070	Suspended.
Willow—							
Bluesky-Gething	Union HB Willow d-29-H/94-H-2	1878	.....	.....	.....	.....	.....
Halfway	Union HB Willow d-11-G/94-H-2	1292	12-69	1,182	0.741	6,522	2,000
	Union HB Willow b-10-H/94-H-2	830	3-70	1,233	0.646	34,184	8,593
Halfway total		.....	.....	.....	.....	.....	10,593
Yoyo—							
Slave Point	West Nat et al Yoyo a-74-H/94-I-13	887	3-62	2,686	0.791	185,000	Suspended.
Pine Point	West Nat et al Yoyo a-74-H/94-I-13	887	.....	.....	.....	.....	.....
	Pacific Placid Yoyo d-95-H/94-I-13	1634	.....	.....	.....	.....	Disposal.
	Pacific Yoyo d-12-I-/94-I-13	2602	12-70	2,772	0.581	251,505	62,876
	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.
	Uno-Tex et al Yoyo c-34-I/94-I-13	2229	2-68	2,838	0.640	92,000	Suspended.
	West Nat Yoyo b-98-E/94-I-14	1405	3-70	2,832	0.533	112,753	28,781

	Pacific Yoyo a-2-L/94-I-14	2271	3-70	2,829	0.684	91,016	23,375
	Pacific Yoyo d-7-L/94-I-14	2035	3-70	2,815	0.600	116,154	29,601
	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	3-70	2,845	0.596	250,722	63,815
	West Nat et al Yoyo b-24-L/94-I-14	1313	3-70	2,797	0.524	106,920	27,381
	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	36,250
Pine Point total		----	----	----	----	----	272,079
Other areas—							
Cadotte	GERC Sunrise 7-12-79-17	2772	----	----	----	----	----
	Westcoast Pouce Coupe 8-18-80-13(6)	----	7-60	595	----	----	----
	Westcoast Pouce Coupe 6-30-80-13(1)	----	----	----	----	----	----
Notikewin	Westcoast Kiskatinaw 8-30-80-14(5)	----	----	----	----	----	----
Bluesky-Gething	Texaco NFA Junction b-9-F(12)/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 Gulf Ladyfern d-77-H/94-H-1	2615	3-70	1,047	0.729	6,016	2,000
	Union HB Woodrush b-56-H/94-H-2	1889	3-70	1,030	----	----	----
	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	----	----	----	----	----
	Sierra Dahl b-62-G/94-H-7	2628	----	----	----	----	----
	Joe Phillips Dahl d-93-G/94-H-7	2622	----	----	----	----	----
	Pacific et al Dahl d-11-J/94-H-7	2445	----	----	----	----	Suspended.
	Tenn Cdn-Sup Dahl d-53-J/94-H-7	1849	----	----	----	----	----
	Texaco Dahl a-67-J/94-H-7	2457	2-69	962	0.726	1,250	Suspended.
	Pacific CIGOL Dahl d-91-J/94-H-7	2466	----	----	----	----	Suspended.
	IOE Scurry Dahl d-51-B/94-H-10	2642	----	----	----	----	----
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 LaGarde 10-12-88-16	1192	2-63	1,335	0.660	3,270	Suspended.
	Tenn N LaGarde 6-23-88-16	1275	----	----	----	----	----
	Woods Rigel 10-8-88-18	2795	12-70	1,063	0.626	5,838	2,000
	Gray Oil PRP NW Grizzly c-25-A/93-I-15	1396	3-64	2,695	0.675	9,300	Suspended.
	Texaco NFA E Osborn a-45-J/94-A-9	1257	----	----	----	----	----
	Cabot et al Rigel a-87-K/94-A-10	2573	----	----	----	----	----
	Anadarko Cdn-Sup Buick b-22-I/94-A-11	2794	----	----	----	----	----
	Union Fireweed d-53-G/94-A-13	497	----	----	----	----	----
	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	8-70	1,503	0.770	1,977	Suspended.
	Pacific Ft St John 1-15-84-19(5)	30	9-52	1,594	----	----	----

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Other areas—*Continued*							
Baldonnel—*Continued*	Apache et al Wilder 7-2-84-20	1940	.....	.....	.....	.....	.....
	Sinclair Bear Ck 11-18-84-20(B2-3)	243	.....	.....	.....	.....	.....
	Pacific et al Siphon 11-27-86-16	444	10-69	1,430	.....	.....	Suspended.
	Pacific West Prod Siphon 7-34-86-16	2581	.....	.....	.....	.....	.....
	White Rose Sec Montney 10-29-86-18	1130	9-62	1,520	0.669	1,640	Suspended.
	Tenn LaGarde 6-35-87-15	1200	11-63	1,665	0.754	1,250	Suspended.
	Dome LaGarde 10-12-87-16	2446	1-70	1,381	0.966	1,550	2,000
	Texaco NFA E Osborn 6-33-88-14	1319	1-69	1,309	0.746	1,168	2,000
	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	0.627	120,000	Suspended.
	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(1)/94-B-9	120	.....	.....	.....	.....	.....
	Security Cypress a-92-K/94-B-10	2365	3-69	1,943	0.532	26,000	Suspended.
	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	8-70	2,009	0.733	3,265	2,000
	FPC Richfield Daiber c-76-D(1)/94-B-16	386	1-69	2,017	0.810	6,600	Suspended.
	ARCo Pac Julienne b-39-D/94-G-1	658	1-67	2,099	.....	.....	2,000
	Sinclair Julienne Ck a-50-D/94-G-1	304	8-66	2,016	1.000	4,950	2,000
	Woods Amerada N Julienne d-33-H/94-G-2	2574	2-70	1,961	1.000	540	2,000
	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	.....	.....	.....	.....	.....
	Fargo Nig Creek c-19-C(1)/94-H-4	92	.....	.....	.....	.....	.....
	Tenn Monsanto Nig d-39-C/94-H-4	1448	7-70	1,651	0.796	7,634	2,000
	Pacific Sunray Imp Sojer a-61-L/94-H-4	472	.....	.....	.....	.....	.....
	Champlin Bass Martin c-91-B/94-H-5	2245	.....	.....	.....	.....	.....
Baldonnel total	.....	.....	.....	.....	.....	.....	16,000
Charlie Lake	Pacific et al Pingel 13-17-81-17(1)	36	.....	.....	.....	.....	.....
	Pacific Pingel Creek 5-26-81-18(2)	66	.....	.....	.....	.....	.....
	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	10-69	1,547	.....	.....	Suspended.
	Pacific West Prod Siphon 7-34-86-16	2581	.....	.....	.....	.....	.....
	Dome LaGarde 10-12-87-16	2446	.....	.....	.....	.....	.....

	Texcan N Cache 10-20-88-22	2567	12-69	2,239	1.000	2,900	2,000
	Texcan N Cache 6-28-88-22	2423	1-69	2,293	.....	.....	Suspended.
	Union HB Alder c-39-I/94-H-2	721	3-70	907	.....	.....	Suspended.
	Richfield-Prespatou Crk d-59-A(1)/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		.....	.....	.....	.....	.....	4,000
Inga	Pioneer Cabot N Inga d-51-K/94-A-12	2533	.....	.....	.....	.....	.....
	Pioneer Cabot N Inga a-81-K/94-A-12	2552	10-70	2,344	0.755	10,146	2,536
	Wincan et al N Inga b-20-B/94-A-13	2684	.....	.....	.....	.....	.....
Halfway	Wainoco Woods Wilder 10-19-83-19	2793	.....	.....	.....	.....	.....
	Wainoco Woods Wilder 7-30-83-19	2773	.....	.....	.....	.....	.....
	Champlin Flatrock 10-9-84-16	2516	6-69	1,952	0.854	15,250	3,813
	Ballinderry Flatrock 10-33-84-16	2760	9-70	1,940	0.659	3,462	2,000
	Pacific Wilder 13-1-84-20(14)	47	12-53	2,035	0.780	5,500	Suspended.
	Pacific et al Siphon 11-27-86-16	444	10-69	1,660	0.629	7,161	2,000
	Pacific West Prod Siphon 7-34-86-16	2581	.....	.....	.....	.....	.....
	Texaco NFA N LaGarde 13-26-88-16(4)	160	1-69	1,532	0.800	3,500	2,000
	Texcan N Cache 6-28-88-22	2423	8-70	1,916	1.000	934	Suspended.
	Cankee CIGOL Melanie d-68-K/94-A-9	1859	.....	.....	.....	.....	.....
	Sinclair Pacific Mink d-88-A/94-A-15	1564	.....	.....	.....	.....	.....
	Dome et al W Peejay d-31-G/94-A-15	1927	.....	.....	.....	.....	.....
	Baysel SR CanDel Osprey d-83-G/94-A-15	2071	.....	.....	.....	.....	.....
	GraMic Scurry et al N Nancy d-30-I/94-A-15	2713	.....	.....	.....	.....	.....
	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.
	Union HB Spruce d-74-E/94-A-16	2664	.....	.....	.....	.....	.....
	ARCo et al E Bulrush d-93-F/94-A-16	2603	.....	.....	.....	.....	.....
	Sinclair et al Graham c-53-D(B5-1)/94-B-9	238	.....	.....	.....	.....	.....
	Texaco NFA Cameron River d-43-H/94-B-10	433	2-60	3,861	.....	.....	.....
	ARCo Pac Julienne b-39-D/94-G-1	658	6-61	2,324	0.911	4,000	2,000
	Sinclair Julienne Ck a-50-D/94-G-1	304	9-58	2,237	1.000	7,000	2,000
	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	1,055	.....	.....	.....	.....	.....
	Texaco Tepee d-99-G/94-G-8	1432	.....	.....	.....	.....	.....
	Mesa et al Prophet c-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(1)/94-H-2	159	.....	.....	.....	.....	.....
	Placid Banner Sandy d-28-G/94-H-2	2496	.....	.....	.....	.....	.....
	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	.....	.....	.....	.....	.....
	CDR Sun Evergreen d-54-J/94-H-2	1918	.....	.....	.....	.....	.....

TABLE 17.—GAS-WELL TEST AND ALLOWABLE DATA, DECEMBER 31, 1970—*Continued*

Field/Pool/Project	Well Name	Well Authorization No.	Date	Pws (Psia)	"n"	AOFP (MSCF/D)	PRL (MSCF/D)
Other areas—*Continued*							
Halfway—*Continued*	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	------	------	------	------	------
	BO&G et al Elm d-83-C/94-H-7	2712	------	------	------	------	------
	Pan Am Redeye d-89-D/94-H-10	2442	1-69	939	0.966	27,385	6,846
Halfway total		------	------	------	------	------	20,659
Permo-Carboniferous	Texaco NFA East Osborn a-33-J(7)/94-A-9	322	1-69	1,937	0.624	8,070	2,018
	CSP Town c-69-J/94-B-16	315	8-61	1,992	------	------	Suspended.
	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 12-31-78-14	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	0.835	7,900	Suspended.
	Pacific Two Rivers 2-27-82-16 (37)	135	------	------	------	------	------
	Amerada Pac Wilder 11-17-83-19	697	------	------	------	------	------
	Wainoco Woods Wilder 11-20-83-19	2708	8-70	2,602	1.000	1,132	2,000
	Pacific Red Creek 6-7-85-20 (39)	102	------	------	------	------	------
	Woods W Stoddart 11-7-86-20	2814	------	------	------	------	------
	Woods W Stoddart 10-18-86-20	2786	------	------	------	------	------
	Trend et al W Stoddart 6-16-87-20	2780	------	------	------	------	------
	Apache Woods W Stoddart 10-14-87-21	2777	------	------	------	------	------
Slave Point	HB Imperial Union Paddy a-49-B(1)/94-H-16	129	8-55	3,114	1.000	8,250	Suspended.
	Atlantic Tees a-16-J/94-I-6	1542	------	------	------	------	------
	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.
	Mobil Sahtaneh c-70-I/94-I-12	2436	3-69	2,746	0.781	3,610	Suspended.
	Pacific Gunnel c-95-L/94-I-12	1239	2-63	2,648	------	------	------
	Cdn Res APL Gunnel a-97-K/94-I-12	2629	------	------	------	------	------
	Pacific Shekilie b-24-A/94-I-16	1816	------	------	------	------	------
	Pacific Sinclair Shekilie b-46-A/94-I-16	2038	------	------	------	------	------
	Triad Sohio Pac Jackfish a-30-K/94-J-8	999	1-63	1,955	------	------	Suspended.
	BA Shell Klua Creek a-50-C(1)/94-J-9	157	------	------	------	------	------
	West Nat Imp Clarke Lake b-78-J/94-J-9	700	12-68	3,331	------	------	Suspended.
	Pacific et al Milo c-43-E/94-J-10	2260	------	------	------	------	------
	IOE E Clarke b-6-A/94-J-16	1576	3-67	3,146	0.685	(4)	Suspended.
	Pan Am A-1 Cam Lake a-31-I/94-O-16	594	------	------	------	------	------
	Tenn FPC Tooga d-18-K/94-P-2	2066	------	------	------	------	------
	Pac Kotcho d-70-C/94-P-3	2609	3-70	2,531	0.589	16,594	4,149
	Pac Kotcho b-30-F/94-P-3	677	2-61	2,561	0.573	148,000	Suspended.
	Pacific Louise c-40-L/94-P-3	2472	------	------	------	------	------
	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.
	Pacific Cabin d-57-B/94-P-5	2425	------	------	------	------	------

	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	.....	.....	.....	.....	.....
	SOBC Helmet b-49-G/94-P-7	1279	.....	.....	.....	.....	.....
	FPC Chevron Peggo b-53-I/94-P-7	2453	2-70	2,322	0.724	751	2,000
	Atkinson Sunlight Helmet b-2-K/94-P-7	2617	.....	.....	.....	.....	.....
	FPC Chevron et al Helmet b-11-K/94-P-7	2517	1-70	2,346	0.500	191,823	47,956
	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	.....	.....	.....	.....	.....
Slave Point total		.....	.....	.....	.....	.....	56,105
Kiskatinaw	Sinclair et al Doe 6-16-81-14 (B6-1)	230	.....	.....	.....	.....	.....
Debolt	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(XB18-1)/94-G-2	385	5-59	2,598	1.000	21,800	Suspended.
	ARCo Pacific FPC Grassy a-A75-D/94-G-7	2687	6-70	2,132	1.000	181,349	45,349
	HB Pacific Pocketknife c-37-L/94-G-7	468	7-60	1,727	0.642	26,600	Suspended.
	Mesa et al Prophet c-97-D/94-G-15	2160	.....	.....	.....	.....	.....
	West Nat Bougie Creek a-49-I/94-G-15	138	.....	.....	.....	.....	.....
	Union IOE Bigfoot d-27-C/94-I-4	508	.....	.....	.....	.....	.....
	Texaco NFA Walrus b-86-L/94-I-16	947	.....	.....	.....	.....	.....
	Pacific S Ft Nelson b-96-B(1)/94-J-10	348	5-58	1,051	0.599	2,350	Suspended.
	Texaco NFA July c-53-D/94-P-6	717	.....	.....	.....	.....	.....
Banff	Dome et al Imp Slave d-10-I/94-H-11	2225	3-68	2,684	0.500	1,400	Suspended.
	Sohio C&E Ekwan a-55-G/94-I-10	897	.....	.....	.....	.....	.....
Jean Marie	Placid Hunt Amoco Niteal a-58-E/94-I-3	2611	.....	.....	.....	.....	.....
Sulphur Point	Socony Mobil Swat b-50-F/94-I-5	1835	.....	.....	.....	.....	.....
	Apache CPOG IOE Clarke d-24-I/94-J-9	2470	2-70	2,823	.....	.....	Suspended.
Pine Point	Socony Mobil S Sierra a-98-K/94-I-11	1814	2-67	3,623	1.000	188,000	Suspended.
	Pan Am A-1 Komie a-51-A/94-O-8	527	3-70	3,713	.....	.....	.....
	Texaco NFA Missle d-54-A/94-O-9	2232	3-68	3,728	0.550	3,972	Suspended.
	Pan Am IOE Union Hostli d-48-J/94-P-8	2287	.....	.....	.....	.....	.....
	Chevron N Helmet a-54-B/94-P-10	2108	.....	.....	.....	.....	.....
Nahanni	Amoco Beaver b-19-K/94-N-16	2563	9-70	5,869	.....	.....	.....
	Pan Am Beaver d-27-K/94-N-16	2313	3-69	6,001	0.500	84,000	Suspended.
	Pan Am Beaver c-45-K/94-N-16	2116	12-67	5,824	0.760	86,844	Suspended.
	Pan Am Beaver d-73-K/94-N-16	682	3-62	5,672	0.653	85,000	Suspended.
Other areas total		.....	.....	.....	.....	.....	150,667

[4] Not available.

TABLE 18—HYDROCARBON AND BY-PRODUCTS RESERVES, DECEMBER 31, 1970

	Crude Oil, MSTB		Raw Gas, BSCF		Established			
	Proved	Probable	Proved	Probable	Residue Gas, BSCF	Residue Gas (Basis 1,000 Btu/SCF)	Natural Gas Liquids, MSTB	Sulphur MLT
Original hydrocarbon in place	1,213,620	15,375	12,032.0	4,288.6	(2)	(2)	(2)	(2)
			Established					
Ultimate recovery, current estimate	390,487	94,623	12,216.6		10,649.7	11,013.0	164,102	4,993
Cumulative production to December 31, 1969	133,814	———	1,909.8		1,706.0	1,829.2	47,088	816
Reserves estimated at December 31, 1969	252,860	85,038	8,962.2		7,828.6	8,110.7	124,099	3,587
Revisions in 1970	−1,566	+4,767	+788.4		+643.8	+592.8	−9,487	+311
Drilling in 1970	+5,379	+4,815	+556.2		+471.3	+480.3	+2,402	+279
Production in 1970	−25,374	———	−331.0		−288.7	−300.2	−5,094	−112
Cumulative production adjustments[1]	−140	———	−3.1		−2.8	−3.0	−70	−1
Reserves at December 31, 1970	231,159	94,623	9,972.7		8,652.2	8,880.6	111,850	4,064

NOTES:

MSTB=Thousands of stock tank barrels, where one barrel contains 34.97 imperial gallons.

BSCF=Billions of standard cubic feet at 14.65 psia and 60°F.

MLT=Thousands of long tons.

Associated and solution gas reserves are included for pools in which a conservation scheme is in operation or for which firm conservation plans have been proposed.

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 1970 was 272.6 BSCF and actually extracted quantities of NGL and sulphur were 1,732,229 barrels and 56,954 long tons respectively.

[1] Adjustment to cumulative production carried in 1969 reserves report. The gas data reflect the implementation of gas sales from Weasel Unit 1 during 1970. In previous years no gas reserve was carried; consequently the cumulative-production data shown in the 1969 reserves report did not include gas flared from this unit.

[2] Not available.

TABLE 19—OILFIELD RESERVOIR FLUID DATA

Field	Pool/Project	Rock Type and Age	Trapping	Producing Mechanism	Fluid Contacts (G/O, O/W) (Feet SS)	Datum Depth (Feet SS)	Initial Reservoir		Saturation Pressure at Reservoir Temp. (°F)	Initial Formation Volume Factor (RB/STB)	Initial Solution Gas–Oil Ratio (SCF/STB)	Initial Oil Viscosity (Cp)
							Pressure (Psig)	Temp. (°F)				
Aitken Creek	Gething	Sandstone/Lower Cretaceous	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 1,270	1,270	1,546	140	1,546	1.296	518	0.476
Bear Flat	Charlie Lake	Sandstone/Triassic	Stratigraphic	Depletion/ Gas cap	G/O 2,285	2,238	1,971	130	1,971	1.270	545	———
Beatton River	Halfway A—B.P. project	Sandstone/Triassic	Structural/ Stratigraphic	Waterflood	G/O 1,110, O/W 1,158	1,134	1,172	129	1,164	1.172	303	1.149
	Halfway B	Sandstone/Triassic	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 1,125, O/W 1,134	1,125	———	129	1,164	1.172	303	1.149
Beatton River West	Bluesky-Gething A	Sandstone/Lower Cretaceous	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 881, O/W 899	881	1,031	120	1,031	1.248	430	0.593
	Bluesky-Gething B	Sandstone/Lower Cretaceous	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 881, O/W 925	881	1,031	120	1,031	1.248	430	0.593
Beaverdam	Halfway	Sandstone/Triassic	Stratigraphic	Depletion/ Gas cap	G/O 1,380	1,380	1,358	127	1,358	1.202	370	———
Blueberry	Dunlevy	Sandstone/Lower Cretaceous	Stratigraphic	Depletion	———	1,200	1,350	130	———	1.339	———	———
	Debolt	Carbonate/ Mississippian	Structural/ Stratigraphic	Gas cap/Partial water	G/O 4,030, O/W 4,158	4,030	2,705	165	2,705	1.349	650	0.652
Boundary Lake	Dunlevy B	Sandstone/Lower Cretaceous	Structural	Water	G/O 1,340, O/W 1,345	1,340	1,454	110	1,454	1.120[1]	265	———
	Boundary Lake	Carbonate/Triassic	Structural/ Stratigraphic	———	G/O 1,700	1,750	1,835	117	1,818	1.278	530	0.960
	Unit 1	Carbonate/Triassic	Structural/ Stratigraphic	Waterflood								
	Unit 2	Carbonate/Triassic	Structural/ Stratigraphic	Waterflood								
	Dome Project 1	Carbonate/Triassic	Structural/ Stratigraphic	Waterflood								
	Dome Project 2	Carbonate/Triassic	Structural/ Stratigraphic	Waterflood								
	Halfway	Sandstone/Triassic	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 2,071, O/W 2,092	2,071	1,700	125	1,700	1.218[1]	450[1]	———
Buick Creek	Dunlevy A	Sandstone/Lower Cretaceous	Stratigraphic	Gas cap/ Depletion	G/O 1,260, O/W 1,280	1,260	1,291	122	1,291	1.148[1]	305[1]	———
	Dunlevy B	Sandstone/Lower Cretaceous	Stratigraphic	Gas cap/ Depletion	G/O 1,223, O/W none	1,225	1,290	122	1,290	1.148[1]	305[1]	———
	Dunlevy C	Sandstone/Lower Cretaceous	Stratigraphic	Gas cap/ Depletion	G/O 1,251, O/W 1,282	1,251	1,291	122	1,291	1.148[1]	305[1]	———

[1] Standing's correlation.

TABLE 19—OILFIELD RESERVOIR FLUID DATA—*Continued*

Field	Pool/Project	Rock Type and Age	Trapping	Producing Mechanism	Fluid Contacts (G/O, O/W) (Feet SS)	Datum Depth (Feet SS)	Initial Reservoir		Saturation Pressure at Reservoir Temp. (°F)	Initial Formation Volume Factor (RB/STB)	Initial Solution Gas-Oil Ratio (SCF/STB)	Initial Oil Viscosity (Cp)
							Pressure (Psig)	Temp. (°F)				
Buick Creek West	Dunlevy A	Sandstone/Lower Cretaceous	Stratigraphic	Gas cap/ Depletion	G/O 1,252, O/W 1,282	1,252	1,318	123	1,318	1.150[1]	300[1]	----
	Dunlevy B	Sandstone/Lower Cretaceous	Stratigraphic	Gas cap/ Depletion	G/O 1,246, O/W 1,250	1,246	1,317	123	1,317	1.150[1]	300[1]	----
Bulrush	Halfway	Sandstone/Triassic	Stratigraphic	Depletion/ Gas cap	G/O 1,320	1,320	1,318	132	1,318	1.192	368	0.950
Bulrush East	Halfway	Sandstone/Triassic	Stratigraphic	Depletion	None	1,285	1,314	131	1,314	1.192	366	0.951
Charlie Lake	Gething	Sandstone/Lower Cretaceous	Stratigraphic	Depletion	----	1,020	1,096	116	----	1.200[3]	----	----
Crush	Halfway—Unit 1	Sandstone/Triassic	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 1,366	1,402	1,338	132	1,330	1.196	376	0.940
Currant	Halfway—Unit 1	Sandstone/Triassic	Stratigraphic	Waterflood	G/O 1,555	1,555	1,399	134	1,399	1.203	390	0.800
Eagle Area	Belloy	Carbonate/Permian	Stratigraphic	Depletion	O/W 3,806	3,788	2,441	155	----	1.334[2]	650[3]	----
Fort St. John	Charlie Lake	Sandstone/Triassic	Stratigraphic	Gas cap	G/O 2,290, O/W 2,343	2,332	1,921	125	1,921	1.290	534	0.600
	Belloy	Carbonate/Permian	Structural/ Stratigraphic	Depletion	----	4,160	2,769	155	----	1.330[2]	----	----
Halfway	Inga	Sandstone/Triassic	Stratigraphic	Depletion	----	2,157	2,112	130	2,112[3]	1.330[2]	630[3]	----
Inga	Baldonnel	Carbonate/Triassic	Structural	Depletion	G/O 1,796	1,796	1,788	126	1,788	1.240[1]	470[1]	----
	Inga	Sandstone/Triassic	Structural/ Stratigraphic	----	----	2,519	2,342	140	2,310	1.335	681	0.440
	Unit 1	Sandstone/Triassic	Structural/ Stratigraphic	Waterflood	G/O 2,405, G/O 2,432							
	Unit 2	Sandstone/Triassic	Structural/ Stratigraphic	Depletion	G/O 2,432							
Milligan Creek	Halfway—Unit 1	Sandstone/Triassic	Structural/ Stratigraphic	Waterflood	G/O 1,127, O/W 1,200	1,170	1,167	132	1,152	1.163	289	0.832
Moberly Lake	Charlie Lake	Sandstone/Triassic	Structural/ Stratigraphic	Depletion	----	2,233	2,290	130	2,290	1.340[1]	700[1]	----
Nettle	Bluesky-Gething	Sandstone/Lower Cretaceous	Stratigraphic	Depletion/ Gas cap	G/O 711, O/W 715	711	960	118	960	1.240	396	0.580
Nig Creek	Baldonnel	Carbonate/Triassic	Stratigraphic	Depletion	None	1,399	1,535	140	1,535	1.213[1]	400[1]	----
North Pine	Charlie Lake	Sandstone/Triassic	Stratigraphic	Depletion	----	1,854	1,511	130	1,511	1.302	575	0.730
Osprey	Halfway	Sandstone/Triassic	Stratigraphic	Depletion	G/O 1,517	1,517	1,415	134	1,415	1.175[1]	340[1]	----
Parkland Area	Belloy B	Carbonate/Permian	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 4,665, O/W 4,727	4,665	2,930	153	2,930	1.333[2]	880[1]	----
Peejay	Halfway—Unit 1	Sandstone/Triassic	Stratigraphic	Waterflood	G/O 1,427, G/O 1,438, O/W 1,504	1,465	1,359	132	1,352	1.202	370	0.850

	Unit 2	Sandstone/Triassic	Stratigraphic	Waterflood	G/O 1,435, O/W 1,547	1,490	1,367	134	1,330	1.196	376	0.840
	Unit 3	Sandstone/Triassic	Stratigraphic	Waterflood	G/O 1,450, O/W 1,543	1,500	1,363	133	1,323	1.183	345	0.892
	Pacific-Arco Project	Sandstone/Triassic	Stratigraphic	Waterflood	G/O 1,450, O/W 1,543	1,500	1,363	133	1,323	1.183	345	0.892
Peejay West	Halfway	Sandstone/Triassic	Stratigraphic	Depletion/ Gas cap	G/O 1,608, O/W 1,620	1,608	1,366	131	1,366	1.202	370	0.850
Rigel	Dunlevy A	Sandstone/Lower Cretaceous	Stratigraphic	Depletion/ Gas cap	G/O 1,237	1,237	1,280	118	1,280	1.148[1]	267[1]	----
	Dunlevy B	Sandstone/Lower Cretaceous	Stratigraphic	Depletion/ Gas cap	G/O 1,278	1,278	1,285	118	1,285	1.148[1]	320[1]	----
	Dunlevy C	Sandstone/Lower Cretaceous	Stratigraphic	Depletion/ Gas cap	G/O 1,263	1,263	1,283	118	1,283	1.148[1]	320[1]	----
	Dunlevy D	Sandstone/Lower Cretaceous	Stratigraphic	Depletion/ Gas cap	G/O 1,303	1,303	1,288	118	1,288	1.148[1]	320[1]	----
Stoddart	Charlie Lake	Sandstone/Triassic		Depletion	None	1,875	1,802	125	1,786[3]	1.163[1]	500[1]	----
	Belloy A	Sandstone/Permian	Structural/ Stratigraphic	Gas cap	G/O 3,726	3,726	2,411	155	2,411	1.335[1]	645[1]	----
	Belloy C	Sandstone/Permian	Structural/ Stratigraphic	Depletion	O/W 3,845	3,798	2,419	155	2,419	1.337[1]	650[1]	----
Two Rivers	Charlie Lake	Sandstone/Triassic	Structural/ Stratigraphic	Gas cap/ Depletion	G/O 2,138, O/W 2,147	2,138	1,803	126	1,803	1.248[1]	510[1]	----
Weasel	Halfway—											
	Unit 1	Sandstone/Triassic	Stratigraphic	Waterflood	G/O 1,345, G/O 1,375	1,377	1,300	132	1,293	1.181	339	0.898
	Unit 2	Sandstone/Triassic	Stratigraphic	Waterflood	O/W 1,410	1,377	1,300	132	1,293	1.181	339	0.898
	Halfway A	Sandstone/Triassic	Stratigraphic	Depletion	O/W 1,389	1,375	1,300	132	1,293	1.181	339	0.898
	Halfway B	Sandstone/Triassic	Stratigraphic	Depletion/ Gas cap	G/O 1,312	1,312	1,284	132	1,284	1.180	340	0.895
Weasel West	Halfway	Sandstone/Triassic	Stratigraphic	Depletion	O/W 1,364	1,359	1,235	132	1,235[3]	1.330[2]	325[1]	----
Wildmint	Halfway—											
	Union-HB Project	Sandstone/Triassic	Structural/ Stratigraphic	Waterflood	G/O 1,252	1,272	1,230	132	1,210	1.142	260	1.05
	Union-HB B	Sandstone/Triassic	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 1,294	1,294	1,238	132	1,238	1.143	265	1.05
	Union-HB C	Sandstone/Triassic	Structural/ Stratigraphic	Depletion	None	1,327	1,264	132	1,210	1.142	260	1.05
	Union-HB D	Sandstone/Triassic	Structural/ Stratigraphic	Depletion	None	1,303	1,256	132	1,210	1.142	260	1.05
	Union-HB E	Sandstone/Triassic	Structural/ Stratigraphic	Depletion	None	1,272	1,230	132	1,210	1.142	260	1.05
	Union-HB F	Sandstone/Triassic	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 1,344	1,344	1,271	132	1,271	1.160[1]	315[1]	----
Willow	Bluesky-Gething	Sandstone/Lower Cretaceous	Stratigraphic	Depletion/ Gas cap	G/O 820	820	1,019	118	1,019	1.115	235	----
Wolf	Halfway	Sandstone/Triassic	Structural/ Stratigraphic	Depletion/ Gas cap	G/O 1,680, O/W 1,690	1,684	1,445	143	1,445	1.208	388	0.832

[1] Standing's correlation. [2] Nominal. [3] Estimated.

TABLE 20—GASFIELD RESERVOIR FLUID DATA

Field/Area	Pool/Project	Rock Type and Age	Trapping	Fluid Contacts G/W (Feet SS)	Datum Depth (Feet SS)	Specific Gravity of Gas	Critical Value	
							Pressure (Psia)	Temperature (°R)
Airport	Cadomin	Sandstone/Lower Cretaceous	Stratigraphic	.....	1,521	0.581	680	347
	Baldonnel	Carbonate/Triassic	Stratigraphic	.....	1,761	0.661	682	373
	Halfway	Sandstone/Triassic	Stratigraphic	.....	2,667	0.693	678	369
Beaver River	Nahanni	Carbonate/Devonian	Structural	11,925	10,500	0.642	698	356
Beavertail area	Bluesky-Gething	Sandstone/Lower Cretaceous	Stratigraphic	None	1,050	0.653	673	374
	Halfway	Sandstone/Triassic	Structural/Stratigraphic	1,833	1,790	0.635	678	379
Beg	Baldonnel A	Carbonate/Triassic	Structural	1,525	1,400	0.652	674	374
	Baldonnel B	Carbonate/Triassic	Structural	1,525	1,400	0.652	674	374
	Baldonnel C	Carbonate/Triassic	Structural	1,370	1,340	0.652	674	374
	Halfway	Sandstone/Triassic	Structural	2,346	2,200	0.673	669	382
Beg West	Baldonnel A	Carbonate/Triassic	Structural	None	1,400	0.653	678	372
	Baldonnel B	Carbonate/Triassic	Structural	None	1,400	0.653	678	372
Bernadet	Bluesky-Gething	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	842	0.644	670	372
Blueberry	Dunlevy A	Sandstone/Lower Cretaceous	Structural	.....	1,200	0.659	675	369
	Dunlevy B	Sandstone/Lower Cretaceous	Structural	.....	1,200	0.659	675	369
	Baldonnel A	Carbonate/Triassic	Structural	.....	1,560	0.673	677	379
	Baldonnel B	Carbonate/Triassic	Structural	.....	1,560	0.673	677	379
	Charlie Lake A	Sandstone/Triassic	Structural/Stratigraphic	.....	2,150	0.939	664	459
	Charlie Lake B	Sandstone/Triassic	Structural/Stratigraphic	.....	2,150	0.802	676	416
Blueberry East	Baldonnel	Carbonate/Triassic	Structural	.....	1,800	0.675	681	380
	Debolt	Carbonate/Mississippian	Structural	.....	4,025	0.615	679	359
Blueberry West	Dunlevy A	Sandstone/Lower Cretaceous	Structural	None	1,084	0.659	682	373
	Dunlevy B	Sandstone/Lower Cretaceous	Structural	None	1,260	0.658	678	375
	Baldonnel	Carbonate/Triassic	Structural	1,620	1,576	0.646	674	374
Boundary Lake	Bluesky-Gething A	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	1,095	0.634	669	365
	Bluesky-Gething B	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	1,140	0.622	671	365
	Gething A	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	1,217	0.641	678	369
	Gething B	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	1,319	0.648	682	370
	Dunlevy A	Sandstone/Lower Cretaceous	Stratigraphic	.....	1,339	0.629	678	365
	Baldonnel A	Carbonate/Triassic	Structural	1,513	1,480	0.677	681	390
	Baldonnel B	Carbonate/Triassic	Structural	1,496	1,480	0.677	681	390
	Basal Boundary Lake	Carbonate/Triassic	Structural	.....	1,757	0.683	663	378
	Halfway B	Sandstone/Triassic	Structural	.....	1,866	0.631	670	368
	Halfway C	Sandstone/Triassic	Structural	.....	1,850	0.641	670	372
Boundary Lake North	Halfway A	Sandstone/Triassic	Stratigraphic	1,930	1,900	0.631	670	378
	Halfway B	Sandstone/Triassic	Stratigraphic	1,852	1,816	0.631	670	378
Bubbles	Baldonnel	Carbonate/Triassic	Structural	None	1,350	0.663	682	373
Bubbles North area	Halfway	Sandstone/Triassic	Stratigraphic	.....	1,825	0.663	678	375

Buick Creek	Bluesky A	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	1,150	0.637	670	372
	Bluesky B	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	1,132	0.637	670	372
	Dunlevy A	Sandstone/Lower Cretaceous	Structural/Stratigraphic	1,287	1,225	0.659	670	378
	Dunlevy B	Sandstone/Lower Cretaceous	Structural/Stratigraphic	1,260	1,225	0.649	674	374
	Dunlevy C	Sandstone/Lower Cretaceous	Structural/Stratigraphic	1,260	1,225	0.659	670	378
	Baldonnel	Carbonate/Triassic	Stratigraphic	.....	1,412	0.692	681	383
	Charlie Lake	Sandstone/Triassic	Structural/Stratigraphic	.....	1,626	0.613	671	362
Buick Creek North	Bluesky-Gething	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	1,100	0.685	672	386
	Dunlevy	Sandstone/Lower Cretaceous	Structural/Stratigraphic	1,238	1,225	0.670	677	380
Buick Creek West	Dunlevy A	Sandstone/Lower Cretaceous	Structural/Stratigraphic	1,252	1,150	0.657	678	375
	Dunlevy B	Sandstone/Lower Cretaceous	Structural/Stratigraphic	None	1,150	0.657	678	375
	Baldonnel	Carbonate/Triassic	Structural/Stratigraphic	.....	1,375	0.698	680	387
	Halfway	Sandstone/Triassic	Structural	.....	2,200	0.748	679	403
Cabin	Slave Point A	Carbonate/Devonian	Stratigraphic	4,808	4,800	0.651	706	353
	Slave Point B	Carbonate/Devonian	Stratigraphic	4,857	4,800	0.686	727	371
Cache Creek area	Charlie Lake	Sandstone/Triassic	Stratigraphic	None	2,134	0.631	671	369
	Halfway	Sandstone/Triassic	Structural/Stratigraphic	2,607	2,560	0.805	805	441
Clarke Lake	Jean Marie	Carbonate/Devonian	Stratigraphic	.....	3,000	0.607	670	345
	Slave Point A	Carbonate/Devonian	Stratigraphic	5,231	5,000	0.671	712	354
	Slave Point B	Carbonate/Devonian	Stratigraphic	5,256	5,000	0.671	712	354
	Slave Point C	Carbonate/Devonian	Stratigraphic	5,255	5,000	0.671	712	354
Clarke Lake South	Slave Point	Carbonate/Devonian	Stratigraphic	5,242	5,000	0.671	712	354
Currant	Halfway	Sandstone/Triassic	Stratigraphic	None	1,555	0.637	672	370
Cypress area	Baldonnel	Carbonate/Triassic	Structural	1,210	1,095	0.584	672	354
Dahl area	Bluesky	Sandstone/Lower Cretaceous	Stratigraphic	729	700	0.642	678	372
Dawson Creek	Cadotte	Sandstone/Lower Cretaceous	Structural/Stratigraphic	.....	363	0.581	671	347
Elm area	Halfway	Sandstone/Triassic	Stratigraphic	1,076	1,074	0.645	674	374
Evergreen area	Halfway	Sandstone/Triassic	Structural	.....	1,057	0.630	679	363.4
Farrell Creek	Charlie Lake	Sandstone/Triassic	Structural	.....	2,624	0.644	675	372
	Halfway	Sandstone/Triassic	Structural	.....	3,325	0.658	678	375
Fort St. John	Cadomin	Sandstone/Lower Cretaceous	Structural	1,045	980	0.581	680	347
	Baldonnel	Carbonate/Triassic	Structural	1,765	1,050	0.661	682	373
	Halfway A	Sandstone/Triassic	Structural	2,731	2,660	0.680	677	382
	Halfway B	Sandstone/Triassic	Structural	2,700	2,677	0.623	700	368
	Belloy	Carbonate/Permian	Structural/Stratigraphic	.....	4,105	0.655	670	378
	Debolt	Carbonate/Mississippian	Stratigraphic	.....	4,739	0.671	666	376
Fort St. John Southeast	Cadomin	Sandstone/Lower Cretaceous	Structural	.....	1,101	0.581	680	347
	Baldonnel	Carbonate/Triassic	Structural	.....	1,800	0.702	668	392
	Charlie Lake	Sandstone/Triassic	Structural	.....	2,335	0.648	665	366
	Halfway	Sandstone/Triassic	Structural	2,875	2,830	0.693	678	369
	Belloy	Carbonate/Permian	Structural/Stratigraphic	4,290	4,255	0.640	674	371
Gundy Creek	Dunlevy	Sandstone/Lower Cretaceous	Stratigraphic	.....	1,276	0.659	675	369
	Baldonnel A	Carbonate/Triassic	Structural	1,750	1,730	0.630	674	367
	Baldonnel B	Carbonate/Triassic	Structural	1,778	1,730	0.630	674	367
	Charlie Lake	Sandstone/Triassic	Structural/Stratigraphic	.....	2,256	0.655	670	378
Halfway	Baldonnel	Carbonate/Triassic	Structural	1,400±	1,361	0.639	670	372
	Charlie Lake	Sandstone/Triassic	Structural	.....	1,880	0.693	667	385
Helmet area	Slave Point	Carbonate/Devonian	Stratigraphic	4,162	4,124	0.661	719	368

TABLE 20—GASFIELD RESERVOIR FLUID DATA—*Continued*

Field/Area	Pool/Project	Rock Type and Age	Trapping	Fluid Contacts G/W (Feet SS)	Datum Depth (Feet SS)	Specific Gravity of Gas	Critical Value	
							Pressure (Psia)	Temperature (°R)
Highway	Dunlevy	Sandstone/Lower Cretaceous	Structural		1,127	0.669	686	375
	Baldonnel	Carbonate/Triassic	Structural		1,472	0.675	677	382
	Debolt	Carbonate/Mississippian	Structural		3,900	0.609	671	362
Inga	Gething	Sandstone/Lower Cretaceous	Structural/Stratigraphic		1,140	0.670	668	379
	Baldonnel B	Carbonate/Triassic	Structural	1,823	1,803	0.689	693	388
	Baldonnel D	Carbonate/Triassic	Stratigraphic		1,866	0.689	693	388
Inga North area	Inga	Sandstone/Triassic	Stratigraphic	2,545	2,299	0.825	923	482
Jedney	Gething	Sandstone/Lower Cretaceous	Structural/Stratigraphic		1,125	0.663	678	375
	Baldonnel	Carbonate/Triassic	Structural		1,300	0.693	699	376
	Halfway	Sandstone/Triassic	Structural	2,054±	1,905	0.673	673	381
Jedney West	Baldonnel	Carbonate/Triassic	Structural		1,500	0.693	499	376
	Halfway	Sandstone/Triassic	Structural		2,100	0.673	673	381
Julienne Creek area	Baldonnel	Carbonate/Triassic	Structural/Stratigraphic	None	1,769	0.656	678	375
	Halfway	Sandstone/Triassic	Structural/Stratigraphic	None	2,833	0.614	671	362
	Debolt	Carbonate/Mississippian	Structural/Stratigraphic		4,457	0.560	673	341
	Shunda	Carbonate/Mississippian	Structural/Stratigraphic		5,575	0.560	673	341
Kobes-Townsend	Dunlevy	Sandstone/Lower Cretaceous	Structural		714	0.651	674	374
	Charlie Lake A	Sandstone/Triassic	Structural/Stratigraphic		2,578	0.652	670	376
	Charlie Lake B	Sandstone/Triassic	Structural/Stratigraphic		2,424	0.638	673	369
	Charlie Lake C	Sandstone/Triassic	Structural/Stratigraphic		2,348	0.629	670	368
	Halfway	Sandstone/Triassic	Structural/Stratigraphic		2,820	0.638	670	372
	Belloy	Carbonate/Permian	Structural/Stratigraphic		4,540	0.695	668	392
	Debolt	Carbonate/Mississippian	Structural/Stratigraphic		4,600	0.647	678	372
Kotcho Lake	Slave Point A	Carbonate/Devonian	Stratigraphic	4,667	4,577	0.670	722	361
	Slave Point B	Carbonate/Devonian	Stratigraphic	4,600	4,560	0.670	722	361
	Slave Point C	Carbonate/Devonian	Stratigraphic	None	4,410	0.670	722	361
Lagarde	Dunlevy	Sandstone/Lower Cretaceous	Structural/Stratigraphic		1,160	0.636	683.4	369.5
	Baldonnel	Carbonate/Triassic	Structural/Stratigraphic		1,361	0.628	671	361
Laprise Creek	Baldonnel	Carbonate/Triassic	Structural/Stratigraphic	1,426	1,250	0.676	681	380
Laprise Creek West	Baldonnel	Carbonate/Triassic	Structural/Stratigraphic		1,375	0.694	669	388
Louise area	Slave Point	Carbonate/Devonian	Stratigraphic	4,950	4,950	0.657	715	365
Milligan Creek	Gething A	Sandstone/Lower Cretaceous	Stratigraphic		800	0.669	676.6	380
	Gething B	Sandstone/Lower Cretaceous	Stratigraphic		762	0.669	676.6	380
	Halfway B	Sandstone/Triassic	Stratigraphic		1,170	0.714	675	389
Montney	Bluesky-Gething	Sandstone/Lower Cretaceous	Structural/Stratigraphic		1,065	0.670	668	379
	Charlie Lake	Sandstone/Triassic	Structural/Stratigraphic		1,784	0.664	657	372
	Halfway A	Sandstone/Triassic	Structural		2,400	0.704	685	385
	Halfway B	Sandstone/Triassic	Structural		2,350	0.701	680	387
Nettle	Charlie Lake	Sandstone/Triassic	Stratigraphic		773	0.663	676	378
	Halfway	Sandstone/Triassic	Structural		925	0.635	681	367

Nig Creek	Baldonnel A	Carbonate/Triassic	Structural/Stratigraphic		1,399	0.681	693	384
	Baldonnel B	Carbonate/Triassic	Structural/Stratigraphic	None	1,508	0.677	681	380
	Baldonnel C	Carbonate/Triassic	Structural/Stratigraphic	None	1,399	0.671	687	380
	Halfway	Sandstone/Triassic	Stratigraphic		1,970	0.748	679	403
	Slave Point	Carbonate/Devonian	Stratigraphic		8,050	0.762	749	376
Nig Creek West area	Baldonnel	Carbonate/Triassic	Stratigraphic		1,550	0.693	686	381
North Pine	Charlie Lake	Sandstone/Triassic	Structural/Stratigraphic	None	2,096	0.675	669	385
Parkland	Belloy	Carbonate/Permian	Structural/Stratigraphic	4,605	4,594	0.674	655	360
	Wabamun	Carbonate/Devonian	Structural/Stratigraphic		8,500	0.623	693	348
Peejay	Gething	Sandstone/Lower Cretaceous	Structural/Stratigraphic		933	0.642	677	371
	Baldonnel	Carbonate/Triassic	Structural/Stratigraphic		1,019	0.638	676	371
Petitot River	Slave Point	Carbonate/Devonian	Structural/Stratigraphic	5,157	5,100	0.673	714	357
Red Creek	Charlie Lake	Sandstone/Triassic	Structural/Stratigraphic		2,300	0.614	675	361
	Halfway	Sandstone/Triassic	Structural		2,686	0.779	674	415
Rigel	Bluesky	Sandstone/Lower Cretaceous	Structural/Stratigraphic	1,180	1,170	0.650	676	375
	Dunlevy	Sandstone/Lower Cretaceous	Structural/Stratigraphic	1,242	1,195	0.654	674	374
Rigel East area	Dunlevy	Sandstone/Lower Cretaceous	Stratigraphic		1,177	0.647	674	372
	Halfway	Sandstone/Triassic	Stratigraphic		1,830	0.611	670	378
Shekilie area	Slave Point	Carbonate/Devonian	Stratigraphic	4,110	4,100	0.649	698.3	357.1
Sierra	Pine Point	Carbonate/Devonian	Stratigraphic	5,457	5,250	0.690	730	373
Siphon area	Baldonnel	Carbonate/Triassic	Structural/Stratigraphic	1,469	1,459	0.690	717	395
	Charlie Lake	Sandstone/Triassic	Stratigraphic	None	1,615	0.693	668	385
	Halfway	Sandstone/Triassic	Structural/Stratigraphic	2,169	2,126	0.678	680.4	385
Stoddart	Belloy A	Sandstone/Permian	Stratigraphic	None	3,726	0.695	668	392
	Belloy B	Sandstone/Permian	Stratigraphic	None	3,726	0.695	668	392
Stoddart West	Belloy A	Sandstone/Permian	Stratigraphic	None	3,830	0.664	677	379.5
	Belloy B	Sandstone/Permian	Stratigraphic	None	3,830	0.664	677	379.5
Sunrise	Cadotte	Sandstone/Lower Cretaceous	Stratigraphic	420	349	0.575	674.5	350
Tsea area	Slave Point	Carbonate/Devonian	Stratigraphic		5,000	0.657	713	358
Two Rivers	Baldonnel	Carbonate/Triassic	Structural		1,941	0.676	710	385
	Halfway	Sandstone/Triassic	Structural		2,839	0.668	693	382
Weasel	Baldonnel	Carbonate/Triassic	Structural		975	0.638	676	371
	Charlie Lake	Sandstone/Triassic	Structural		1,377	0.649	678	372
Wilder	Halfway	Sandstone/Triassic	Structural/Stratigraphic	2,698	2,670	0.630	704	369
	Belloy A	Carbonate/Permian	Stratigraphic		4,255	0.668	670.5	379.3
	Belloy B	Carbonate/Permian	Stratigraphic		4,115	0.673	671.6	383.2
Willow	Halfway	Sandstone/Triassic	Structural	1,238	1,225	0.635	678	379
Wolf	Halfway	Sandstone/Triassic	Structural		1,660	0.645	681.7	369.8
Yoyo	Slave Point	Carbonate/Devonian	Stratigraphic	None	4,800	0.613	696	351
	Pine Point	Carbonate/Devonian	Structural/Stratigraphic	5,420	5,322	0.704	729	368

TABLE 21—WELLS DRILLED AND DRILLING, 1970

Well Authorization No.	Well Name	Date Spudded	Date Rig Released	Total Depth	Status at December 31, 1970
2603	ARCo et al E Bulrush d-93-F	Jan. 4, 1970	Jan. 17, 1970	3,710	Halfway gas.
2822	ARCo Pac LRI Grassy c-44-D	Dec. 14, 1970	----------	------	Drilling.
2648	ARCo Pacific FPC Grassy a-75-D	Feb. 4, 1970	Feb. 23, 1970	1,681	Abandoned—junked.
2687	ARCo Pacific FPC Grassy a-A75-D	Feb. 25, 1970	Apr. 23, 1970	6,585	Debolt gas.
2812	ARCo Pac S Sierra a-25-K	Dec. 15, 1970	----------	------	Drilling.
2563	Amoco Beaver b-19-K	Sept. 10, 1969	Apr. 6, 1970	14,073	Nahanni gas.
2547	Amoco Beaver d-A64-K	July 11, 1969	----------	------	Drilling.
*2718	Amoco Inga 16-23-85-24	Apr. 1, 1970	Apr. 2, 1970	18	Water source.
*2671	Amoco Inga A16-19-86-23	Feb. 17, 1970	Feb. 19, 1970	190	Water source.
2762	Amoco Inga 14-20-86-23	Aug. 25, 1970	Sept. 12, 1970	5,230	Inga oil.
*2672	Amoco Inga A6-29-86-23	Feb. 16, 1970	Feb. 19, 1970	177	Water source.
*2647	Amoco Inga A6-8-87-23	Feb. 7, 1970	Feb. 28, 1970	1,639	Abandoned—dry.
*2674	Amoco Inga 10-19-87-23	Feb. 18, 1970	Feb. 19, 1970	164	Abandoned—dry.
*2673	Amoco Inga A16-13-87-24	Feb. 18, 1970	Feb. 19, 1970	225	Water source.
2811	Amoco Stewart 14-35-79-23	Dec. 21, 1970	----------	------	Drilling.
2840	Anadarko Cdn-Sup Buick 11-29-88-19	Dec. 31, 1970	----------	------	Drilling.
2794	Anadarko Cdn-Sup Buick b-22-I	Nov. 9, 1970	Nov. 19, 1970	3,572	Dunlevy gas.
2782	Andex Two Rivers A11-36-82-17	Oct. 19, 1970	Nov. 8, 1970	5,461	Abandoned—dry.
2810	Apache Uno-Tex et al Beaverdam d-30-L	Dec. 11, 1970	Dec. 23, 1970	3,820	Abandoned—dry.
2775	Apache Buick c-74-L	Oct. 15, 1970	Oct. 22, 1970	3,603	Abandoned—dry.
2601	Apache Cecil 6-8-85-17	Dec. 19, 1969	Jan. 1, 1970	4,492	Abandoned—dry.
2757	Apache et al Stoddart 6-36-85-20	Aug. 1, 1970	Aug. 21, 1970	6,535	Belloy oil.
2815	Apache Woods W Stoddart 11-12-87-21	Dec. 13, 1970	Dec. 29, 1970	6,450	Abandoned—dry.
2777	Apache Woods W Stoddart 10-14-87-21	Oct. 26, 1970	Nov. 19, 1970	6,590	Belloy gas.
2789	Apache DiaSham et al W Weasel d-18-B	Nov. 4, 1970	Nov. 19, 1970	4,030	Halfway gas.
2669	Ashland Cdn-Sup W Beatton d-3-L	Feb. 15, 1970	Feb. 20, 1970	3,410	Bluesky-Gething oil.
2644	Ashland Homestead Milligan d-85-G	Jan. 16, 1970	Jan. 27, 1970	3,800	Bluesky-Gething gas.
2617	Atkinson Sunlite Helmet b-2-K	Jan. 4, 1970	Feb. 10, 1970	6,143	Slave Point gas.
2688	BO&G et al N Dahl d-71-D	Mar. 2, 1970	Mar. 8, 1970	3,480	Abandoned—dry.
2689	BO&G et al Elm b-74-C	Mar. 10, 1970	Mar. 18, 1970	3,888	Abandoned.
2712	BO&G et al Elm d-83-C	Mar. 23, 1970	Mar. 30, 1970	3,910	Halfway gas.
2742	BVX et al N Cache c-16-L	July 23, 1970	Aug. 11, 1970	5,300	Abandoned—dry.
2760	Ballinderry Flatrock 10-33-84-16	Aug. 2, 1970	Aug. 13, 1970	4,850	Halfway gas.
2606	Banff et al Stanislas c-28-H	Dec. 22, 1969	Feb. 3, 1970	8,600	Abandoned—dry.
2659	Baysel SR Milligan d-76-G	Jan. 29, 1970	Feb. 11, 1970	3,800	Multiple Bluesky-Gething gas and Halfway oil.
2711	Bralorne N Beatton d-90-J	Mar. 24, 1970	Mar. 31, 1970	3,790	Abandoned—dry.
2614	CDR GN Gulf Eagle 14-26-84-18	Dec. 28, 1969	Jan. 24, 1970	6,350	Abandoned—dry.
2826	CDR et al Junior d-47-E	Dec. 26, 1970	----------	------	Drilling.
2747	CIGOL GWG Blair d-55-E	July 17, 1970	Aug. 12, 1970	5,164	Abandoned—dry.
2758	CIGOL et al Flatrock 7-28-85-15	July 30, 1970	Aug. 18, 1970	4,890	Abandoned—dry.
2790	CIGOL IOE et al Howell a-16-B	Oct. 31, 1970	Dec. 22, 1970	4,632	Abandoned—dry.
2652	CIGOL et al Rabbit d-28-A	Jan. 23, 1970	Jan. 31, 1970	4,003	Abandoned—dry.

2501	CPOG et al W Altares a-81-B	Feb. 22, 1969	Jan. 12, 1970	8,040	Abandoned.
2651	CPOG Goldenrod b-2-F	Jan. 23, 1970	Feb. 27, 1970	6,884	Abandoned—dry.
2621	Cabot Pioneer W Jeans d-15-I	Jan. 7, 1970	Jan. 18, 1970	4,640	Abandoned—dry.
2741	Cabot et al Rigel b-6-C	July 15, 1970	July 30, 1970	4,235	Abandoned—dry.
2629	Cdn Res APL Gunnel a-97-K	Jan. 7, 1970	Feb. 22, 1970	7,665	Finished drilling.
2824	Cdn-Sup Dahl b-6-J	Dec. 23, 1970	———	———	Drilling.
*2668	Cdn-Sup Inga A16-30-87-23	Feb. 8, 1970	Feb. 21, 1970	470	Water source.
*2680	Cdn-Sup Inga B16-30-87-23	Feb. 22, 1970	Feb. 27, 1970	371	Abandoned—dry.
*2682	Cdn-Sup Inga 5-32-87-23	Feb. 28, 1970	Apr. 15, 1970	185	Water source.
*2714	Cdn-Sup Inga A5-32-87-23	Apr. 1, 1970	Apr. 4, 1970	180	Water source.
*2719	Cdn-Sup Inga B5-32-87-23	Apr. 9, 1970	Apr. 13, 1970	160	Water source.
*2716	Cdn-Sup Inga 12-32-87-23	Mar. 23, 1970	Mar. 26, 1970	260	Abandoned—dry.
*2715	Cdn-Sup Inga 14-32-87-23	Apr. 5, 1970	Apr. 9, 1970	245	Abandoned—dry.
*2632	Cdn-Sup Inga 13-5-88-23	Jan. 5, 1970	Jan. 9, 1970	162	Water source.
*2706	Cdn-Sup Inga 2-6-88-23	Mar. 10, 1970	Mar. 15, 1970	310	Water source.
*2637	Cdn-Sup Inga 9-6-88-23	Jan. 5, 1970	Feb. 6, 1970	310	Water source.
*2634	Cdn-Sup Inga A16-6-88-23	Jan. 5, 1970	Jan. 9, 1970	520	Water source.
*2635	Cdn-Sup Inga B16-6-88-23	Jan. 5, 1970	Jan. 9, 1970	190	Water source.
*2636	Cdn-Sup Inga C16-6-88-23	Jan. 5, 1970	Jan. 9, 1970	145	Water source.
*2717	Cdn-Sup Inga 1-7-88-23	Mar. 16, 1970	Apr. 15, 1970	491	Abandoned—dry.
*2633	Cdn-Sup Inga 4-8-88-23	Jan. 5, 1970	Jan. 9, 1970	150	Water source.
*2660	Cdn-Sup Inga A4-8-88-23	Jan. 29, 1970	Feb. 7, 1970	544	Abandoned—dry.
2767	Clark Can Elcan TGS Pine c-29-B	Sept. 12, 1970	———	———	Drilling.
2585	Cox SE et al E Beg d-80-G	Nov. 29, 1969	Jan. 5, 1970	5,625	Abandoned.
2690	Decalta et al E Dahl a-67-I	Feb. 27, 1970	Mar. 8, 1970	3,900	Abandoned—dry.
2623	DiaSham Suptst W Jeans d-37-I	Jan. 12, 1970	Feb. 8, 1970	5,300	Abandoned—dry.
2808	DiaSham IOE Junior c-56-C	Dec. 11, 1970	———	———	Drilling.
2600	DiaSham IOE Kyklo b-43-F	Dec. 14, 1969	Feb. 5, 1970	6,340	Slave Point gas.
2677	DiaSham Sasquatch a-23-E	Feb. 24, 1970	Apr. 27, 1970	8,200	Abandoned—dry.
2759	FPC Rigel 10-26-87-18	Aug. 2, 1970	Aug. 18, 1970	3,660	Abandoned—dry.
2666	Fina Lapp a-78-K	Feb. 12, 1970	Feb. 22, 1970	3,685	Abandoned—dry.
2656	Fina Lapp d-73-L	Jan. 28, 1970	Feb. 7, 1970	3,705	Abandoned—dry.
2807	Fina et al Titan d-44-F	Dec. 12, 1970	Dec. 25, 1970	3,150	Abandoned—dry.
2838	Fina Amoco Venus d-44-G	Dec. 30, 1970	———	———	Drilling.
2624	Francana BOG et al Chinchaga c-34-B	Jan. 6, 1970	Jan. 14, 1970	3,350	Abandoned—dry.
2839	GAOL GERC Helmet c-40-K	Dec. 29, 1970	———	———	Drilling.
2605	GERC Boundary 16-8-85-14	Dec. 29, 1969	Jan. 11, 1970	4,279	Abandoned—dry.
2772	GERC Sunrise 7-12-79-17	Oct. 2, 1970	Oct. 13, 1970	3,070	Cadotte gas.
2732	GNOL et al Stoddart 10-28-86-20	July 8, 1970	July 28, 1970	6,540	Abandoned—dry.
2676	GPD NOEL et al Poplar d-35-G	Feb. 21, 1970	Apr. 16, 1970	8,393	Abandoned—dry.
2665	General American Cabin a-61-F	Feb. 17, 1970	Mar. 17, 1970	7,219	Slave Point gas.
2713	GraMic Scurry et al N Nancy d-30-I	June 13, 1970	June 21, 1970	3,755	Halfway gas.
2661	HB IOE Union Gutah b-44-G	Feb. 1, 1970	Feb. 11, 1970	3,366	Abandoned—dry.
2683	HB IOE Union Kahntah d-37-H	Feb. 25, 1970	Mar. 4, 1970	3,180	Abandoned—dry.
2667	HB Union Lapp d-33-E	Feb. 13, 1970	Feb. 20, 1970	3,330	Abandoned—dry.
2625	HB Sush a-6-C	Jan. 13, 1970	Feb. 23, 1970	9,025	Abandoned—dry.
2819	IOE Amoco Clayhurst 14-26-82-15	Dec. 16, 1970	———	———	Drilling.

* Water source well.

TABLE 21—WELLS DRILLED AND DRILLING, 1970—*Continued*

Well Authorization No.	Well Name	Date Spudded	Date Rig Released	Total Depth	Status at December 31, 1970
2642	IOE Scurry Dahl d-51-B	Jan. 14, 1970	Jan. 25, 1970	3,455	Bluesky-Gething gas.
2618	IOE Scurry et al Dahl a-89-B	Jan. 1, 1970	Jan. 11, 1970	3,415	Abandoned—dry.
2806	IOE et al Inga 6-16-87-23	Dec. 7, 1970	Dec. 23, 1970	5,090	Inga oil.
2798	IOE Pac Inga 6-20-87-23	Nov. 14, 1970	Dec. 2, 1970	5,411	Inga oil.
2837	IOE Pac Inga 16-20-87-23	Dec. 28, 1970	.....	.....	Drilling.
2778	IOE Pac Inga 6-21-87-23	Oct. 17, 1970	Oct. 30, 1970	5,240	Inga oil.
2743	IOE Pac Inga 6-28-87-23	July 8, 1970	July 22, 1970	5,270	Inga oil.
2770	IOE Pac Inga 6-29-87-23	Sept. 29, 1970	Oct. 15, 1970	5,190	Inga gas.
2658	IOE Pac Inga 16-30-87-23	Feb. 2, 1970	Feb. 25, 1970	5,393	Inga oil.
2755	IOE Pac Inga 6-31-87-23	July 24, 1970	Aug. 7, 1970	5,480	Inga oil.
2805	IOE Pac Inga 6-32-87-23	Dec. 5, 1970	Dec. 21, 1970	5,185	Abandoned—dry.
2833	IOE Inga 16-34-87-23	Dec. 30, 1970	.....	.....	Drilling.
2720	IOE Pac Inga 16-36-87-24	June 5, 1970	June 19, 1970	5,364	Inga oil.
2748	IOE Fina Rigel 10-27-87-18	July 18, 1970	July 31, 1970	3,725	Abandoned—dry.
2707	IOE Fina Rigel 7-35-87-18	Mar. 10, 1970	Mar. 20, 1970	3,565	Dunlevy gas.
2686	IOE et al Rigel d-39-J	Feb. 25, 1970	Mar. 8, 1970	3,620	Multiple Bluesky-Gething and Dunlevy gas.
2726	IOE Fina Rigel d-71-K	June 8, 1970	June 16, 1970	3,630	Dunlevy gas.
2729	Imp et al Boundary 5-35-84-14	July 23, 1970	July 10, 1970	4,155	Boundary Lake oil.
2735	Imp et al Boundary 7-35-84-14	July 6, 1970	July 19, 1970	4,180	Boundary Lake oil.
2730	Imp et al Boundary 7-5-85-13	June 24, 1970	July 1, 1970	4,330	Boundary Lake oil.
2641	Imp Pac Boundary 16-17-85-13	Jan. 14, 1970	Jan. 23, 1970	4,350	Boundary Lake oil.
2709	Imp et al Rigel 11-29-88-17	May 24, 1970	June 6, 1970	3,736	Water disposal.
2721	Ipex Milligan b-75-G	May 7, 1970	May 15, 1970	3,798	Halfway oil.
2765	Ipex Milligan b-85-G	Sept. 2, 1970	Sept. 8, 1970	3,800	Halfway oil.
2756	Ipex Milligan d-96-G	Aug. 10, 1970	Aug. 17, 1970	3,810	Abandoned—dry.
2622	Joe Phillips Dahl d-93-G	Jan. 9, 1970	Jan. 14, 1970	3,760	Bluesky-Gething gas.
2796	Kanata et al N Aitken c-60-D	Nov. 12, 1970	Dec. 11, 1970	5,470	Baldonnel gas.
2801	Kanata LRI Total Br Ridge 6-13-78-14	Dec. 1, 1970	Dec. 28, 1970	5,725	Abandoned—dry.
2626	Kerr McGee Shell Toad d-57-K	Jan. 15, 1970	Apr. 15, 1970	10,016	Abandoned—dry.
2608	Marathon LL&E Toob d-33-B	Dec. 25, 1969	Feb. 9, 1970	8,910	Abandoned—dry.
2590	Mesa et al Aikman a-92-F	Dec. 5, 1969	Mar. 13, 1970	12,715	Abandoned—dry.
2816	Mesa et al E Clarke c-2-A	Dec. 16, 1970	.....	.....	Drilling.
2817	Mesa Pubco S Clarke d-75-F	Dec. 18, 1970	.....	.....	Drilling.
2595	Mobil Eskai a-58-E	Dec. 28, 1969	Feb. 15, 1970	8,267	Abandoned—dry.
2596	Mobil Sierra c-A78-C	Dec. 17, 1969	Feb. 15, 1970	7,200	Sulphur Point—Pine Point gas.
2799	Monsanto BP N Beatton d-62-K	Nov. 23, 1970	Dec. 5, 1970	3,743	Abandoned—dry.
2592	Monsanto Tenneco Donis d-34-F	Dec. 18, 1969	Jan. 8, 1970	3,870	Abandoned—dry.
2828	POR BP Milligan d-98-G	Dec. 27, 1970	.....	.....	Drilling.
2610	Pacific ARCo Beavertail c-92-C	Dec. 21, 1969	Jan. 3, 1970	4,100	Bluesky-Gething gas.
2620	Pacific N Cache 11-10-88-22	Jan. 4, 1970	Jan. 26, 1970	6,600	Halfway gas.
2820	Pacific Imp Clarke b-6-D	Dec. 16, 1970	.....	.....	Drilling.
2771	Pacific et al Clarke a-69-G	Oct. 7, 1970	Oct. 31, 1970	6,806	Abandoned—dry.

2694	Pacific et al Clarke b-84-G	Mar. 6, 1970	Apr. 6, 1970	6,983	Abandoned—dry.
2776	Pacific et al Clarke b-26-J	Oct. 13, 1970	Nov. 12, 1970	6,060	Slave Point gas.
2678	Pacific Imp Clarke b-90-L	Mar. 2, 1970	Apr. 5, 1970	6,713	Abandoned—dry.
2640	Pacific CIGOL Dahl a-21-A	Jan. 15, 1970	Jan. 24, 1970	3,357	Abandoned—dry.
2779	Pacific S Julienne b-70-K	Oct. 17, 1970	Nov. 19, 1970	6,200	Halfway gas.
2588	Pacific Kobes d-57-A	Dec. 2, 1969	Jan. 5, 1970	5,875	Charlie Lake gas.
2609	Pacific Kotcho d-70-C	Dec. 24, 1969	Feb. 6, 1970	6,862	Slave Point gas.
2823	Pacific Kotcho d-100-C	Dec. 19, 1970	...	...	Drilling.
2679	Pacific Louise d-13-L	Feb. 21, 1970	Mar. 21, 1970	7,233	Abandoned—dry.
2472	Pacific Louise c-40-L	Feb. 13, 1970	Mar. 12, 1970	7,045	Slave Point gas.
2630	Pacific Lucy d-95-I	Jan. 21, 1970	Feb. 25, 1970	8,049	Abandoned—dry.
2769	Pacific West Prod Siphon 7-16-85-15	Sept. 30, 1970	Nov. 4, 1970	9,880	Abandoned—dry.
2662	Pacific West Prod Tommy Lakes a-13-D	Feb. 9, 1970	Feb. 26, 1970	4,660	Abandoned—dry.
*2698	Pacific et al Weasel d-A2-B	Feb. 15, 1970	Feb. 20, 1970	310	Water source.
*2696	Pacific et al Weasel a-11-B	Feb. 15, 1970	Feb. 20, 1970	313	Water source.
*2697	Pacific et al Weasel d-A94-J	Feb. 5, 1970	Feb. 10, 1970	200	Water source.
2657	Pacific Wildboy d-16-B	Jan. 30, 1970	Feb. 24, 1970	6,516	Abandoned—dry.
2804	Pacific S Yoyo b-42-E	Dec. 12, 1970	...	...	Drilling.
2602	Pacific Yoyo d-12-I	Dec. 17, 1969	Jan. 16, 1970	7,290	Pine Point gas.
2818	Pembina et al W Stoddart 11-10-87-20	Dec. 20, 1970	...	...	Drilling.
2788	Penzl Tenn E Bulrush d-94-F	Oct. 26, 1970	Nov. 3, 1970	3,740	Abandoned—dry.
2705	Penzl West Prod HB Nig a-5-E	Mar. 7, 1970	Mar. 31, 1970	4,734	Abandoned—dry.
2612	Penzl et al Snake b-51-J	Dec. 29, 1969	Feb. 25, 1970	7,900	Abandoned—dry.
2611	Placid Hunt Amoco Niteal a-58-E	Jan. 2, 1970	Mar. 6, 1970	8,450	Jean Marie gas.
2607	Scurry et al Boundary 16-29-85-13	Jan. 2, 1970	Jan. 11, 1970	4,305	Abandoned—dry.
2763	Sierra Bear Flat 8-20-84-20	Sept. 1, 1970	Sept. 12, 1970	4,525	Abandoned—dry.
2802	Sierra Patrick W Beatton d-4-L	Dec. 7, 1970	Dec. 14, 1970	3,430	Bluesky-Gething oil.
2628	Sierra Dahl b-62-G	Jan. 18, 1970	Jan. 25, 1970	3,891	Bluesky-Gething gas.
2751	Sierra Pouce Coupe 7-31-80-13	July 28, 1970	Aug. 9, 1970	4,762	Abandoned—dry.
2725	Sierra Rigel 10-17-88-18	June 2, 1970	June 8, 1970	3,538	Dunlevy gas.
2750	Sierra Rigel b-22-L	July 22, 1970	July 30, 1970	3,628	Abandoned—dry.
2752	Suptst DiaSham Saturn 7-13-87 22	July 30, 1970	Aug. 15, 1970	5,575	Abandoned—dry.
2783	Tenn et al Coplin 10-29-84-23	Oct. 25, 1970	Nov. 19, 1970	5,400	Abandoned—dry.
2749	Tenn et al Coplin 6-18-85-23	July 21, 1970	Aug. 5, 1970	4,960	Abandoned—dry.
2731	Tenn Inga 8-6-87-23	June 25, 1970	July 6, 1970	5,310	Inga oil.
*2722	Tenn Inga 15-2-87-24	May 19, 1970	May 22, 1970	125	Water source.
*2710	Tenn Inga A16-12-87-24	Mar. 17, 1970	Apr. 4, 1970	290	Abandoned—dry.
2576	Tenn Cdn-Sup et al Inga c-20-J	Nov. 2, 1970	Jan. 29, 1970	5,450	Abandoned—junked.
2704	Tenn Cdn-Sup et al Inga d-27-J	Mar. 12, 1970	Mar. 28, 1970	5,390	Water injection.
2613	Tenn Osprey d-13-J	Dec. 30, 1969	Jan. 6, 1970	3,820	Halfway gas.
*2702	Tenn Weasel a-32-B	Mar. 4, 1970	Mar. 6, 1970	176	Water source.
*2701	Tenn Weasel c-32-B	Mar. 3, 1970	Mar. 5, 1970	140	Water source.
*2703	Tenn Weasel c-A32-B	Mar. 4, 1970	Mar. 6, 1970	154	Water source.
*2700	Tenn Weasel b-42-B	Mar. 3, 1970	Mar. 5, 1970	185	Water source.
2834	Tenn et al W Weasel d-71-C	Dec. 28, 1970	...	...	Drilling.
2693	Texaco et al Buick c-94-I	Mar. 5, 1970	Mar. 16, 1970	3,692	Dunlevy gas.
2766	Texaco Texcan Inga 8-36-87-24	Sept. 18, 1970	Oct. 3, 1970	5,470	Inga oil.

* Water source well.

TABLE 21—WELLS DRILLED AND DRILLING, 1970—*Continued*

Well Authorization No.	Well Name	Date Spudded	Date Rig Released	Total Depth	Status at December 31, 1970
2653	Texaco Jupiter c-9-D	Jan. 24, 1970	Mar. 4, 1970	7,761	Abandoned—dry.
2761	Texaco Gulf Nig d-76-A	Aug. 12, 1970	Aug. 28, 1970	4,407	Baldonnel gas.
2784	Texaco et al Nig b-68-B	Nov. 9, 1970	Nov. 21, 1970	4,572	Baldonnel gas.
2638	Texcan N Cache c-32-I	Jan. 16, 1970	Feb. 4, 1970	5,318	Abandoned—dry.
2780	Trend et al W Stoddart 6-16-87-20	Oct. 21, 1970	Nov. 10, 1970	6,480	Belloy gas.
*2649	Triad Beatton d-35-K	Jan. 18, 1970	Jan. 19, 1970	200	Water source.
*2650	Triad Beatton d-A35-K	Jan. 18, 1970	Jan. 19, 1970	101	Water source.
2670	Triad et al W Beatton d-24-L	Feb. 22, 1970	Mar. 1, 1970	3,480	Abandoned—dry.
2643	Triad BP Birley d-31-B	Jan. 18, 1970	Jan. 28, 1970	4,081	Abandoned—dry.
2646	Triad BP Chestnut d-99-K	Jan. 30, 1970	Feb. 6, 1970	3,545	Abandoned—dry.
2599	Triad et al Pine 6-21-81-21	Dec. 23, 1969	Jan. 5, 1970	2,819	Abandoned—junked.
2813	Union E Aitken d-19-K	Dec. 16, 1970	Dec. 31, 1970	4,760	Abandoned—dry.
2654	Union HB Beaverdam d-52-L	Jan. 30, 1970	Feb. 7, 1970	3,810	Abandoned—dry.
2655	Union HB Suptst Bluejay d-97-E	Jan. 31, 1970	Feb. 12, 1970	3,920	Abandoned—dry.
2616	Union HB Gulf Canuck d-39-G	Jan. 10, 1970	Jan. 28, 1970	4,510	Bluesky-Gething oil.
2675	Union HB Cedar d-99-H	Feb. 23, 1970	Mar. 3, 1970	3,773	Abandoned—dry.
2615	Union HB Gulf Ladyfern d-77-H	Dec. 30, 1969	Jan. 7, 1970	3,499	Bluesky-Gething gas.
2685	Union HB Gulf Lime d-99-C	Feb. 24, 1970	Mar. 5, 1970	3,650	Abandoned—dry.
2692	Union et al Milligan a-52-G	Mar. 13, 1970	Mar. 20, 1970	3,770	Halfway oil.
2691	Union et al Milligan c-52-G	Mar. 5, 1970	Mar. 13, 1970	3,780	Halfway oil.
2724	Union et al Milligan c-63-G	June 16, 1970	June 22, 1970	3,780	Abandoned—dry.
1518	Union HB Milligan d-65-G	July 24, 1970	Aug. 1, 1970	3,800	Halfway oil.
2723	Union et al Milligan a-74-G	May 23, 1970	May 30, 1970	3,780	Halfway oil.
2728	Union et al Milligan a-84-G	June 5, 1970	June 12, 1970	3,780	Halfway oil.
2836	Union et al Moose d-34-K	Dec. 29, 1970	———	———	Drilling.
2663	Union HB Moose d-38-K	Feb. 9, 1970	Feb. 21, 1970	3,810	Abandoned—dry.
2695	Union HB Moose d-39-K	Mar. 8, 1970	Mar. 19, 1970	3,850	Abandoned—dry.
2619	Union HB Dome Moose d-88-K	Jan. 3, 1970	Jan. 14, 1970	3,790	Abandoned—dry.
2803	Union et al Peejay a-83-D	Dec. 4, 1970	Dec. 12, 1970	3,950	Halfway oil.
2800	Union et al Peejay a-92-D	Nov. 23, 1970	Dec. 2, 1970	3,940	Halfway oil.
2791	Union et al Peejay a-93-D	Oct. 30, 1970	Nov. 9, 1970	3,925	Halfway oil.
2821	Union et al Peejay a-2-E	Dec. 15, 1970	Dec. 23, 1970	3,922	Halfway oil.
2781	Union et al Peejay a-3-E	Oct. 17, 1970	Oct. 29, 1970	3,925	Halfway oil.
2797	Union et al Peejay a-23-E	Nov. 12, 1970	Nov. 20, 1970	3,900	Halfway oil.
2627	Union HB Gulf Skwat d-65-A	Jan. 17, 1970	Jan. 28, 1970	3,538	Abandoned—dry.
2591	Union Silverberry 11-8-88-20	Dec. 5, 1969	Jan. 2, 1970	6,487	Abandoned—dry.
2664	Union HB Spruce d-74-E	Feb. 13, 1970	Feb. 23, 1970	3,940	Halfway gas.
2631	WOL Woods Pine A6-21-81-21	Jan. 7, 1970	Aug. 20, 1970	5,858	Abandoned—dry.
2774	WSOG Husky Dome Wilder 10-14-83-20	Oct. 10, 1970	Nov. 5, 1970	6,745	Abandoned—dry.
2792	Wainoco Francana Cecil 10-16-85-17	Nov. 7, 1970	Nov. 21, 1970	4,930	Abandoned—dry.
2793	Wainoco Woods Wilder 10-19-83-19	Nov. 6, 1970	Dec. 2, 1970	6,425	Halfway gas.
2708	Wainoco Woods Wilder 11-20-83-19	June 23, 1970	July 27, 1970	6,400	Belloy gas.

2773	Wainoco Woods Wilder 7-30-83-19	Oct. 2, 1970	Oct. 26, 1970	6,020	Multiple Belloy and Halfway gas.
2699	Westcoast Dahl d-35-A	Mar. 6, 1970	Mar. 14, 1970	3,260	Abandoned—dry.
2753	Westcoast HB Valiant d-30-K	Aug. 14, 1970	Oct. 10, 1970	8,054	Abandoned—dry.
2768	West Nat et al Bernadet 10-12-88-25	Sept. 20, 1970	Oct. 25, 1970	7,052	Abandoned—dry.
2764	West Nat et al Inga 8-1-88-24	Sept. 4, 1970	Sept. 16, 1970	5,360	Inga oil.
887	West Nat et al Yoyo a-74-H	Jan. 2, 1970	Mar. 2, 1970	570†	Pine Point gas (deepened well).
2645	Whitehall Cdn-Sup W Beatton d-31-L	Feb. 8, 1970	Feb. 13, 1970	3,460	Bluesky-Gething oil.
2684	Wincan et al N Inga b-20-B	Feb. 27, 1970	Mar. 15, 1970	4,947	Inga gas.
2754	Woods Sun Bison d-75-C	July 31, 1970	Aug. 9, 1970	4,000	Abandoned—dry.
2785	Woods Buick a-65-I	Oct. 31, 1970	Nov. 7, 1970	3,505	Dunlevy gas.
2787	Woods Dome Laprise d-17-H	Oct. 24, 1970	Nov. 4, 1970	4,533	Abandoned—dry.
2795	Woods Rigel 10-8-88-18	Nov. 21, 1970	Nov. 30, 1970	3,592	Dunlevy gas.
2814	Woods W Stoddart 11-7-86-20	Dec. 12, 1970	Dec. 29, 1970	6,690	Belloy gas.
2786	Woods W Stoddart 10-18-86-20	Oct. 22, 1970	Nov. 9, 1970	6,500	Belloy gas.
2737	Woods W Stoddart 11-19-86-20	July 12, 1970	July 29, 1970	6,410	Belloy gas.

* Water source well.
† Not total depth—deepened in 1970.

TABLE 22—OILFIELDS AND GASFIELDS DESIGNATED AT DECEMBER 31, 1970

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(3), gas	4
						Pacific Airport 12-34-83-17(10), gas	10
						Pacific Airport 9-32-83-17(97), 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
Bear Flat	Oct. 1, 1969		Tp. 84, R. 20, W. of 6th M.	7	2	Monsanto Bear Flat 7-16-84-20, oil	7
Beatton River	Aug. 7, 1959	Jan. 1, 1962	N.T.S. 94-H-2	10	12	Triad Beatton d-60-J, gas	10
						Triad Beatton River b-38-J, oil	10
Beatton River West	Aug. 7, 1959	Jan. 1, 1962 Oct. 1, 1964 Apr. 1, 1969 July 1, 1970	N.T.S. 94-H-2	2	14	Triad West Beatton River d-39-K, oil	2
Beaverdam	Apr. 1, 1966		N.T.S. 94-A-16	10	3	Tenn Sun Beaverdam d-37-L, gas	10
						Tenn Beaverdam d-38-L, oil	10
Beavertail	Apr. 1, 1970		N.T.S. 94-A-15		4		
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	30	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	33	West Nat et al Blueberry b-22-D, gas	10
						West Nat et al Blueberry c-32-D, gas	5
						West Nat et al Blueberry d-87-D, gas	6
						West Nat et al Blueberry a-61-L, gas	7
						West Nat et al Blueberry d-82-L, 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, gas	6, 10
						West Nat et al E Blueberry b-36-C, gas	12
Blueberry West	Feb. 7, 1958	July 1, 1961 Oct. 1, 1969	N.T.S. 94-A-12, 94-B-9, 94-B-16, Tp. 88, R. 25, W. of 6th M.	5, 6	5	West Nat et al W Blueberry d-82-I, gas	5
						West Nat et al W Blueberry d-19-L, 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, 9, 10	294	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

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	11	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 Apr. 1, 1970	N.T.S. 94-A-11, 94-A-14 N.T.S. 94-A-10, 94-A-15	5, 7	31	Texaco NFA Buick Creek d-98-I(1), gas Texaco NFA Buick Creek d-83-J(4), gas	5 7
Buick Creek North	Apr. 1, 1967	....	N.T.S. 94-A-14	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	14	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
Cabin	Apr. 1, 1970	....	N.T.S. 94-P-5		3		
Charlie Lake	Jan. 1, 1961	May 27, 1960	Tp. 84, R. 18, W. of 6th M.	3	1	Imp Pac Charlie 13-5-84-18, oil	3
Clarke Lake	Feb. 15, 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 July 1, 1969 July 1, 1970	N.T.S. 94-J-9, 94-J-10, 94-J-15, 94-J-16	14	28	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	10	Union et al Crush d-28-F, oil	10
Currant	Oct. 1, 1965	....	N.T.S. 94-A-9, 94-A-16	10	9	Union HB Sinc Pac Currant d-37-C, gas Sinclair et al Currant d-17-C, oil	10 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
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 Petroleums Farrell a-9-L, gas CanDel et al Farrell a-41-I, gas	10 7
Fort St. John	Aug. 22, 1956	Feb. 7, 1958 Feb. 15, 1960 Jan. 1, 1961 Oct. 1, 1968 Apr. 1, 1969	Tp. 83, R. 18, W. of 6th M.	4, 6, 7, 10, 11	30	Pacific Ft St John A3-29-83-18(31), gas Pacific Ft St John 14-15-83-18(7), gas Pacific Ft St John B3-29-83-18(52), gas Pacific Ft St John 3-14-83-18(9), oil Pacific Ft St John 1-20-83-18(30), gas Imp Pac Ft St John 9-19-83-18(45), oil Pacific Ft St John 14-21-83-18(4), gas	4 6 7 7 10 11 11

TABLE 22—OILFIELDS AND GASFIELDS DESIGNATED AT DECEMBER 31, 1970—*Continued*

Field	Date Designated	Date(s) Revised	Field Location	Pool(s)	Number of Wells Capable of Production	Discovery Well(s)	Pool(s) Discovered
Fort St. John Southeast	Feb. 7, 1958		Tp. 82, 83, R. 17, W. of 6th M.	4, 6, 10, 11	15	Pac Ft St John SE 10-31-82-17(80), gas	4
						Pac 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, 7	4	West Nat et al Halfway 5-1-87-25, gas	6
						West Nat et al Halfway 8-11-87-25, gas	7
						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	Tp. 86, R. 23, 24, W. of 6th M.	6, 7, 8	64	Cdn-Sup et al Inga 10-25-88-24, oil	8
		July 1, 1968	Tp. 87, R. 23, 24, W. of 6th M.			Hunt Sands Pac Imp Inga 7-16-86-23, oil	6
		Oct. 1, 1968	Tp. 88, R. 23, 24, W. of 6th M.			Texaco Inga 6-25-87-24, oil	7
		Jan. 1, 1969	N.T.S. 94-A-12				
		Apr. 1, 1969	Tp. 85, R. 23, W. of 6th M.				
		July 1, 1970	N.T.S. 94-A-13				
		Oct. 1, 1970					
Jedney	Aug. 7, 1959	Nov. 24, 1959	N.T.S. 94-G-1, 94-G-8	3, 6, 10	44	Pacific Imperial Jedney a-95-C, gas	3
		Feb. 15, 1960				Pacific et al Jedney b-88-J, gas	6
		Jan. 1, 1961				Pacific Imp Jedney d-99-J, gas	10
		Apr. 1, 1961					
		Apr. 1, 1963					
		Oct. 1, 1963					
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	13	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
LaGarde	July 1, 1970		Tp. 87, R. 15, W of 6th M.	5, 9	2	Texaco NFA LaGarde 7-21-87-15, gas	5
						Texaco NFA LaGarde 10-29-87-15, gas	9
Laprise Creek	Feb. 15, 1960	Jan. 1, 1961	N.T.S. 94-G-8, 94-H-4, 94-H-5	6	40	Dome Basco Laprise Ck a-35-H, gas	6
		Apr. 1, 1961					
		Apr. 1, 1963					
		Jan. 1, 1964					
		Apr. 1, 1964					
Laprise Creek West	July 1, 1962		N.T.S. 94-G-8	6	2	Dome CDP C&E W Laprise c-82-G, gas	6
Milligan Creek	Feb. 7, 1958	Aug. 7, 1959	N.T.S. 94-H-2	10	30	Union HB Milligan Creek d-73-G, oil	10
		Feb. 15, 1960					
		Jan. 1, 1961					
		Apr. 1, 1962					
		July 1, 1963					
		Jan. 1, 1970					
		Apr. 1, 1970					

Moberly Lake	Jan. 1, 1969	Apr. 1, 1969	Tp. 82, R. 22, W. of 6th M.	7	2	JBA Moberly 10-15-82-22, oil — 7
Montney	Feb. 7, 1958	Jan. 6, 1959	Tp. 87, R. 18, W. of 6th M.	2, 7, 10	4	Pac Sunray Montney 16-32-86-19(3), gas — 2 Pac Sunray Montney 14-36-86-19(2), gas — 7 Pac Sunray Montney 14-31-86-19(5), gas — 10
		Jan. 1, 1962	Tp. 86, 87, R. 19, W. of 6th M.			
Nettle	Apr. 1, 1966	.....	N.T.S. 94-H-7	2	5	Union KCL ROC Nettle d-67-A, oil — 2 Union KCL ROC Nettle d-76-A, gas — 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	31	Texaco NFA Nig Creek a-79-B(1), gas — 6 Texaco NFA Nig d-87-A, oil — 6
North Pine	Oct. 1, 1968	Oct. 1, 1969	Tp. 85, R. 18, W. of 6th M.	7	3	Texaco N Pine 6-15-85-18, oil — 7 Pacific et al N Pine 6-27-85-18, gas — 7
Osprey	Apr. 1, 1966	.....	N.T.S. 94-A-15	10	4	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	102	Pacific SR West Cdn Peejay d-52-I, gas — 10 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 Jan. 1, 1963 Apr. 1, 1963 Jan. 1, 1964 Oct. 1, 1964	Tp. 85, R. 21, W. of 6th M. N.T.S. 94-A-10	7, 10	2	Pacific Red Creek 5-27-85-21(36), gas — 7, 10
Rigel	Oct. 1, 1962	Oct. 1, 1965 Jan. 1, 1967 July 1, 1967 July 1, 1968 Oct. 1, 1968 Jan. 1, 1969 July 1, 1969 Apr. 1, 1970	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	59	Monsanto Rigel 6-13-87-17, oil — 5 Imp Fina Rigel 4-27-88-17, gas — 5

TABLE 22—OILFIELDS AND GASFIELDS DESIGNATED AT DECEMBER 31, 1970—*Continued*

Field	Date Designated	Date(s) Revised	Field Location	Pool(s)	Number of Wells Capable of Production	Discovery Well(s)	Pool(s) Discovered
Sierra	Oct. 1, 1969		N.T.S. 94-I-14	15	2	Socony Mobil Sierra c-78-C, gas	15
Stoddart	Jan. 6, 1959	Feb. 15, 1960 Apr. 1, 1965 Jan. 1, 1966 Apr. 1, 1967 Apr. 1, 1969 Oct. 1, 1969 July 1, 1970	Tp. 86, R. 19, 20, W. of 6th M. Tp. 85, R. 19, W. of 6th M. Tp. 85, R. 18, 19, W. of 6th M.	7, 11	20	Pacific Stoddart 4-24-86-20(85), gas Uno-Tex et al Stoddart 10-31-85-19, oil Chaut Dunbar Stoddart 11-23-85-19, oil	11 11 7
Stoddart West	Apr. 1, 1964		Tp. 86, R. 20, W. of 6th M.	11	5	Pacific W Stoddart 11-10-86-20, gas	11
Sunrise	Oct. 1, 1969		Tp. 78, 79, R. 16, W. of 6th M.	1	8	Pacific Sunrise 10-7-79-16(3), gas	1
Two Rivers	Apr. 1, 1969		Tp. 83, R. 16, W. of 6th M.	6, 7, 10	3	Champlin Two Rivers 10-5-83-16, gas Champlin et al Two Rivers 6-9-83-16, gas	7 6, 10
Weasel	Apr. 1, 1966	Apr. 1, 1967	N.T.S. 94-H-2, 94-A-15	6, 10	23	Tenn Ashland Weasel d-35-B, oil Sinclair Pacific Weasel d-93-J, gas Pacific Sinclair Weasel d-50-A, gas	10 6 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 Tenn Wildmint d-4-A, gas	10 10
Willow	July 1, 1963	Apr. 1, 1970	N.T.S. 94-H-2	2, 10	4	Union HB Willow b-10-H, gas Union HB Willow d-20-H, oil	10 2
Wolf	Apr. 1, 1967		N.T.S. 94-H-15	10	5	Baysel Sinclair Wolf d-93-B, oil Baysel Sinclair Wolf d-3-G, gas	10 10
Yoyo	Apr. 1, 1965	Jan. 1, 1967 Jan. 1, 1968 Oct. 1, 1970	N.T.S. 94-I-13, 94-I-14	14, 15	13	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 sandstone.
9. Triassic Boundary Lake carbonate.
10. Triassic Halfway sandstone.
11. Permian Belloy carbonate.
12. Debolt carbonate.
13. Upper Devonian Wabamun carbonate.
14. Middle Devonian Slave Point carbonate.
15. Middle Devonian Pine Point carbonate.

TABLE 23—NUMBER OF CAPABLE AND OPERATING WELLS AT DECEMBER 31, 1970[1]

Field and Pool	Oil Wells		Gas Wells	
	Capable	Operating	Capable	Operating
Airport field—				
Cadomin	.....	.....	1	.....
Baldonnel	.....	.....	1	.....
Halfway	.....	.....	1	.....
Field totals	.....	.....	3	.....
Aitken Creek field—Gething	5	4	3	3
Bear Flat field—Charlie Lake	2	2	.....	.....
Beatton River field—Halfway	11	9	1	.....
Beatton River West field—Bluesky-Gething	14	10	.....	.....
Beaverdam field—Halfway	1	.....	2	.....
Beavertail field—				
Bluesky-Gething	.....	.....	3	2
Halfway	.....	.....	1	.....
Field totals	.....	.....	4	2
Beg field—				
Baldonnel	.....	.....	14	9
Halfway	.....	.....	16	21
Field totals	.....	.....	30	21
Beg West field—Baldonnel	.....	.....	3	.....
Bernadet field—Bluesky-Gething	.....	.....	1	.....
Blueberry field—				
Dunlevy	.....	.....	7	4
Baldonnel	.....	.....	3	1
Charlie Lake	.....	.....	2	.....
Halfway	.....	.....	1	.....
Debolt	20	19	.....	.....
Field totals	20	19	13	5
Blueberry East field—				
Baldonnel	.....	.....	1	.....
Debolt	.....	.....	1	.....
Field totals	.....	.....	2	.....
Blueberry West field—				
Dunlevy	.....	.....	2	2
Baldonnel	.....	.....	3	.....
Field totals	.....	.....	5	2
Boundary Lake field—				
Bluesky-Gething	.....	.....	2	.....
Gething	.....	.....	2	1
Cadomin	1	.....	.....	.....
Dunlevy	.....	.....	1	.....
Baldonnel	.....	.....	6	3
Boundary Lake	272	258	1	.....
Basal Boundary	.....	.....	1	1
Halfway	6	2	2	.....
Field totals	279	260	15	5
Boundary Lake North field—Halfway	.....	.....	4	2
Bubbles field—Baldonnel	.....	.....	11	7
Buick Creek field—				
Bluesky-Gething	.....	.....	3	1
Dunlevy	2	1	25	21
Charlie Lake	.....	.....	1	.....
Field totals	2	1	29	22
Buick Creek North field—				
Bluesky-Gething	.....	.....	2	1
Dunlevy	.....	.....	6	3
Field totals	.....	.....	8	4
Buick Creek West field—				
Dunlevy	2	.....	9	7
Baldonnel	.....	.....	2	1
Halfway	.....	.....	1	.....
Field totals	2	.....	12	8
Bulrush field—Halfway	4	3	.....	.....
Bulrush East field—Halfway	1	.....	.....	.....

[1] Each zone of a multiple completion is counted as a well.

TABLE 23—NUMBER OF CAPABLE AND OPERATING WELLS AT DECEMBER 31, 1970[1]—*Continued*

Field and Pool	Oil Wells		Gas Wells	
	Capable	Operating	Capable	Operating
Cabin field—Slave Point	.....	.....	3	.....
Charlie Lake field—Gething	1	.....	.....	.....
Clarke Lake field—Slave Point	.....	.....	28	18
Clarke Lake South field—Slave Point	.....	.....	2	.....
Crush field—Halfway	9	8	1	.....
Currant field—Halfway	5	4	4	.....
Dawson Creek field—				
Dunvegan	.....	.....	1	.....
Cadotte	.....	.....	1	.....
Field totals	.....	.....	2	.....
Farrell Creek field—				
Charlie Lake	.....	.....	2	1
Halfway	.....	.....	3	1
Field totals	.....	.....	5	2
Fort St. John field—				
Cadomin	.....	.....	2	.....
Baldonnel	.....	.....	12	8
Charlie Lake	4	4	1	.....
Halfway	.....	.....	8	5
Belloy	1	.....	2	2
Field totals	5	4	25	15
Fort St. John Southeast field—				
Cadomin	.....	.....	1	.....
Baldonnel	.....	.....	2	2
Charlie Lake	.....	.....	2	.....
Halfway	.....	.....	5	2
Belloy	.....	.....	5	3
Field totals	.....	.....	15	7
Gundy Creek field—				
Baldonnel	.....	.....	4	.....
Charlie Lake	.....	.....	1	.....
Field totals	.....	.....	5	.....
Halfway field—				
Baldonnel	.....	.....	2	.....
Charlie Lake	1	.....	1	.....
Field totals	1	.....	3	.....
Highway field—				
Dunlevy	.....	.....	1	.....
Baldonnel	.....	.....	4	.....
Debolt	.....	.....	1	.....
Field totals	.....	.....	6	.....
Inga field—				
Baldonnel	1	.....	3	3
Inga	64	58	5	.....
Charlie Lake	1	.....	.....	.....
Field totals	66	58	8	3
Jedney field—				
Gething	.....	.....	1	.....
Baldonnel	.....	.....	20	16
Halfway	.....	.....	23	19
Field totals	.....	.....	44	35
Jedney West field—				
Baldonnel	.....	.....	1	.....
Halfway	.....	.....	2	.....
Field totals	.....	.....	3	.....
Kobes-Townsend field—				
Dunlevy	.....	.....	3	2
Charlie Lake	.....	.....	6	4
Halfway	.....	.....	2	2
Debolt	.....	.....	2	1
Field totals	.....	.....	13	9
Kotcho Lake field—Slave Point	.....	.....	6	2

[1] Each zone of a multiple completion is counted as a well.

TABLE 23—NUMBER OF CAPABLE AND OPERATING WELLS AT DECEMBER 31, 1970[1]—*Continued*

Field and Pool	Oil Wells		Gas Wells	
	Capable	Operating	Capable	Operating
LaGarde field—				
Dunlevy	.....	.....	1	.....
Boundary Lake	.....	.....	1	.....
Field totals	.....	.....	2	.....
Laprise Creek field—Baldonnel	.....	.....	40	31
Laprise Creek West field—Baldonnel	.....	.....	2	.....
Milligan Creek field—				
Bluesky-Gething	.....	.....	3	.....
Halfway	26	21	1	.....
Field totals	26	21	4	.....
Moberly Lake field—Charlie Lake	2	2	.....	.....
Montney field—				
Bluesky-Gething	.....	.....	1	.....
Charlie Lake	.....	.....	1	.....
Halfway	.....	.....	2	.....
Field totals	.....	.....	4	.....
Nettle field—				
Bluesky-Gething	3	.....	1	.....
Halfway	.....	.....	1	.....
Field totals	3	.....	2	.....
Nig Creek field—Baldonnel	1	1	30	21
North Pine field—Charlie Lake	1	1	2	1
Osprey field—Halfway	3	1	1	.....
Parkland field—Wabamun	.....	.....	2	1
Peejay field—Halfway	98	82	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—				
Bluesky-Gething	.....	.....	3	.....
Dunlevy	8	3	48	26
Field totals	8	3	51	26
Sierra field—Pine Point	.....	.....	2	.....
Stoddart field—				
Charlie Lake	1	1	.....	.....
Belloy	3	3	16	14
Field totals	4	4	16	14
Stoddart West field—Belloy	.....	.....	5	2
Sunrise field—Cadotte	.....	.....	8	1
Two Rivers field—				
Baldonnel	.....	.....	1	.....
Charlie Lake	.....	.....	1	1
Halfway	.....	.....	1	1
Field totals	.....	.....	3	2
Weasel field—				
Baldonnel	.....	.....	1	1
Halfway	20	14	2	.....
Field totals	20	14	3	1
Wildmint field—Halfway	26	10	2	.....
Willow field—				
Bluesky-Gething	1	1	1	.....
Halfway	.....	.....	2	1
Field totals	1	1	3	1
Wolf field—Halfway	4	3	1	.....
Yoyo field—Pine Point	.....	.....	13	8
Other areas—				
Cadotte	.....	.....	3	.....
Notikewin	.....	.....	1	.....

[1] Each zone of a multiple completion is counted as a well.

TABLE 23—NUMBER OF CAPABLE AND OPERATING WELLS AT DECEMBER 31, 1970[1]—*Continued*

Field and Pool	Oil Wells		Gas Wells	
	Capable	Operating	Capable	Operating
Bluesky-Gething	3	.....	17	.....
Gething	.....	.....	3	.....
Dunlevy	.....	.....	10	.....
Baldonnel	.....	.....	35	.....
Inga	3	3	4	.....
Charlie Lake	.....	.....	12	.....
Halfway	3	.....	39	1
Permo-Carboniferous	.....	.....	4	.....
Belloy	3	1	11	.....
Kiskatinaw	.....	.....	1	.....
Debolt	.....	.....	10	.....
Banff	.....	.....	2	.....
Slave Point-Sulphur Point	.....	.....	1	.....
Slave Point	.....	.....	30	.....
Sulphur Point	.....	.....	1	.....
Pine Point	.....	.....	5	.....
Nahanni	.....	.....	4	.....
Confidential	1	.....	8	.....
Areas totals	13	4	201	1
Totals	640	529	725	282

[1] Each zone of a multiple completion is counted as a well.

TABLE 24—MONTHLY CRUDE-OIL PRODUCTION BY FIELDS AND POOLS, 1970

(Quantities in barrels.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Aitken Creek—													
Gething	34,850	30,274	29,122	30,650	34,845	33,681	36,416	35,249	25,856	26,427	27,804	37,045	382,219
Gething[1]	2,974	2,208	3,144	3,103	2,093	2,998	3,023	2,666	773	2,870	2,889	2,991	31,732
Field totals	37,824	32,482	32,266	33,753	36,938	36,679	39,439	37,915	26,629	29,297	30,693	40,036	413,951
Bear Flat—Charlie Lake	5,331	2,164	3,740	.....	5,516	3,343	2,737	2,639	2,953	3,527	5,966	5,689	43,605
Beatton River—Halfway	47,186	49,507	49,585	51,561	50,987	40,763	50,462	47,464	43,457	46,120	35,360	45,032	557,484
Beatton River West—Bluesky-Gething	15,113	14,861	19,182	17,580	17,418	15,119	18,854	16,445	12,044	9,559	14,449	16,097	186,721
Blueberry—													
Dunlevy[1]	25	25	23	23	24	25	21	25	.....	22	22	23	258
Debolt	53,212	49,856	55,749	48,798	55,363	53,608	55,564	53,701	21,335	37,892	64,105	52,607	601,790
Field totals	53,237	49,881	55,772	48,821	55,387	53,633	55,585	53,726	21,335	37,914	64,127	52,630	602,048
Boundary Lake—													
Baldonnel[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	317	125	98	540
Boundary Lake	784,951	722,407	804,156	784,418	802,919	762,962	791,055	789,263	766,140	787,088	759,279	773,359	9,327,997
Halfway	5,339	4,088	6,511	7,534	7,638	6,788	7,919	6,849	5,276	7,725	6,442	3,847	75,956
Field totals	790,290	726,495	810,667	791,952	810,557	769,750	798,974	796,112	771,416	795,130	765,846	777,304	9,404,493
Boundary Lake North—Halfway[1]	688	1,522	1,373	1,270	1,926	2,025	1,786	1,212	1,231	1,677	1,355	1,107	17,172
Buick Creek—													
Dunlevy[1]	1925	1,559	1,705	800	1,232	1,293	519	334	731	1,632	1,480	1,446	14,656
Dunlevy	1,032	1,051	1,007	65	821	1,022	1,016	972	620	936	909	895	10,346
Field totals	2,957	2,610	2,712	865	2,053	2,315	1,535	1,306	1,351	2,568	2,389	2,341	25,002
Bulrush—Halfway	7,300	5,597	6,154	6,014	6,553	5,316	4,667	6,529	5,530	6,100	4,623	6,405	70,788
Crush—Halfway	21,248	19,965	23,190	24,092	20,821	20,272	26,033	20,433	21,537	17,306	14,493	20,046	249,436
Currant—Halfway	20,799	19,796	23,041	21,300	21,055	11,944	11,039	23,045	19,627	13,025	14,263	19,141	218,075
Fort St. John—Charlie Lake	1,913	1,752	1,938	2,037	2,177	1,935	929	102	1,067	595	1,255	1,322	17,022
Inga—Inga	246,766	200,833	179,584	172,245	180,322	178,694	185,143	180,162	226,387	263,780	222,211	268,474	2,504,601
La Garde—Boundary Lake[1]	.....	.....	.....	.....	177	126	152	135	38	.....	.....	.....	628
Milligan—Halfway	319,868	281,043	326,731	354,605	357,279	340,946	369,110	359,013	319,723	323,532	282,214	278,734	3,912,798
Moberly Lake—Charlie Lake	466	597	1,374	887	320	731	1,215	391	950	906	852	465	9,154
Nig Creek—Baldonnel	1,333	1,007	1,499	276	1,304	1,340	1,035	1,455	713	1,198	1,135	1,137	13,432
North Pine—Charlie Lake	512	507	628	273	591	618	611	569	559	350	550	536	6,304
Osprey—Halfway	1,401	1,462	1,629	1,562	1,601	1,627	534	196	668	1,378	1,420	1,573	15,051
Peejay—Halfway	469,519	430,975	464,660	436,117	439,438	415,184	424,387	409,436	401,335	396,075	385,055	425,398	5,097,579
Rigel—Dunlevy	2,945	4,031	4,186	407	4,255	3,752	3,970	4,728	4,333	4,177	4,096	3,770	44,650

[1] Condensate.

TABLE 24—MONTHLY CRUDE-OIL PRODUCTION BY FIELDS AND POOLS, 1970—*Continued*

(Quantities in barrels.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Stoddart—													
Charlie Lake	2,331	86	2,420	.....	2,430	2,093	2,007	2,055	1,466	1,200	615	1,185	17,888
Belloy	2,201	2,167	2,449	690	1,433	2,895	2,733	2,653	2,597	2,569	2,280	2,514	27,181
Belloy[1]	145	678	456	69	747	262	.....	.....	.....	.....	.....	.....	2,357
Field totals	4,677	2,931	5,325	759	4,610	5,250	4,740	4,708	4,063	3,769	2,895	3,699	47,426
Stoddart West—Belloy[1]	.....	2,021	3,891	3,516	3,350	3,346	2,165	3,463	3,438	4,034	3,709	3,429	36,362
Two Rivers—Charlie Lake[1]	1,798	1,810	1,926	758	877	1,554	629	.....	.....	926	1,489	1,165	12,932
Weasel—Halfway	117459	87,289	98,388	96,715	102,296	95,860	112,542	102,970	92,722	100,113	88,482	103,177	1,198,013
Wildmint—Halfway	74,911	66,286	70,475	56,843	46,064	36,335	43,090	50,860	75,959	51,878	67,255	40,787	680,743
Willow—Bluesky-Gething	2,455	2,327	2,091	1,625	1,751	1,798	2,170	2,497	2,804	3,181	2,595	2,633	27,927
Wolf—Halfway	3,635	5,184	5,034	4,559	4,964	4,742	4,974	4,752	3,763	3,103	4,070	3,360	52,140
Other areas—													
Bluesky-Gething	.....	419	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	455
Inga	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,199	1,171	3,682	7,052
Belloy	118	.....	.....	.....	.....	.....	.....	.....	.....	1,097	1,419	2,295	4,929
Field totals	118	419	36	.....	.....	.....	.....	.....	.....	3,296	2,590	5,977	12,436
Totals—													
Crude	2,244,194	2,005,531	2,184,559	2,120,853	2,170,161	2,043,368	2,160,212	2,124,428	2,059,421	2,113,036	2,014,368	2,121,205	25,361,336
Field condensate	7,555	9,823	12,518	9,539	10,426	11,629	8,295	7,835	6,211	11,478	11,069	10,259	116,637
Total crude and equivalent	2,251,749	2,015,354	2,197,077	2,130,392	2,180,587	2,054,997	2,168,507	2,132,263	2,065,632	2,124,514	2,025,437	2,131,464	25,477,973

[1] Condensate.

TABLE 25—MONTHLY NATURAL GAS PRODUCTION BY FIELDS AND POOLS, 1970

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Airport—Cadomin	503				5,310	8,060	7,525	5,119	9,411	11,000	6,119		53,047
Aitken Creek—Gething	341,393	271,885	344,935	325,538	240,255	293,634	359,701	286,216	104,282	331,557	330,174	289,999	3,519,569
Beavertail—Bluesky-Gething												42,141	42,141
Beg—													
Baldonnel	377,860	350,492	391,450	288,105	108,585	179,182	266,638	369,083	339,709	343,531	306,467	201,847	3,522,949
Halfway	494,146	445,876	502,048	377,751	216,988	264,508	386,734	477,805	381,579	453,764	400,003	358,968	4,760,170
Field total													8,283,119
Beg West—Baldonnel	12,978	9,667	9,064	3,977									35,686
Bernadet—Bluesky-Gething	3,525	2,887	3,856	1,075	1,901	3,161	3,246	2,908		1,344	783		24,686
Blueberry—													
Dunlevy	78,307	73,415	87,104	78,811	79,490	83,821	85,890	78,554	48,771	78,895	83,880	82,017	938,955
Baldonnel	13,828	12,122	13,342	12,355	12,746	10,432	13,338	11,794	12,599	13,417	12,895	13,488	152,356
Field total													1,091,311
Blueberry West—Dunlevy	8,343	7,520	8,254	7,478	7,635	8,219	9,116	10,317	9,766	8,873	10,064	9,600	105,185
Boundary Lake—													
Gething	58,057	51,203	53,977	55,378	50,970	58,748	51,797	50,719	21,052	42,231	49,050	44,202	587,384
Baldonnel	153,320	141,739	142,923	142,154	126,619	64,764	142,582	128,446	73,473	122,033	97,817	109,079	1,444,949
Boundary Lake	5,949	5,983	8,144						1,985	64			22,125
Basal Boundary	22,242	20,135	21,476	21,112	20,686	20,811	21,037	20,461	10,062	18,921	18,791	19,611	235,345
Field total													2,289,803
Boundary Lake North—Halfway	428,399	379,580	355,485	473,688	480,142	492,089	462,590	318,591	306,263	448,971	392,992	375,492	4,914,282
Bubbles—Baldonnel	515,747	451,222	486,078	460,416	387,789	354,797	499,511	397,088	403,091	409,140	428,703	443,272	5,236,854
Buick Creek—													
Bluesky-Gething	16,368	14,801	13,642	14,124	13,321	17,601	19,228	18,030	11,747	18,976	15,906	13,312	187,056
Dunlevy	1,021,040	913,144	980,852	928,815	757,135	692,880	570,526	668,944	830,601	1,117,164	1,012,612	1,032,910	10,526,623
Field total													10,713,679
Buick Creek North—													
Bluesky-Gething		5,765	22,943	18,997	11,796	51,511	31,530	59,587	23,843	44,652	75,139	72,232	417,995
Dunlevy	143,472	121,157	132,886	119,156	43,360	106,336	100,666	103,177	67,701	132,552	127,664	155,857	1,353,984
Field total													1,771,979
Buick Creek West—													
Dunlevy	306,221	218,331	262,595	237,460	214,806	141,729	75,986	250,590	179,210	170,015	230,490	200,065	2,487,498
Baldonnel	2,328			7,596	6,187	20,137	13,173	21,978	14,080	13,898	10,077	12,242	121,696
Field total													2,609,194
Clarke Lake—Slave Point	10,458,531	9,342,203	9,788,375	8,621,590	6,917,941	4,528,051	5,965,106	7,055,908	9,340,807	10,503,776	10,430,757	11,325,342	104,278,387
Farrell Creek—													
Charlie Lake	54,040	47,054	59,919	31,361	7,402	49,347	46,771	21,765		48,587	39,269	33,225	438,740
Halfway	46,416	45,354	41,819	18,208	4,473	37,310	48,280	34,210	8,069	51,550	54,826	51,470	441,985
Field total													880,725

TABLE 25—MONTHLY NATURAL GAS PRODUCTION BY FIELDS AND POOLS, 1970—*Continued*

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Fort St. John—													
Baldonnel	281,149	121,159	209,805	247,668	257,738	272,806	246,339	158,152	240,660	283,409	220,530	220,936	2,760,351
Halfway	149,416	92,998	115,445	130,972	153,996	146,497	120,313	135,678	140,965	158,687	147,722	111,790	1,604,479
Belloy	27,625	13,473	29,891	41,238	26,715	29,363	29,397	12,469	35,292	38,104	34,057	31,978	349,602
Field total													4,714,432
Fort St. John Southeast—													
Baldonnel	70,265	63,160	71,450	66,291	8,489	49,611	68,060	66,232	73,962	58,136	61,088	65,408	722,152
Halfway	72,299	66,758	71,891	67,174	8,040	47,092	70,649	67,231	65,098	55,476	62,809	82,334	736,851
Belloy	159,224	152,087	213,304	164,291	18,475	106,620	152,757	146,341	150,978	130,866	144,919	158,924	1,698,786
Field total													3,157,789
Halfway—Baldonnel	926									8,932	7,830		17,688
Highway—Dunlevy	13,820	8,696	13,535	11,894	10,951	2,340		2,396					63,632
Inga—Baldonnel	159,971	149,534	152,869	139,753	119,423	117,668	105,053	100,457	85,212	76,648	74,427	61,906	1,342,921
Jedney—													
Baldonnel	926,337	808,272	927,251	804,213	738,618	749,282	763,273	133,860	595,611	802,074	859,386	902,958	9,011,135
Halfway	887,329	808,076	901,235	691,759	670,513	718,438	743,469	141,354	402,698	688,741	794,440	851,921	8,299,973
Field total													17,311,108
Kobes-Townsend—													
Dunlevy	42,736	66,821	73,943	68,223	32,588	68,729	39,814	53,903	59,588	47,025	38,547	25,100	617,017
Charlie Lake	140,492	118,885	137,214	100,687	43,433	227,246	49,213	37,157	37,064	73,667	65,040	51,200	1,081,298
Halfway	328,909	293,268	320,249	296,392	261,820	137,642	233,996	172,770	163,908	270,486	288,923	300,972	3,069,335
Debolt	62,467	51,023	58,739	35,885		21,286	75,756	88,670	66,955	94,640	66,714	73,283	695,418
Field total													5,463,068
Kotcho Lake—Slave Point	891,639	486,287	530,374	473,739	583,514	472,420	261,057	358,795	19,086		212,138	373,705	4,662,754
La Garde—													
Dunlevy	3,093	53,891	46,165	45,619	20,233	20,403	16,330	15,405	10,695	2,022			233,856
Boundary Lake	154,676	99,709	59,161	48,827	47,900	34,588	38,052	34,345	2,831	2,460			522,549
Field total													756,405
Laprise Creek—Baldonnel	2,643,748	2,315,411	2,414,963	2,172,830	1,901,642	1,413,534	1,965,890	1,825,762	2,042,797	2,207,055	2,552,394	2,452,089	25,908,115
Milligan—Bluesky-Gething	4,277	3,353	4,647	5,396	5,012	2,456	5,592	1,905			1,628		34,266
Montney—Halfway						1,316	424						1,740
Nig Creek—Baldonnel	1,423,137	1,291,520	1,462,754	1,383,892	1,314,038	1,452,201	1,325,294	1,293,352	1,215,589	1,347,896	1,345,508	1,694,861	16,550,042
North Pine—Charlie Lake	67,734	3,485	7,697	65,026	76,492	69,387	66,321	37,109	34,032	55,396	52,642	73,842	609,163
Parkland—Wabamun	411,172	413,935	437,421	432,956	432,731	181,908	337,307	409,074	265,040	388,509	259,226	515,165	4,484,444
Rigel—Dunlevy	1,347,171	1,098,666	1,177,370	1,231,176	1,096,187	1,421,384	1,230,243	1,438,172	1,377,203	1,698,685	1,516,152	1,845,820	16,478,229
Sierra—Pine Point	611,036	553,862	690,144	1,417,808	1,164,951	415,083	584,120	974,647	1,064,625	590,918	813,151	1,006,111	9,886,456
Stoddart—Belloy	966,653	935,862	1,001,496	930,282	1,068,614	1,071,962	806,818	817,324	994,172	1,293,293	1,247,300	1,214,377	12,348,153
Stoddart West—Belloy		80,604	144,406	133,645	140,645	138,674	82,866	169,957	180,701	206,673	191,993	169,988	1,640,152
Sunrise—Cadotte	5,762	2,527	11,487	26,041	24,965	18,587	5,738	45	11		17,322	17,995	130,480

Two Rivers—													
Charlie Lake	55,951	49,529	64,382	26,011	33,533	56,787	30,876			45,144	59,434	59,142	480,789
Halfway	96,082	115,316	147,679	116,082	36,133		66,169			69,796	99,080	98,139	844,476
Field total													1,325,265
Weasel—Baldonnel	2,395	2,247	1,977	1,321	1,541	1,891	2,251	1,555	444	1,588	2,080	2,341	21,631
Willow—Halfway				148,399	210,084	152,581	192,777	255,308	238,206	345,800	268,822	372,192	2,184,169
Yoyo—Pine Point	4,532,693	3,888,387	4,326,385	4,032,197	3,994,423	3,254,303	2,152,022	3,181,936	4,046,897	4,660,067	4,832,947	5,162,241	48,064,498
Other areas—													
Baldonnel	2,313								44,000				46,313
Halfway									59,900	2,780	65,309	109,415	237,404
Nahanni						104,700		536,480					641,180
Field total													924,897
Totals	31,105,510	27,140,336	29,556,496	27,802,832	24,218,974	20,465,913	21,049,207	23,059,131	25,912,321	30,089,884	30,538,036	32,992,504	323,931,144

TABLE 26—SUMMARY OF DRILLING AND PRODUCTION STATISTICS, 1970

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Well authorizations—													
Issued	42	31	26	3	6	9	25	6	7	18	10	48	231
Cancelled	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*
Wells spudded	34	32	14	*Nil*	3	9	17	7	8	19	12	31	186
Rigs operated during month	38	35	23	8	3	8	17	15	9	23	20	27	491
Rigs operating at month's end	27	20	7	*Nil*	1	3	8	2	6	15	9	23	.....
Development footage	37,300	29,406	38,736	27,769	7,578	18,464	49,085	36,442	18,915	30,481	45,788	42,533	382,497
Exploratory outpost footage	43,877	55,767	38,779	7,251	*Nil*	5,364	8,898	8,960	*Nil*	15,895	23,387	15,523	223,701
Exploratory wildcat footage	56,555	82,846	47,137	25,943	*Nil*	3,755	*Nil*	18,643	*Nil*	8,054	30,440	24,097	297,470
Total footage drilled	137,732	168,019	124,652	60,963	7,578	27,583	57,983	64,045	18,915	54,430	99,615	82,153	903,668
Wells abandoned	17	19	14	5	*Nil*	1	4	10	1	4	7	8	90
Service wells	*Nil*	*Nil*	1	*Nil*	*Nil*	1	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	2
Finished drilling wells	*Nil*	1	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	1
Oil wells completed	2	4	2	*Nil*	2	2	5	3	3	3	2	6	34
Capable oil wells	619	621	628	626	627	629	632	632	632	638	637	640	.....
Operating oil wells	514	525	522	508	517	519	515	519	522	530	527	529	.....
Production in barrels	2,244,194	2,005,531	2,184,559	2,120,853	2,170,161	2,043,368	2,160,212	2,124,428	2,059,421	2,113,036	2,014,368	2,121,205	25,361,336
Average daily production	72,393	71,626	70,470	70,695	70,005	68,112	69,684	68,530	68,647	68,162	67,146	68,426	69,483
Gas wells completed	11	6	10	2	*Nil*	3	2	2	*Nil*	4	10	3	53
Capable gas wells	688	696	707	706	707	707	709	710	709	710	716	725	.....
Operating gas wells	289	284	283	279	283	274	286	255	274	298	298	282	.....
Production in M scf	31,105,510	27,140,336	29,556,496	27,802,832	24,218,974	20,465,913	21,049,207	23,059,131	25,912,321	30,089,884	30,538,036	32,992,504	323,931,144
Average daily production	1,003,404	969,298	953,435	926,761	781,257	682,197	679,007	743,843	863,744	970,641	1,017,934	1,064,274	887,483

[1] Rig operated during 1970.

NOTE—Each zone of a multiple completion is counted as one well.

TABLE 27—MONTHLY SUPPLY AND DISPOSITION OF CRUDE OIL AND CONDENSATE/PENTANES PLUS, 1970

(Quantities in barrels.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Available Supply													
British Columbia production—													
Crude	2,244,194	2,005,531	2,184,559	2,120,853	2,170,161	2,043,368	2,160,212	2,124,428	2,059,421	2,113,036	2,014,368	2,121,205	25,361,336
Field condensate	7,555	9,823	12,518	9,539	10,426	11,629	8,295	7,835	6,211	11,478	11,069	10,259	116,637
Plant condensate	100,246	87,648	93,525	85,834	80,293	77,162	76,976	65,690	75,288	87,371	74,458	98,647	1,003,138
Alberta imports—crude and equivalent	9,015,874	7,025,169	6,787,675	7,006,207	6,906,701	7,913,249	8,677,301	8,616,370	9,183,008	7,981,908	8,546,025	9,115,537	96,775,024
Totals	11,367,869	9,128,171	9,078,277	9,222,433	9,167,581	10,045,408	10,922,784	10,814,323	11,323,928	10,193,793	10,645,920	11,345,648	123,256,135
Disposition													
Inventory change—													
Field	6,235	—236	4,272	5,803	—1,519	3,860	—19,206	—1,119	3,913	—4,949	12,440	—10,967	—1,473
Plant	—4,746	—5,548	—2,707	211	46,796	—41,524	6,561	—2,821	11,737	18,313	—12,901	575	13,946
British Columbia transporters	742,934	—435,510	289,284	—474,160	—140,215	—160,167	268,225	—280,404	378,238	—81,813	—322,404	217,429	1,437
Miscellaneous—													
Plant fuel													
Pipe-line use	7,147	8,213	1,908	3,526	1,470	7,914	5,739	7,933	8,411	10,172	24,040	5,917	92,390
Field losses and adjustments	—5,432	—615	272	—165	—5	—70	127	650	—3,489	12,230	348	4,708	8,559
Plant losses and adjustments	—7,826	—4,581	—3,956	—4,310	—4,132	—3,724	—5,067	—6,316	—13,943		—44		—53,899
Transporters' losses and adjustments	27,025	1,882	19,797	23,519	—11,114	304	13,915	3,349	12,328	1,981	—20,839	39,996	112,143
Deliveries—													
British Columbia refineries—													
British Columbia crude	1,819,608	1,821,273	1,682,820	2,095,937	2,215,790	1,985,218	1,746,376	2,090,301	1,848,018	1,688,679	1,872,584	2,063,111	22,929,715
Alberta crude	1,696,700	1,319,253	1,115,270	1,473,772	1,670,717	1,616,781	2,075,738	1,726,727	1,702,604	1,977,188	1,757,142	2,102,696	20,234,588
British Columbia condensate	41,482	37,884	36,587	27,625		83,977	42,998	42,133	39,723	40,697	57,071	52,051	502,228
Export to United States—													
British Columbia crude	354,701	251,162	355,979	255,474	305,954	313,483	299,099	341,552	201,831	322,389	368,709	108,659	3,478,492
Alberta crude	6,638,528	6,097,068	5,568,529	5,827,726	5,100,845	6,408,109	6,469,527	6,880,839	7,102,620	6,091,223	6,860,822	6,747,236	75,793,072
British Columbia condensate	67,861	56,018	59,160	58,198	33,120	34,353	27,982	27,848	33,040	36,308	45,258	34,701	513,847
Field sales	6,219	1,222	545	46		—336		279	2,565	1,346	21	120	12,027
Reporting adjustments	—22,567	—19,314	—49,483	—70,769	—50,126	—202,770	—9,230	—16,628	—3,168	80,029	3,673	—20,584	—380,937
Totals	11,367,869	9,128,171	9,078,277	9,222,433	9,167,581	10,045,408	10,922,784	10,814,323	11,323,928	10,193,793	10,645,920	11,345,648	123,256,135
British Columbia Refineries													
Receipts—													
British Columbia crude	1,853,951	1,847,158	1,682,820	2,095,937	2,215,790	1,985,218	1,746,376	2,090,301	1,848,018	1,688,679	1,872,584	2,063,141	22,989,973
Alberta crude	1,696,700	1,319,253	1,115,270	1,473,772	1,670,717	1,616,781	2,075,738	1,726,727	1,702,604	1,977,188	1,757,142	2,102,696	20,358,711
British Columbia condensate	41,482	37,884	36,587	27,625		83,977	42,998	42,133	39,723	40,697	57,071	52,051	502,228
Alberta condensate	9,537	9,919	10,387	1,472	8,315	10,713	10,643	11,140	8,444	11,796	7,912	6,512	106,790
British Columbia butane	21,777	17,143	9,064	5,182	3,904	2,024	4,499	4,964	2,801	165			71,523
Alberta butane	12,267								8,107	12,101	6,602	10,082	49,159
Totals	3,635,714	3,231,357	2,854,128	3,603,988	3,898,726	3,698,713	3,880,254	3,875,265	3,609,697	3,730,626	3,701,311	4,234,482	44,078,384

TABLE 27—MONTHLY SUPPLY AND DISPOSITION OF CRUDE OIL AND CONDENSATE/PENTANES PLUS, 1970—*Continued*

(Quantities in barrels.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Disposition													
Inventory changes	−37,984	169,163	−132,868	−40,990	49,460	−40,677	−40,654	146,763	−134,719	43,143	18,186	27,434	26,257
Losses and adjustments	249	67	−714	338	−1,549	−550	−1,720	−3,339	251	1,721	135	−1,744	−6,855
Refinery runs—													
British Columbia crude	1,772,202	1,486,756	1,536,425	2,175,221	2,492,270	2,003,878	1,783,465	1,968,353	1,934,783	1,723,654	1,878,877	2,072,455	22,828,339
Alberta crude	1,815,937	1,512,936	1,391,926	1,431,664	1,345,762	1,641,465	2,080,106	1,706,189	1,749,547	1,899,809	1,736,596	2,067,744	20,379,681
British Columbia condensate	41,482	37,884	36,587	27,625	.....	83,977	42,998	42,133	39,723	40,697	57,071	52,051	502,228
Alberta condensate	9,784	7,408	13,708	4,948	8,879	8,596	11,560	10,202	9,204	9,336	3,844	6,460	103,929
British Columbia butane	21,777	17,143	9,064	5,182	3,904	2,024	4,499	4,964	2,801	165	.....	.....	71,523
Alberta butane	12,267	.....	.....	.....	.....	.....	.....	.....	8,107	12,101	6,602	10,082	49,159
Total refinery runs	3,673,449	3,062,127	2,987,710	3,644,640	3,850,815	3,739,940	3,922,628	3,731,841	3,744,165	3,685,762	3,682,990	4,208,792	43,954,261

TABLE 28—MONTHLY SUPPLY AND DISPOSITION OF NATURAL GAS, 1970

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Available Supply													
British Columbia production—													
Wet gas	14,200,439	12,455,662	13,783,797	12,824,542	11,125,414	11,614,148	11,749,595	11,078,771	11,175,866	13,946,614	13,989,817	14,609,940	152,554,605
Dry gas	16,905,071	14,684,674	15,772,699	14,978,290	13,093,560	8,851,765	9,299,612	11,980,360	14,736,455	16,143,270	16,548,219	18,382,564	171,376,539
Associated gas	2,014,862	1,766,483	1,886,083	1,795,970	1,740,550	1,687,189	1,831,349	1,696,298	1,665,567	1,637,078	1,602,235	1,731,386	21,055,050
Less injected	691,046	559,041	669,061	612,778	385,029	427,981	535,885	375,790	215,313	402,778	371,250	392,411	5,638,371
Net British Columbia production	32,429,326	28,347,778	30,773,518	28,986,024	25,574,495	21,725,121	22,344,671	24,379,639	27,362,575	31,324,184	31,769,013	34,331,479	339,347,823
Alberta imports	34,446,284	31,023,223	33,613,056	32,830,135	29,881,239	28,829,889	29,966,167	28,545,746	31,656,725	30,913,018	32,974,066	37,089,035	381,768,583
Totals	66,875,610	59,371,001	64,386,574	61,816,159	55,455,734	50,555,010	52,310,838	52,925,385	59,019,300	62,237,202	64,743,079	71,420,514	721,116,406
Disposition													
Flared—													
Field	1,133,565	969,189	998,657	1,072,687	1,007,053	933,919	805,558	1,166,950	568,292	580,926	870,203	903,003	11,010,002
Plant—													
Residual gas	10,134	1,992	1,441	7,451	719	88	.....	.....	.....	.....	.....	.....	21,825
Natural gas	2,144,348	1,829,568	1,917,565	1,794,246	1,634,606	1,125,894	1,089,582	1,459,764	1,922,938	2,004,274	2,017,840	2,454,035	21,394,660
Gas gathering systems	34,225	9,843	8,229	1,600	1,174	4,420	7,190	740	948	20,930	4,590	1,822	95,711
Fuel—													
Lease	206,041	185,193	200,751	191,921	186,461	193,223	201,432	191,560	343,419	205,883	226,887	242,076	2,574,847
Plant	961,952	844,756	890,812	828,207	824,480	739,687	749,334	779,228	854,671	990,856	1,063,131	1,122,749	10,649,863
Transporters	2,293,781	1,924,788	2,035,376	1,805,327	1,347,752	1,025,194	1,157,533	1,228,329	1,866,523	2,158,537	2,147,867	2,288,923	21,279,930
Gas gathering systems	.....	.....	.....	.....	.....	.....	24	.....	.....	.....	.....	.....	24
Line pack changes—													
Gas gathering systems	.....	2,871	.....	.....	.....	—3,836	.....	—5,312	.....	.....	.....	.....	—6,277
Transporters	—28,095	—148,263	181,267	6,339	102,160	—69,021	55,654	—75,283	—100,158	147,397	—14,044	34,550	92,503
Losses and metering difference—													
Field	736,336	821,734	875,667	1,125,710	617,424	487,587	688,966	632,986	560,129	926,308	1,307,037	205,574	8,985,458
Gas gathering systems	—9,329	.....	9,667	—4,298	5,919	.....	479	.....	—959	645	—20,816	6,145	—12,547
Gas plants	502,839	41,441	642,097	210,138	597,196	444,389	420,719	293,522	236,118	585,834	39,489	1,391,502	5,405,282
Transporters	321,586	285,352	297,980	101,332	190,849	155,883	—164,389	167,416	112,253	117,818	327,266	79,713	1,993,059
Processing shrinkage	533,712	550,384	614,329	549,659	465,885	480,391	533,740	427,493	509,410	595,065	574,745	626,978	6,461,791
Deliveries—													
British Columbia distributors—													
Northern	1,310,503	1,090,493	1,154,545	1,032,375	696,305	204,517	404,663	928,162	911,593	1,121,584	1,310,372	1,466,133	11,631,245
Interior	2,946,997	2,322,371	2,399,749	2,011,487	1,637,058	1,349,321	1,282,458	987,934	1,470,418	2,279,175	2,731,808	3,061,173	24,479,949
Lower Mainland	6,482,489	5,250,242	5,364,764	4,781,875	3,624,400	2,299,176	3,336,286	4,768,377	6,653,185	6,979,340	7,211,017	7,469,999	64,221,150
Export—													
British Columbia natural gas	14,541,794	13,479,686	14,840,565	14,450,850	13,998,231	13,298,870	12,403,966	12,109,582	12,636,479	14,244,245	13,748,572	14,444,718	164,197,558
Alberta natural gas	32,735,124	29,656,736	32,043,073	31,690,705	28,765,153	27,896,213	29,309,941	27,807,506	30,438,390	29,284,177	31,291,214	35,519,178	366,427,410
Reporting adjustments	17,608	252,625	—89,960	168,548	—247,091	—10,903	27,702	56,431	35,651	—5,792	—94,099	102,243	212,963
Totals	66,875,610	59,371,001	64,386,574	61,816,159	55,455,734	50,555,010	52,310,838	52,925,385	59,019,300	62,237,202	64,743,079	71,420,514	721,116,406

TABLE 28—MONTHLY SUPPLY AND DISPOSITION OF NATURAL GAS, 1970—*Continued*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
British Columbia Distributors													
Receipts—													
Natural gas	10,556,704	8,660,734	8,896,340	7,825,344	5,957,470	3,852,880	5,023,170	6,683,942	9,034,108	10,379,606	11,171,424	11,996,906	100,038,628
LPG gas	98,876	78,606	82,411	70,747	57,680	47,855	46,716	45,509	53,146	69,949	83,826	108,742	844,063
Disposition													
Gas used in operations	28,065	19,763	14,967	23,224	11,009	15,905	11,129	8,613	11,546	20,727	19,096	27,901	211,945
Losses and adjustments	659,924	−1,042,930	55,237	−412,209	−940,592	−851,746	−185,837	120,597	810,646	1,664,596	1,749,005	1,671,544	3,298,235
Line pack changes	10,623	−14,624	−68	4,600	−14,109	−7,184	14,727	−602	−2,512	21,804	−17,052	−2,144	−6,541
Sales—													
Residential	3,648,027	3,722,936	2,981,614	2,773,257	2,193,976	1,404,728	847,196	703,392	834,663	1,389,366	2,296,828	3,513,405	26,309,388
Commercial	2,499,014	2,424,245	2,071,465	1,900,025	1,512,277	1,007,465	757,792	684,358	839,134	1,175,256	1,810,768	2,467,969	19,149,768
Industrial	3,511,099	3,376,885	3,797,218	3,536,122	3,143,903	2,289,177	2,476,655	1,998,235	3,117,812	3,848,876	3,915,002	4,117,498	39,128,482
Electric power	298,828	253,065	58,318	71,072	108,686	42,390	1,148,224	3,214,858	3,475,965	2,328,930	1,481,603	309,475	12,791,414
Miscellaneous													
Total sales	9,956,968	9,777,131	8,908,615	8,280,476	6,958,842	4,743,760	5,229,867	6,600,843	8,267,574	8,742,428	9,504,201	10,408,347	97,379,052
Value of sales to distributors	$7,628,981	$6,850,596	6,948,050	5,934,220	$4,963,375	$3,378,754	$3,152,034	$3,458,894	$4,759,000	$6,291,696	7,249,976	8,709,404	69,324,980

TABLE 29—MONTHLY PRODUCTION AND DISPOSITION OF BUTANE, PROPANE, AND SULPHUR, 1970

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Butane													
Production (bbl.)—													
Plant	26,813	27,911	18,814	13,382	20,459	13,386	21,324	11,353	27,485	42,907	37,930	46,900	308,664
Refinery	34,032	33,022	20,885	26,518	38,908	31,580	41,970	43,178	48,968	39,092	49,107	60,354	467,614
Opening inventory	9,504	11,035	14,845	14,062	12,705	16,952	17,926	15,738	13,279	12,218	13,765	15,233	9,504
Plant fuel	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gasoline enrichment	17,585	11,791	9,064	6,361	5,919	6,676	5,464	3,510	13,646	10,840	24,033	30,588	145,477
To refinery	.....	.....	8,522	5,200	3,904	2,094	4,500	4,900	2,800	200	.....	.....	32,120
Losses and adjustments	3,915	8,619	.....	.....	3,661	—94	101	100	9,944	5,383	2,950	1,558	36,137
Sales—													
British Columbia	34,466	27,773	23,396	27,694	39,567	33,247	54,227	39,475	49,710	62,569	57,633	76,825	526,582
Yukon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Export—U.S.A.	4,643	8,940	.....	2,002	2,069	2,069	1,190	9,005	1,414	1,460	945	1,822	32,459
Total Sales	39,109	36,713	23,396	29,696	41,636	35,316	55,417	48,480	51,124	64,029	58,578	78,647	562,141
Closing inventory	9,740	14,845	13,562	12,705	16,952	17,926	15,738	13,279	12,218	13,765	15,233	11,694	11,694
Propane													
Production (bbl.)—													
Plant	42,557	36,902	42,055	38,470	34,245	31,005	33,509	23,370	33,337	36,046	29,363	39,468	420,327
Refinery	41,221	24,965	12,522	22,611	20,194	17,426	19,392	22,609	31,837	33,876	33,763	39,549	319,965
Opening inventory	12,440	9,709	9,108	7,983	7,700	7,988	8,444	6,301	8,580	8,244	8,329	8,744	12,440
Plant fuel	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gasoline enrichment	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
To refinery	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Losses and adjustments	300	400	.....	.....	100	100	108	200	100	1,436	3,247	—21	5,970
Sales—													
British Columbia	77,989	54,586	48,303	61,164	14,497	23,965	42,568	20,779	48,382	42,261	48,042	69,315	551,851
Alberta	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Northwest Territories	207	.....	.....	.....	.....	.....	1,782	.....	.....	.....	.....	.....	1,989
Export—													
U.S.A.	.....	.....	.....	200	405	405	.....	.....	.....	.....	.....	.....	1,010
Off shore	6,718	7,412	7,399	.....	39,149	23,505	10,586	22,721	17,028	22,140	11,422	10,075	178,155
Total Sales	84,914	62,068	55,702	61,364	54,051	47,875	54,936	43,500	65,410	68,401	59,464	79,390	737,075
Closing Inventory	11,004	9,108	7,983	7,700	7,988	8,444	6,301	8,580	8,244	8,329	8,744	8,392	8,392
Sulphur													
Production (long tons)	5,372	4,711	5,505	4,747	3,739	4,587	4,844	3,550	4,298	5,238	5,191	5,172	56,954
Opening inventory	52,331	54,438	53,889	50,058	51,914	49,941	47,007	49,697	53,247	55,915	59,649	62,111	52,331
Losses and adjustments	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	777	778
Sales—													
British Columbia	341	599	491	502	415	905	.....	.....	.....	.....	.....	.....	3,253
Export	2,924	4,661	8,845	2,389	5,297	6,616	2,153	.....	1,630	1,504	2,729	878	39,626
Total sales	3,265	5,260	9,336	2,891	5,712	7,521	2,153	.....	1,630	1,504	2,729	878	42,879
Closing inventory	54,438	53,889	50,058	51,914	49,941	47,007	49,697	53,247	55,915	59,649	62,111	65,628	65,628

TABLE 30—MONTHLY GROSS VALUES OF CRUDE PETROLEUM, NATURAL GAS, LIQUIDS, AND SULPHUR TO PRODUCERS, 1970

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
	$	$	$	$	$	$	$	$	$	$	$	$	$
Crude petroleum	5,343,484	4,764,902	5,167,577	5,007,940	5,146,151	4,836,376	5,153,666	5,023,889	4,942,990	5,121,072	4,763,882	5,411,841	60,683,770
Natural gas	2,848,994	2,508,656	2,692,047	2,541,198	2,230,371	1,910,854	1,973,604	2,106,953	2,397,081	2,760,314	2,808,363	3,025,976	29,804,411
Products—													
Natural gas liquids[1]	46,697	43,003	37,671	43,001	40,597	45,841	41,835	32,610	41,922	35,908	37,117	40,084	486,268
Sulphur	1,819	1,570	1,610	1,359	905	1,069	393	.....	.....	.....	.....	.....	8,725
Total products	48,516	44,573	39,281	44,360	41,502	46,910	42,228	32,610	41,922	35,908	37,117	40,084	495,011
Total value	8,240,994	7,318,131	7,898,905	7,593,498	7,418,024	6,794,140	7,169,498	7,163,452	7,381,993	7,917,294	7,609,362	8,477,901	90,983,192

[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 5, 1971.

TABLE 31—CRUDE-OIL PIPE-LINES, 1970

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)				
Blueberry-Taylor Pipeline Co. (formerly British Columbia Oil Transmission)	Aitken Creek, Blueberry	12¾	2.2	...	.....	.....	.....	.....	.....
		8⅝	62.8	1	5,000	12,000	37.4	2,739	74,800
	Inga	6⅝	1.7	1	12,500	12,500	.....	7,124	1,000
Trans-Prairie pipelines (B.C.) Ltd.	Beatton River, Beatton River West, Boundary Lake, Bulrush, Currant, Milligan Creek, Osprey, Peejay, Weasel, Wildmint, Willow, Wolf	4½	45.6	1	36,000	52,000[1]	83.1	60,927	160,000
		6⅝	24.3	2	45,000	45,000[2]	.....	.....	.....
		8⅝	103.0	...	.....	.....	.....	.....	.....
		12¾	39.0	...	.....	.....	.....	.....	.....
Tenneco Oil & Minerals Ltd.	Inga	4½	8.7	1	2,400	2,400	8.7	2,300	500
Western Pacific Products and Crude Oil Pipelines Ltd.	.....	12	505.0	12	70,000	70,000	.....	62,367	586,000

[1] Boundary Lake.

[2] Terminal to Western Pacific Products and Crude Oil line.

TABLE 32—CRUDE OIL REFINERIES, 1970

Name	Location	Type	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, lub-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, merox.
Gulf Oil Canada Limited	Port Moody	Comp.	1958	B.C. and Alberta	30,000	1,625,000	Catalytic-fluid	8,480	Catalytic reformer, distillate, desulphurization, alkylation-sulphuric acid, naptha, desulphurization, merox.
Imperial Oil Enterprises Ltd.	Ioco	SCA	1915	B.C. and Alberta	33,000	2,942,000	Catalytic-fluid	11,700	Catalytic polymerization, powerformer, Toluene extraction LPG plant.
Pacific Petroleums Ltd.	Taylor	Comp.	1960	B.C.	10,400	895,264	Catalytic-fluid	3,500	H.F. alkylation, asphalt, pentane, splitter, platformer, unifiner, HDS unit, DDS unit.
Shell Canada Limited	Shellburn	Comp.	1932	B.C. and Alberta	20,500	2,455,300	Catalytic-fluid	6,000	Catalytic polymerization, platformer, vacuum flashing, solvent fractionation distillate hydrotreater.
Union Oil Company of Canada Limited	Prince George	SA	1967	B.C.	8,000	630,500			Unifiner, reformer, asphalt.

Symbols: SCA—skimming, cracking, and asphalt; Comp.—complete.

TABLE 33—NATURAL GAS PIPE-LINES, 1970

Company	Source of Natural Gas	Transmission-lines		Compressor-stations		Present Daily Capacity (MSCF)	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	....	.....	528,000	....	3,500.0	
		24	12.4	....	.....	.....	....	.....	
		20	44.5	....	.....	.....	....	.....	Lower Mainland of British Columbia.
		18	37.3	....	.....	.....	....	.....	
		16	18.5	....	.....	.....	....	.....	
		12	77.8	....	.....	.....	....	.....	
Columbia Natural Gas Ltd.	Alberta Natural Gas Co. Ltd.	8	38.4	....	.....	24,800	8	1.7	
		6	38.7	....	.....	.....	6	2.6	
		4	22.8	....	.....	.....	4	8.8	
		3	27.6	....	.....	.....	3	18.2	Cranbrook, Fernie, Kimberley, Creston, Sparwood.
		2	0.5	....	.....	.....	2	32.8	
		....	.....	....	.....	.....	1¼	40.0	
Gas Trunk Line of British Columbia Ltd.	Beg field	....	.....	1	1,000	.....	16	27.4	
							6⅝	5.7	To Westcoast Transmission Co. Ltd.
	Boundary Lake field	....	.....	....	.....	.....	16	31.4	
							6⅝	1.8	
	Jedney and Bubbles field	....	.....	4	4,960	.....	12¾	31.5	
							10¾	7.0	
	Laprise Creek field	....	.....	1	2,160	.....	12¾	23.8	
	Nig Creek	....	.....	1	1,800	.....	16	28.3	
Inland Natural Gas Co. Ltd.	Westcoast Transmission Co. Ltd.	12	152.8	1	1,100	78,600	8	12.4	
		10	119.1	....	.....	.....	6	22.9	
		8	20.6	....	.....	.....	4	120.4	MacKenzie, Hudson Hope, Chetwynd, Prince George, Cariboo, Okanagan, and West Kootenay areas.
		6	90.2	....	.....	.....	3	72.9	
		4	120.9	....	.....	.....	2	458.6	
		3	48.1	....	.....	.....	1½	20.8	
		2	57.2	....	.....	.....	1¼	103.5	
		1½	1.4	....	.....	.....	....	.....	
Northland Utilities (B.C.) Ltd.	Peace River Transmission	1¼	3.5	....	.....	10,900	....	57.2	Dawson Creek, Pouce Coupe, and Rolla.
		....	9.5	....	.....	.....	....	.....	
Pacific Northern Gas Ltd.	Westcoast Transmission Co. Ltd.	10¾	272.0	....	.....	.....	6	2.5	
		8⅝	86.9	....	.....	.....	4	8.5	Vanderhoof, Fraser Lake, Burns Lake, Smithers, Terrace, Prince Rupert, Kitimat, Houston, Fort St. James.
		6⅝	36.5	2	3,150	54,000	3	14.9	
		4½	11.0	....	.....	.....	2	22.6	
		3½	44.0	....	.....	.....	1¼	20.1	
		2⅞	20.8	....	.....	.....	¾	11.6	
Plains Western Gas & Electric Co. Ltd.	Westcoast Transmission Co. Ltd.	6	0.3	....	.....	.....	4	13.7	Fort St. John, Taylor, and Grandhaven.
		4	17.0	....	.....	.....	....	.....	
		3	5.7	....	.....	.....	2	32.3	
		2	0.9	....	.....	.....	....	.....	

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 the United States.
	McMahon Plant, Taylor	36	98.5	---	------	------	---	------	
		30	646.6	14	251,140	955,000	---	------	
	Alaska Highway system	---	------	---	------	------	26	37.5	
							20	18.1	
							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	
	Fort St. John field	---	------	5	1,980	------	18	7.8	
							10¾	0.9	
							8⅝	0.7	
	Fort St. John Southeast field	12	7.0	---	------	------	12¾	4.0	
	Fort Nelson plant	30	220.75	---	------	325,000	---	------	
	Gundy Creek field	---	------	---	------	------	10¾	6.1	
	Kobes-Townsend field	---	------	1	6,000	------	12¾	18.9	
							8⅝	5.5	
	Kotcho Lake field	---	------	---	------	------	12	10.0	
	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	
		---	------	1	1,400	------	10¾	10.3	
	Sierra field	---	------	---	------	------	12	6.8	
	Stoddart field	---	------	1	1,400	------	8⅝	6.3	

TABLE 34—GAS-PROCESSING PLANTS, 1970

Operator	Location	Fields Served	Plant Type	Date on Stream	Plant Capacity, Thousand MSCF/Day		Natural Gas Liquids	Residual Gas to—
					In	Out		
Gas Trunk Line of British Columbia Ltd.	NW 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.	SE. 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.
Mobil Oil Canada Ltd.	Unit 91, Block D, NTS map 94-I-14	Sierra	Inlet separator, dry dessicant dehydration	1969	63.5	63		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.
Westcoast Transmission Co. Ltd.	Lot 2683, P.R.D.	Clarke Lake	Potassium carb. M.E.A. treating absorption	1967	568	480		Westcoast Transmission Co. Ltd.

TABLE 35—SULPHUR PLANTS, 1970

Name	Location	Raw Material	Principal Product	Date on Production	Capacity (Long Tons per Day)
Jefferson Lake Petrochemicals Co. of Canada Ltd.	Taylor	Hydrogen sulphide	Sulphur	1957	300

Inspection of Mines

CHAPTER 5

By J. W. Peck, Chief Inspector of Mines

CONTENTS

LIST OF DRAWINGS

FATAL ACCIDENTS

Sixteen fatalities occurred in the mining industry in 1970, 12 occurring in metal mining and four in coal mining. Of the 12 surface fatalities, nine occurred at metal mines. In addition one metal mining company employee was killed in a highway accident while travelling on company business. The total of 16 represents an increase of one over the 15 mining fatalities in 1969, but is less than the past 10-year average of 17.2 in which is included the 26 fatalities incurred in the Granduc avalanche of 1965.

The following table shows the mines at which fatal accidents occurred during 1970, with comparative figures for 1969:

Company or Place	Location	Number of Fatal Accidents	
		1970	1969
Mines other than coal—			
Anaconda American Brass Limited	Britannia Beach	1	1
Bethlehem Copper Corporation Ltd.	Highland Valley	—	1
British Columbia Molybdenum Limited	Kitsault	—	1
Churchill Copper Corporation Ltd.	Delano Creek	1	1
Craig gravel pit	Langley	1	—
Craigmont Mines Limited	Merritt	1	—
Granduc Operating Co. (Tide Lake Camp)	Stewart	2	—
Granisle Copper Limited	Granisle	—	1
Greyhound Mines Ltd.	Greenwood	1	—
Phelps Dodge Corporation of Canada, Limited	Rupert Inlet	1	—
Phoenix Copper Division, The Granby Mining Company Limited	Greenwood	1	—
Texada Mines Ltd.	Moose Valley, Omineca	—	2
Union Carbide Exploration Corporation	Lillooet	1	—
Wesfrob Mines Limited	Tasu	1	1
Western Mines Limited	Myra Falls	1	—
Coal Mines—			
Crows Nest Industries Limited (Big Indian Drilling Company	Horseshoe Ridge (Elk River)	1	—
Kaiser Resources Ltd.—			
"A" North No. 2	Michel	1	—
Balmer South	Michel	—	3
Harmer Ridge	Michel	1	4
Sparwood Breaker Station	Michel	1	—
Totals		16	15

The following table classifies fatalities as to cause and location:

Cause	Number	Location	
		Surface	Underground
Electrocution	2	1	1
Exposure	1	1	—
Fall of ground	3	1	2
Machinery—			
(*a*) Caught by	5	5	—
(*b*) Struck by	1	1	—
Transportation—			
(*a*) Loader capsizing	2	2	—
(*b*) Locomotive derailment	2	1	1
Totals	16	12	4

A description of each fatal accident follows.

Ram Narian Singh, aged 30 years, single, and employed as a geologist in the Port Hardy area by Phelps Dodge Corporation of Canada, Limited, died from exposure on January 11 or 12 while lost in the bush 2 miles north of Alice Lake, Vancouver Island.

The foregoing company's crew was completing a geophysical survey on company claims south of the east end of Rupert Inlet. On January 10, Singh visited a survey crew on location, 1 mile south of the mouth of Coetkwaus Creek, and got a helper to aid him search for two claim posts located about a quarter of a mile to the northwest. As it was getting dark, the survey-crew supervisor offered the help of a second man to station himself about midway to the posts so that, by shouting, he could guide Singh and his partner back after dark. Singh declined this help and

left about 3.50 p.m. to search for the posts. By 4.20 p.m. the posts had not been found, but the location line to them had been intercepted. As it was raining and dark, Singh decided to return to camp and to search again the following day.

The two men set off at a fast pace in a southeasterly direction and soon became lost. Singh believed his compass to be wet and not functioning properly. They travelled at this speed for about three hours, arriving at the north shore of a small lake at about 7.30 p.m. Exhausted and realizing they were lost, they tried unsuccessfully to light a fire and finally spent the night sleeping fitfully in snow and freezing rain. Meanwhile the survey party returned with lights and attempted, unsuccessfully, to search for Singh and his partner.

In the morning, Singh was unable to travel because of exposure, but his partner made his way southward until, at 1.30 p.m., he reached the north bank of Marble River. He proceeded upstream to a bridge on the Port Hardy–Jeune Landing road where a fisherman and his wife picked him up and drove him back to the survey camp. They left before the helper found the camp to be empty, as all the crew was searching for the lost men. The helper, being exhausted, found it impossible to walk to Port Hardy to pass information to the organized search party and being overtired, he fell asleep in camp and did not waken until the survey search-crew returned in the late afternoon. An attempt was made immediately to obtain a helicopter to go to the lake where Singh had been left, but it was too dark to do so. During that night 4 to 6 inches of snow fell and the next day the ground search party, aided by helicopter, scoured the area, but were unable to locate Singh. The following morning his snow-covered body was found south of the lake, where his partner had last seen him. An inquiry into the accident, not an inquest, was held by the District Coroner.

Osvaldo DiMarco, aged 34 years, married, and employed as a locomotive operator at Craigmont mine, of Craigmont Mines Limited, was instantly killed at approximately 12.45 p.m. February 18 when crushed by a derailed locomotive in the 2400 main haulage level.

DiMarco was operating a 25-ton electric locomotive and at the time of the accident was pulling a train of 12 fourteen-ton cars toward the surface portal on 2400 level. He was in the operator's cab on the leading end of the locomotive. At a point about 3,000 feet from the portal is a track switch at the inner end of a by-pass drift which is used to allow trains to pass one another. Although there was no witness to the accident, evidence indicates the locomotive derailed on entering the switch but continued on down the main tunnel. In addition, the front trucks of each of the five cars nearest to the locomotive derailed but remained attached in the train. Apparently at the time of derailment DiMarco was either thrown out or attempted to jump out of the locomotive because his body was found behind a post at the leading edge of the pillar between the drifts.

During the investigation the switch-throw mechanism, the switch actuator, the switch lights, the block lights, the frog, and the tracks were all carefully examined for operation and condition. No fault could be found in the operation of any part of the switch or light systems and the only physical damage evident was an abrasion on one side of the switch point, a splintered tie between it and the switch frog, scars on the frog guide and on the side track lead rail, all of which indicates the locomotive entered a split switch. In addition to the foregoing both rails had fractured at a point 17 feet beyond the frog and toward the portal where the 85-pound rail to the portal joins the 60-pound rail used inside the mine. In view of the evidence at the switch it is believed the rail fractures were caused by and not the cause of the accident.

The switch had been operated about 15 minutes prior to DiMarco entering it and had functioned satisfactorily. The position of the switch and colour of the indicator lights demonstrated that DiMarco had correctly actuated it. However, testing revealed the closed point could have been open as much as three-eighths of an inch and the indicator light still operate satisfactorily. Although none was found it is possible that some foreign object could have lodged between the point and the track and kept the point open enough to have permitted the locomotive to derail or split the switch.

The findings of the jury were as follows: "We, the jury, find that Osvaldo DiMarco came to his death at approximately 12.45 p.m. on February 18, 1970, at Craigmont Mine, near Merritt in the county of Yale, Province of British Columbia; when he was crushed to death by the locomotive or cars of which he was the operator after he was thrown or jumped from the derailed locomotive. The immediate reason for the derailment is not evident. We find no blame attached to anyone.

"We, the jury, recommend that the Mine Inspector investigate a safety procedure that would ensure that the operator not be thrown from a locomotive involuntarily and that this device be implemented in such a way that he can escape voluntarily if the need arises.

"We also recommend that the track be inspected as often as the locomotives are."

Jacob Wolfe, aged 55 years, married, and employed as a truck driver by Bird Construction (Cambi) Ltd. at the Sparwood breaker station of Kaiser Resources Ltd. died on February 23, 1970, as a result of crushing injuries received when caught between the box of a dump truck and its frame.

Although there were no witnesses it would appear that at about 12 noon Wolfe was checking the truck prior to eating his lunch. He apparently decided to clean the dust off the rear cab window and had elevated the dump box to give himself room to perform the task. To do this Wolfe had the engine running, the parking brake set, and gear shift in neutral. The power takeoff (pump control) was not engaged but the dump box hoist lever appeared to be in the hoist position range just above the hold position. The dump box elevated but Wolfe did not block it in the raised position and as he was cleaning the window the box descended silently and trapped him against the truck frame.

With the power takeoff (pump control) lever not engaged the box would come down unless the hoist lever was in the hold position. It would seem reasonable to assume that the driver thought he had the lever in the hold position, but he may have bumped it slightly with his foot while descending from the cab and thus placed it in the hoist position.

At the inquest held in Sparwood, March 10, 1970, the jury determined that the death of Jacob (Jack) Wolfe "was caused by accidental means . . . " and "that the deceased was negligent in his own safety in regards to the operation of the truck." They made the following recommendations also.

"We strongly recommend that safety precautions be more strictly enforced by operators and supervisors.

"Also, warning labels should be placed somewhere on the dash instructing operators to block the hoist when the box is in the air.

"We, the jury, further recommend that the truck in question be thoroughly checked and repaired with particular attention to the hydraulic system."

Ian Morrison, aged 26 years, single, and employed as a miner by Granduc Operating Company, was instantly killed on March 31, 1970, when crushed by an overturning scooptram at the 3100 level Leduc adit portal.

At about 11 p.m. Morrison was tramming from 113 ore pass to the ore stockpile outside the 3100 level portal.

Although there were no witnesses to the accident it was determined that about 11 p.m. Morrison was using a scooptram to tram ore from the 113 ore pass to the 3100 level portal ore dump, the toe of which was about 50 feet from the mine entry. In stockpiling the ore it was necessary to travel another 40 feet up a 20-degree slope and with the bucket booms raised to a full height of 10 feet in order to dump on the 8-foot high embankment. The evidence indicated Morrison had proceeded up the ramp to the ore pile and had possibly dumped some of the load when for some undetermined reason the scooptram veered off across the ramp to one of its embankments and rolled over it. Morrison's body was found pinned under the overturned vehicle.

The examining doctor determined that death appeared to have occurred as a result of a massive brain injury following crushing of the skull.

The verdict and recommendation returned by the Coroner's jury were, "Ian Morrison came to his death at the 3100 portal, Leduc camp, when a scooptram overturned by accident. We attach no blame to any party."

Recommendation: "We should have better lighting at the 3100 portal and a more thorough and extended training programme."

Daniel Carl Povezenich, aged 69 years, single, and employed as a reagentman by the Phoenix Copper Division of The Granby Mining Company Limited, died on April 20, 1970, from injuries received in an accident on April 15, 1970, at the Phoenix concentrator.

The accident took place in the concentrate dryer room of the mill at Phoenix which is operated by the Phoenix Copper Division of The Granby Mining Company Limited. The dryer is a steel tube, 24 feet long and 3 feet in diameter, inclined at about 15 degrees. The concentrates are entered at the upper end and are heated by an open-flame propane fire inside the rotating tube. To prevent build-up of concentrates, the tube is equipped with two gravity hammers which require daily greasing. The hammers are mechanically held at 90 degrees to the tube when being lifted and fall in the direction of rotation as they pass over the top of the tube. The blow of falling loosens caked concentrates inside the tube. There are several pumps, conveyors, and other pieces of equipment related to the dryer operation, all controlled from a switch panel located in a room separate from the actual dryer room. The dryer capacity is greater than mill production so is not run continuously but only when sufficient concentrates have accumulated.

On April 15, 1970, Povezenich was greasing the dryer. The actual circumstances are unknown but it appears that he was standing on a steel platform with a dryer hammer between his legs and reaching over the top of the dryer to grease the other hammer. An electrician started the dryer. As the tube started to rotate, the hammer between Povezenich's legs rose and caught him in the crotch throwing him over the dryer to a concrete floor some 12 feet from the top of the dryer. He probably landed on his head or the back of his neck.

The electrician who started the machine was making electrical repairs to equipment related to the dryer operation and started the machinery to check results. There was no lock or tag on the dryer switch. Immediately prior to starting the dryer, the electrician had passed through the dryer room and did not see Povezenich but, on returning, found the injured man on the floor. The victim who remained conscious was given first-aid treatment and taken to the Grand Forks hospital where he died five days later.

During the investigation it was determined that on August 15, 1967, Povezenich was injured while jumping clear of the dryer when someone started the

machine while Povezenich was preparing to grease the dryer hammers. The victim had not bothered to lock and tag the relative switch although aware of the company requirement that electrical switches must be tagged before working on machinery operated by the switch.

Also on April 13, 1970, Povezenich, who was about to retire, had instructed a new employee on the procedure to follow while greasing the dryer. His instructions stressed the need to tag the dryer switch before working on the dryer.

At the inquest held in Grand Forks on May 19, 1970, the Coroner's jury returned the following verdict and recommendations:

"We the jury find that Mr. Daniel Povezenich came to his death on April 20, 1970, through injuries sustained from an accident at the Phoenix Copper Division (Granby Mining) on April 15, 1970.

"We feel that he came to his death by failing to comply with the established safety regulations which require a workman to tag the switch. These regulations are laid down by the Granby Mining Co.

"From evidence supplied by the Regional Pathologist the death is attributed to an accidental fall which resulted in a fracture of the first thoracic vertebræ body, fractures of the lower cervical bodies and the typical clinical picture of ascending traumatic myelitis.

"Due to the fact that this is the second time that this type of accident has happened we recommend that suitable caging be installed over the hammers of the dryer.

"We further recommend that consideration be given to the installation of an auxiliary switch or warning system on any unit not visible from the main switch."

John Robert Evans, aged 48 years, married, and employed as a filter operator in the Britannia Beach concentrator at Anaconda Britannia Mines was instantly killed on April 21, 1970, when caught between the crown-and-pinion gears of the copper concentrate conveyor tripper.

In order to unload concentrate at any point along the main concentrate conveyor belt the conveyor system has been equipped with a tripping device. It comprises two pulleys with the upper installed ahead of the lower pulley and over which the belt passes. In so doing it makes a reverse bend and gives a spill point. Immediately under the spill point is a short transverse conveyor belt to unload the spilling material into the storage area. The short transverse conveyor or tripper operates through a drive-shaft and crown-and-pinion drive from the lower idler pulley, which is itself turned by the moving belt. The whole assembly is lubricated from four grease cups—three are on the tripper drive-shaft and the fourth behind the crown gear attached to the lower idler pulley. A plywood guard covered the drive assembly but had to be removed when lubricating was being done. The guard was not present when Evans came to the tripper.

As there was no eyewitnesses to the accident it is presumed that sometime after Evans was last seen at 2.30 a.m. he had cleaned the tripper with compressed air and without stopping the belt was tightening the grease cup behind the crown gear when his clothes caught in the meshing crown-and-pinion gears.

Although his fellow workmen were aware that Evans did not appear in the lunchroom between 4.00 and 4.30 a.m. his absence was not considered unusual because occasionally existing conditions made it necessary to have lunch later. At 6 a.m. when the shiftboss commenced shutting the mill down he missed Evans and then started a search for him. Evans' body was found at 7.45 a.m.

On examination it was found that the major injuries received by Evans were the amputation of both arms close to the shoulders, multiple rib fractures, and a punctured left lung.

At the inquest held in Squamish on June 18, 1970, the jury gave the following verdict and recommendations:

"We the jury find that John Robert Evans died between 2.15 a.m. and 5.30 a.m. on April 21, 1970, when he was caught in the crown-and-pinion gears located on the tripper, situated over the copper bin of the mill. It would appear he was checking either the grease cup or bend pulley from an unknown position with the machinery in full operation. We find he met his death accidentally.

"Recommendations:

1. All gears and pinch points be adequately guarded.
2. Guards should be inspected daily by workers and reported to the supervisor immediately if not in proper position.
3. Each man should have contact with his supervisor at least four times a shift."

Dennis Ernest Strachan, aged 24 years, and employed as a drill crew man by Big Indian Drilling Company on the Crows Nest Industries Limited Horseshoe Ridge property, Fording River, died instantly by strangulation on April 24, 1970, when his clothing caught in a rotating drill.

The drill operator and Strachan were about to add another drill stem to the Gardner-Denver, Model 2000, truck-mounted drill rig. To do this the normal procedure was to stop drilling, unscrew the kelly bar, add the new length, and then reattach the kelly bar. Without waiting for the rotating drill to stop Strachan reached over the turntable in order to loosen the power grips from the kelly. At this time the right pocket of Strachans' parka became caught in the handle of the clip holding the drill stem in the rotary table. Witnesses claim the clutch controlling the table had been shut off but the momentum of the table pulled Strachan into a narrow space between the frame of the rig and the table, causing crushing injuries which resulted in his death.

The investigation of the accident indicated the main causes of it were:

(*a*) The failure of Strachan to wait until the turntable came to rest;

(*b*) The wearing of loose-fitting clothes around rotating machinery;

(*c*) Poorly designed slip handles in that the sharp corners should be rounded.

At the inquest held in Natal on April 30, 1970, the jury determined that "Dennis Ernest Strachan died accidentally of his own neglect, by strangulation, while making a drilling pipe connection," and recommended "that the slip handles of this machine be changed."

James William Robert Craig, aged 55 years, married, and a self-employed gravel-pit operator in Langley, was instantly killed on May 26, 1970, when crushed by the front-end loader he was operating.

Mr. Craig's gravel pit on Jackman road is 8- to 10-feet deep with about 1 foot of topsoil having been removed from the surface around the pit rim. On the morning of the day of the accident Craig was operating a diesel-powered International D-60 front-end loader and was loading a truck with topsoil from two small piles near the pit rim.

There was no witness to the accident but the investigation indicated the shovel and operator were facing away from the pit as the truck was being loaded. One pile was almost completely removed and it would appear Craig was backing up to begin working on the second pile when he backed over the pit rim. The loader overturned, landing on the canopy which collapsed and permitted Craig to be crushed by the weight of the machine.

After autopsy the attending physician advised death was caused by a "massive internal hemorrhage from lacerations to heart as a result of injury."

The Coroner determined an inquest was not necessary and held only an inquiry.

It may be presumed Mr. Craig's death was accidental.

Gerben Land, aged 28 years, single, and employed as prospecting field-assistant by Union Carbide Exploration Corporation, in the Lillooet area, died on June 19, 1970, shortly after receiving severe cranial injuries when crushed by a rolling boulder he dislodged as he was crossing a gravel slide on the bank of Boulder Creek.

Land and a fellow workman had been taking soil samples on a ridge above Boulder Creek, a tributary of Cayoosh Creek, 10 miles southwest of Lillooet and at 6.30 p.m. were en route down to a road where they would be picked up. In expectation of easier travel the two men decided to descend across the face of an open gravel slide in hope of finding a game trail in the valley bottom. While descending the slope Land slipped and in falling dislodged a large boulder which rolled over him, lacerating his head and fracturing his skull. Land's partner endeavoured to render first aid and then went for help. The doctor, on arriving at the accident scene the following morning, advised that Land had died within two to three hours of being injured.

The Coroner's statement given at his inquiry was "that Land came to his death by falling on a rock slide area and being struck on the head with a boulder causing him to bleed excessively from the wound. Land died approximately two hours after the accident before help could be obtained for him. Death was due to a falling accident. No blame can be attached to anyone."

The District Inspector recommended:

(1) The wearing of light protective headwear by prospecting crews;

(2) An improved means of communication should be established between home base and field prospecting crews.

Imrie Nemeth, aged 44 years, divorced, and employed as motorman at the Magnum mine of Churchill Copper Corporation Ltd., was instantly killed at 4 a.m. July 12, 1970, when ejected from a locomotive at 5900 level portal dump.

The main ore dump for the mine was at 5900 portal. It had two dumping positions or bays each supplied with a safety chain and a car-retaining hold-down bar designed to engage with two stabilizer arms welded to the side of the truck chassis of each mine car. The safety chain can be attached to the truck chassis when a car is being dumped. This and the hold down arrangement mentioned above prevent cars from capsizing if there is any tendency to do so.

The dump was equipped with a track-mounted pneumatic piston located on a pair of inner rails, the piston being used to dump the cars. A walkway and handrail extended along the outer side of and between dump openings.

The track extended along the edge of the dump, 55 feet beyond the centre of the first dumping bay, and terminated at a securely attached bumper block to prevent derailment. This track was sufficiently long to accommodate at the same time only the two trains working on 5900 level and the safe dumping of all cars at the dumping bays. The foregoing provided an ore storage approximately 40 feet high.

Immediately prior to the accident a train composed of a locomotive and four V-cars came to the dump where the cars were emptied. As it was lunchtime, the motorman took this train as far out on the dump as possible but was unable to touch the bumper block because of an empty V-car which had unaccountably been in that location for several days. The motorman went to the lunchroom and while there, Nemeth and his partner brought a two-car Granby train to the dump. The car nearest the locomotive was dumped first and Nemeth moved the train out as far as possible until it came in contact with the V-car. The second car was then dumped but in so doing it overturned sufficiently to permit the stabilizer arms to come free

of the hold-down bar and as the safety chain had not been used, the car capsized. The twisting action derailed and capsized the other car and locomotive in turn. Nemeth was ejected from the locomotive seat where he had remained and he was catapulted down the dump pile where he landed on his head.

The first-aid attendant examined Nemeth within 10 minutes of the accident but was unable to detect any sign of life. The doctor, in subsequent examination, advised that death had been instantaneous.

After a preliminary meeting the jury viewed the deceased and at a subsequent hearing in Fort Nelson on July 22, 1970, a verdict was made. However a second sitting was held July 24 because of further information being made available. At the first hearing the evidence presented failed to indicate the presence of the V-car at the bumper block on the dump track. With this informaion the District Inspector went to the mine and on July 23 and 24 reconstructed as closely as possible the conditions on the dump as they were at the time of the accident. It was determined that under no circumstances of coupling arrangement of car and train could the last Granby car of the fatal train be located in proper dumping position. Proper dumping position is defined as that in which both stabilizer arms of the muck car are under the working portion of the hold-down bar and the safety-chain hook can be engaged on the appropriate lug of the car chassis. It was also determined that because of the position of the last Granby car the safety chain could not be engaged.

The information obtained during the investigation was conveyed to the jury at a second hearing on July 24 and a further verdict was given. The two verdicts given are detailed in order herewith:

"July 22. Imrie Nemeth died on the 12th day of July, 1970, at Churchill Copper Mine, near Fort Nelson, B.C., as a result of a fractured skull, we find that this death was unnatural and that it was accidental. We attach no blame to any person in connection with the death. Safety Practices were not in evidence by the Corporation or their employees. We recommend that: Safety devices were inadequate and not employed. Proper supervision should be employed to ensure the safety devices and safe practices are used at all times. Safety instructions should be strategically posted wherever necessary, and that dumps should have proper safety equipment installed before use.

"July 24. After hearing the new evidence we would like to express more strongly that safety practices were not in evidence and there was a complete lack of supervision."

Inasmuch as the inquest was held in Fort Nelson some 120 miles from the scene of the accident the jury was chosen from people completely unfamiliar with mining terms and practices.

The jury's comment that safety devices were inadequate does not agree with the evidence presented. Safety devices such as safety chains and hold-down bars were installed but the car to be dumped was not properly located under the hold-down bar nor was the safety chain used. The workmen involved were experienced in the use of this equipment but supervision must also accept some responsibility for not ensuring safe practices were being observed.

Supervision should also have been aware of the limited track space and had the empty V-car removed as soon as it was noticed at the bumper block.

The unwitting removal of the V-car train after the accident complicated the investigation and was in contravention with section 8 (3) of the *Mines Regulation Act* which requires the preservation of accident evidence.

It is believed that Imrie Nemeth's death was attributable to the following factors:

1. The presence of the spare V-car on the dump tracks precluded the possibility of spotting the second car of the Granby train in proper dumping position with both operating trains present at one time.

2. The practice by motormen and trammers of dumping muck cars without first engaging the safety chain and hook, permitted cars to be unloaded from an unsafe and unsecured position.

3. Mine standing orders, as testified to by the mine staff, which require locomotives to be uncoupled before dumping muck cars, use of safety chains on the muck cars, and the motorman to dismount from the locomotive, were not followed.

Stewart William Fulton, aged 30 years, married, and employed as electrician, first class, by Granduc Operating Company at their Tide Lake Camp near Stewart, was electrocuted on August 10, 1970, while working on the pantograph of a Mitsubishi 50-ton locomotive in the concentrator building haulage and loading bay off the 2600 or main haulage level.

There are three spur tracks in the bay, two of which are used when making repairs on equipment and the third while loading and off-loading trains. The 1,500-volt trolley conductor extends over the loading spur only. This conductor is disconnected from the main conductor serving the haulage tunnel by a manually operated single-pole switch. Operating practice requires this section to be de-energized at all times except when moving a train in or out of the loading bay.

In conjunction with the trolley-conductor system is a set of warning lights which are controlled by switches actuated by a cam on the shaft of the manually operated single-pole switch for the loading bay line. A continuous green light indicates the loading bay conductor section is de-energized while a continuous red light accompanied by constantly flashing amber lights indicates the loading bay conductor section is energized.

On the day of the accident the locomotive motorman advised the electrical superintendent the pantograph conveying electric power from the trolley line to the locomotive was arcing. After a confirmatory trip, the locomotive was placed on the loading bay spur and some time later Fulton commenced work on the pantograph. Subsequently the shift electric foreman came to the job and on seeing Fulton working on the pantograph he asked Fulton if the 1,500-volt power switch was tagged out. Fulton assured the foreman the switch was tagged out. About 15 minutes later another electrician came to do some work on the signal lights and was advised by the foreman not to touch the trolley line power switch. The electrician replied he would not touch the switch but would simply be checking it.

On reaching the switch the electrician advised that it was almost in the "on" position so went to pull it to the "off" position. He advised in so doing he heard the switch arc immediately he touched it and also noticed a commotion on top of the locomotive. He immediately returned to Fulton who had collapsed. Artificial respiration and cardiac massage was given but failed to revive Fulton.

At the inquest held at the mine on August 10 the jury returned the following verdict:

"We the jury find that Stewart William Fulton came to his death at approximately 4.15 p.m. August 10, 1970, in the Locomotive Maintenance Bay area of Granduc Op. Co. at Tide Lake, B.C.

"His death was the result of electrical shock that he received while working on the locomotive pantograph that was in contact with a 1,500-volt D.C. line that

was supposedly de-energized at the main switch which was tagged, presumably by the deceased.

We recommend that only a limited, qualified number of personnel be authorized to operate this switch and that it be padlocked and tagged in the open position when working on the line."

Raymond Peter Elliott Moorman, aged 26 years, married, and employed as a shovel mechanic by Kaiser Resources Ltd., Michel, died suddenly on September 22, 1970, while crawling under a stationary Marion 15-cubic-yard electric-powered shovel in the Harmer pit.

About 1 p.m. Moorman and another mechanic were servicing the shovel and were attempting to clear a blocked grease line at the back end. Some difficulty was experienced in doing this and it is presumed Moorman endeavoured to trace the line to examine it for damage. Although the other mechanic did not see Moorman enter the unguarded front manhole in the shovel base, Moorman's hat was found inside the shovel base and flashlight beside the 6-9KV collector rings. Both mechanics were aware the power shovel was energized as it was necessary to make various movements of the machine while servicing it.

Shortly thereafter Moorman crawled on the ground toward his partner to whom he said, "Well, I don't know John," then collapsed. Artificial respiration was applied without success.

The doctor completing the autopsy advised that on the anterior part of each thigh there were what appeared to be recent superficial burns. There were no signs of asphyxia and the cause of death could not be determined with certainty. There were no burns on the deceased's clothing.

The inquest was held in Natal on October 6 and the verdict of the jury was that Moorman's "death was accidental due to electrocution on or about 1 p.m. September 22, 1970, at the Kaiser Resources Ltd. strip coal mine, Harmer Ridge.

"Recommendations:

(1) That safety parctices be more rigidly enforced in regard to personnel conducting repairs inside the machines, particularly in regard to the electrical circuitry.

(2) That electrical circuitry be protected from personnel access in a more efficient manner."

Nuno C. F. Cunha, aged 38 years, married, and employed as a driller by Wesfrob Mines Limited at Tasu, was fatally injured at 2.45 p.m. September 25, 1970, when struck by a falling drill stem which detached from its bell cap while being hoisted by a 40R Bucyrus Erie rotary drill.

The 1002-40R rotary drill was being used to drill drainage holes from the floor of the 1020 bench in No. 3 zone to an inclined raise below the bench. Two drill rods, each 27 feet long, were being used to drill the holes but inasmuch as the raise had not been intersected it was proposed to obtain a third length from a drilling machine about 500 feet distant and being used by Cunha. This rod was obtained and was being raised into position by means of the drill hoist, the rod being attached by means of a Drilco ET-944 bell cap. Cunha came over to watch the operation and although he had been warned to move away he remained beside the drill. As the 1,500-pound drill rod was being raised it came loose from the bell cap and fell striking Cunha in the abdomen.

The investigation revealed that the regularly used Bucyrus-Erie bell cap had for some unknown reason been substituted by a Drilco bell cap which fitted too loosely on the threaded drill stem.

At the Coroner's inquest held in Queen Charlotte City on October 30, 1970, the jury returned the following verdict:

"Regarding the death of Nuno Cunha, 40R driller, which occurred at approximately 2.50 p.m., 25 September 1970, in the 3-Zone pit, Wesfrob Mines Ltd., Tasu, B.C., we find the reason for his death to be due to a direct blow from a drill stem. We find the cause to be accidental."

No recommendations were made by the jury but the District Inspector of Mines recommends a weekly check shall be made on the drill stem thread gauge and on the bell cap. The information obtained shall be recorded in a log book.

Peter Hildebrand, aged 46 years, married, and employed as a faceman in the "A" North No. 2 mine, Michel Colliery of Kaiser Resources Ltd. at Natal, was instantly killed at 6 a.m., October 1, 1970, when struck by a timber bridge stick (cap) dislodged by a shuttlecar he was operating.

Hildebrand who had previous experience operating the equipment was driving a shuttlecar conveying coal a distance of 350 feet from a continuous mining machine to a conveyor belt in No. 2 incline. The route of travel required negotiating three curves through a low, narrow section of roadway where the overlying rock was supported with timber posts and caps. Some of the caps were bolted to the roof of the roadway. Because of the restricted access to the working face the fireboss assisted Hildebrand with directions in tramming out the first two loads. The fireboss then directed a third man to assist the driver in the same manner. On the seventh trip out, Hildebrand, who was moving the shuttlecar slowly, ran into the timber supports inbye No. 1 incline. The collapsing timbers drew Hildebrand out of the operator's position and on top of the shuttlecar where he was crushed by a falling cap. The shuttlecar came to rest in the middle of No. 1 incline.

At the Coroner's inquest held in Natal on October 14, the jury submitted the following verdict:

"We the jury find that Peter Hildebrand died as a result of a crushing chest injury caused by a shuttlecar striking a leg supporting a bridge stick thereby bringing the bridge stick down over his body pinning him to the shuttlecar on October 1, 1970, at approximately 6 a.m. at the "A" North No. 2 mine at Michel with no blame attached to anyone. We the jury strongly recommend that roadways where shuttlecars operate be of sufficient height above the shuttlecar for safe operation."

The District Inspector of Mines has instructed the mine operator to maintain at least 12 inches clearance above the top of the shuttlecars to the timber sets.

Peter William Chernoff, aged 46 years, married, and employed as a crusher helper by Greyhound Mines Ltd. at Greenwood was fatally injured at about 4.15 p.m. October 17, 1970, when he was caught by a rope and drawn into the capstan of the No. 5 ore bin shuttle conveyor.

No. 5 conveyor is about 50 feet long by 36 inches in width and is reversible. This conveyor is designed to distribute crushed ore in six compartments of the fine ore bin having a total capacity of about 5,000 tons. The conveyor is mounted on tracks and can be moved about 50 feet in order to fill compartments on either end of the bin from a centrally located feed point. Operators had been instructed to use a pinch bar to move the conveyor along the tracks. This bar was in its usual place when the accident occurred.

The drive end of the conveyor was fitted with a capstan about 10 inches in diameter and 3 inches in width. It was to be used as part of an automatic conveyor belt mover which had not been fully installed. The capstan was, from the operator's normal position, on the off-side of the conveyor and was unguarded.

Sometime prior to the accident Chernoff told one of the crusher operators the conveyor could be moved by tying a safety rope to the end wall of the building housing the conveyor, looping the rope around the capstan and tensioning the free end of the rope. Depending on the direction of rotation of the head pulley the conveyor

could be moved in either direction. The crusher operator advised Chernoff this practice was unsafe and was not permitted.

As there was no witness to the accident it can only be presumed from the evidence that the following sequence of events took place:

About 15 minutes prior to the end of the shift at 4.30 p.m., the crusher operator asked Chernoff to check No. 5 conveyor so that the bin condition could be reported to the oncoming shift. At 4.20 p.m., the crusher operator stopped No. 5 conveyor and about 10 minutes later he sent another man to look for Chernoff to see what was delaying his return. Chernoff was found apparently lifeless and wrapped around the capstan.

The autopsy completed after Chernoff's body was removed indicated instantaneous death from a broken neck.

The position of the victim's hard hat, drag marks, and ore spills indicated Chernoff had tied one end of the ore bin safety rope (⅝-inch polypropylene) to an end wall over No. 6 bin compartment and had looped the other end around the capstan, having first reversed the direction of the belt. His hand became entangled and his entire body was drawn into the capstan. The capstan continued to turn and the conveyor moved about 50 feet dragging Chernoff with it.

At the inquest held December 21, 1970, the jury returned the following verdict:

"We, the jury here to enquire into the death of Peter Chernoff on 18th October, 1970, at Greyhound Mines, Greenwood, B.C., at approximately 4:20 p.m., do hereby find the cause of death to be accidental with no blame attached to any person or persons whomsoever.

"Recommendations:

"1. That there by inserted into the Mines Regulations the regulation prohibiting the use of capstans or capstan type devices on machinery of the mining industry.

"2. That all machinery be guarded to the satisfaction of the Mines Act.

"3. That this conveyor be fitted with the emergency stop cords as called for in the mines regulations."

Taduesz Pogorzelec, aged 44 years, married, and employed as a miner in the Lynx mine of Western Mines Limited at Myra Falls, was instantly killed at 3.15 p.m. October 31, 1970, when crushed by a fall of rock in 12R61 stope.

The 12R61 stope, 75 feet long and 23 feet wide, was being mined by cut-and-fill mining methods with the back about 20 feet above 12-615 crosscut south. The stope back was about 11 feet above the fill and was supported at 4-foot centres with 20 steel rock bolts each ⅝ inch in diameter and 5 feet long. The outer end of each bolt was upset to a diameter of ¾ inch to terminate in a hexagonal bolt head of ½-inch face length attached to a flush fitting ⅛-inch thick steel washer 1¾ inches in diameter. When installed, the bolt is passed through a steel bearing-plate of dimensions 4 by 4 by 3/16 inches having a centrally located rectangular hole 1 by 13/16 inches and then through a 2-inch thick wooden face-board. This bolt with the expansion shell attached is inserted into the drill hole. Tensioning is achieved by rotating the bolt assembly in the threaded expansion shell when it is positioned within the hole.

On the day of the accident Pogorzelec slushed muck, with assistance installed three posts, and was in the process of drilling a slash hole when the stope back collapsed. The fall of ground and the stopping of the drill were noticed by a miner working in a nearby stope.

The investigation indicated the fall to have occurred over most of the stope back with approximately 400 tons of rock having dropped. Varying lengths of 18 rock bolts were left protruding from the walls and back of the stope. On examina-

tion of the bolts it was noted that in all instances but one, the washers had failed in shear and the load had forced the bearing plates off the rods.

Subsequent investigations indicated that for the loading developed on the bolts the bearing surface area between the hexagonal bolt heads and the washers was inadequate and shearing occurred in the washers along the outline of the boundaries of the hexagonal head of the bolt. Laboratory tests indicate this type of failure could be overcome by any of the following actions:

1. Increasing the washer thickness.
2. Increasing the bearing area of the bolt head, for example, a ⅞-inch square bolt head would give approximately a 77 per cent increase in bearing surface.
3. Decreasing the shape and size of the opening in the steel bearing plate to approach those of the upset shank.

The inquest was held in Campbell River on November 10, 1970, and the verdict follows:

"We, the jury, find that Taduesz Pogorozelec, age 44, of Campbell River, B.C. came to his death by accident. Death was due to being crushed severely by falling rock. Death was instantaneous, and occurred on October 31, at Western Mines Ltd., Myra Creek operation in 12R61 Stope.

"No blame is attached to anyone. The jury recommends, however, from evidence presented that a better quality of washer be used in the whole mine concerned and that in the case of bad ground that screening be used on the back or roof. Supervisory staff should see that miners install sufficient roof bolts to ensure safety. The mine should be inspected to ensure that existing bolts are adequate and if not that additional bolts be installed to correct any unsafe conditions."

The District Inspector of Mines concurred with the jury's findings and offered the following additional recommendations:

1. Care should be taken to ensure that the stoper used to tension the rock bolts does not come into contact with either the washer or the bearing plate.
2. Once installed the rock bolt should be tested with a torque wrench to ensure the tension is satisfactory.
3. The rock bolts should be tested periodically with the torque wrench to ensure adequate tension is being maintained.

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

There were 16 fatalities in as many accidents and 619 accidents involving a loss of time 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 accidents that occurred in the coal-mining industry are reported separately from those occurring in all other types of mining operations. The fourth table lists all fatalities and compensable accidents which occurred in coal and metal 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	Coal Mines		Mines Other Than Coal	
	Number of Accidents	Percentage of Total	Number of Accidents	Percentage of Total
Atmosphere	6	3.0	1	0.2
Explosives	6	3.0	10	2.4
Falls of ground	23	11.6	43	10.3
Falls of persons	71	35.9	124	29.5
Lifting and handling material	39	19.7	34	8.1
Machinery and tools	22	11.1	92	21.8
Transportation	19	9.6	41	9.7
Miscellaneous	12	6.1	76	18.0
Totals	198	100.0	421	100.0

Accidents Causing Death or Injury Classified as to the Occupation of Those Injured

Occupation	Coal Mines		Mines Other Than Coal	
	Number of Accidents	Percentage of Total	Number of Accidents	Percentage of Total
Underground—				
Chutemen	—	—	7	1.6
Haulagemen	23	11.6	28	6.7
Miners	14	7.1	160	38.1
Helpers	8	4.0	23	5.5
Timbermen and facemen	14	7.1	17	4.0
Mechanics, electricians, etc	12	6.1	25	5.9
Miscellaneous	26	13.1	15	3.6
Surface—				
Mechanics, electricians, repairmen, etc.	47	23.7	51	12.2
Mill and crusher workers	2	1.0	25	5.9
Carpenters	—	—	7	1.6
Miners and drillers	9	4.6	17	4.0
Vehicle drivers	21	10.6	14	3.3
Coal-preparation and by-product plants	—	—	—	—
Miscellaneous	22	11.1	32	7.6
Totals	198	100.0	421	100.0

Accidents Causing Death or Injury Classified as to the Parts of the Body

Location	Coal Mines		Mines Other Than Coal	
	Number of Accidents	Percentage of Total	Number of Accidents	Percentage of Total
Eyes	9	4.6	20	4.8
Head, face, and neck	12	6.1	36	8.6
Trunk	69	34.8	120	28.6
Upper extremities	38	19.2	103	24.4
Lower extremities	65	32.8	123	29.2
General	5	2.5	19	4.4
Totals	198	100.0	421	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
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	7,210	158	102
1967	92	688	457	6,716	201	102
1968	73	682	553	9,254	132	74
1969	93	725	700	9,633	133	75
1970	172	860	1,275	11,622	135	74

[1] Compensable accident means an injury causing a loss of more than three days' work not including the day of the accident.

DANGEROUS OCCURRENCES

Eighty-one dangerous occurrences were reported as required by sections 9 and 10 respectively of the *Mines Regulation Act* and the *Coal Mines Regulation Act.* Seventy-five were reported from metal-mining operations and six from coal mines. Fifty occurred on the surface and 31 underground. These were investigated by the Inspectors of Mines.

In summarizing these incidents, 20 involved the use of vehicles of which 16 occurred on the surface. Of the 20, 13 involved the use of trucks, two the use of front-end loaders, and two the use of drilling jumbos. There were 19 fires reported, 11 of which were on the surface. Of the 19 fires, six involved the use of electricity, five the use of propane or acetylene, and two occurred after metal-burning operations. The direct repair or replacement cost of the fire damage exceeded $4,750,000. There were 11 instances of slides of rock or snow and eight incidents involving the use of explosives or blasting procedures. Four incidents were reported involving the use of compressed air, three instances involving hoisting, and three involving the use of electricity. Two each were reported involving gassing, dumping of trains, and being caught in machinery. In addition there were seven miscellaneous dangerous occurrences reported.

On January 18, 1970, in the Tide Lake tunnel of Granduc Operating Company, an employee received burns to his eyes, head, and chest when the propane gas tank he was using to assist in thawing pipes exploded after being knocked over by an incoming train.

On January 19, 1970, on 2600 level of Granduc mine of Granduc Operating Company, an 8-inch valve flange on the compressed-air line ruptured while under normal drilling pressure.

On February 1, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., an avalanche 600 feet long buried a section of the mine road to a maximum depth of 100 feet of snow.

On February 2, 1970, at the Eagle mine of Davis-Keays Mining Co. Ltd., a mechanic was replacing the transmission of an Eimco 912 LHD loader at the 5900 level portal when a snowslide occurred burying the vehicle and him. He was recovered in about 30 minutes and sustained minor injuries.

On February 5, 1970, at the McLeese Lake property of Gibraltar Mines Ltd., a small crawler tractor servicing a diamond drill broke through the ice on Granite Lake and sank in 6 feet of water.

On February 6, 1970, at the Annex mine of Reeves MacDonald Mines Limited, an examination of the sinking hoist revealed a crack in the bull gear and the failure of a foundation bolt. A splice plate was installed on the bull gear.

On February 17, 1970, at the Tasu open pit of Wesfrob Mines Limited, a workman suffered a fractured kneecap when struck by a flying rock which was deflected into a shovel bucket where the workman was sheltering from a blast.

On March 3, 1970, at the Annex mine of Reeves MacDonald Mines Limited, another hoist-foundation bolt was found to have failed. Investigation showed that high tensile strength bolts had been used in error when making the original installation. Three fractured bolts were replaced with three pairs of mild steel split rock-pins with hold-down bars bolted to the pins. In the failure occurrences of February 6 and March 3 the services of a consulting mechanical engineering firm was obtained to advise the company on the necessary corrective action.

On March 3, 1970, at the underground 2600 level electrical substation in Granduc mine, the wiring insulation at the plug receptacle of a locomotive battery caught fire while on charge. A short circuit in the receptacle caused the overheating and the use of an 8-inch nail instead of a fuse prevented the interruption of the circuit on overcurrent.

On March 7, 1970, at the Sparwood coal-preparation plant of Kaiser Resources Ltd., three men entered a deduster unit to make adjustments on the cone, and, while inside, the table on which they were standing commenced to rotate. The men were thrown about violently before the machine was stalled. The workmen had failed to lock out the switchgear before entering the machine.

On March 10, 1970, at Granduc mine of Granduc Operating Company, a 10-inch airline under 100 psi compressed air pressure was ruptured at a coupling when struck by a mine car. One man was slightly injured by flying rocks.

On March 11, 1970, in the "A" decline at the mine of Valley Copper Mine Limited, the tow cable being used to haul a stalled scooptram out of the mine snapped, thus permitting the machine in tow to run out of control down the incline where it came to rest at a landing. It was subsequently noted that the operator had been applying the accelerator rather than the brake pedal in an attempt to halt the runaway vehicle.

On March 12, 1970, at the Pride of Emory mine of Giant Mascot Mines Limited, the operator of an Eimco 915 LHD loader was slightly injured by flying rocks when an explosion occurred in front of the bucket as it was being used to muck out a drift round. As some loose powder had been removed from the muck pile it is presumed the bucket struck an unexploded cartridge.

On March 15, 1970 at the Tasu mine of Wesfrob Mines Limited, a crushing-plant employee suffered such injuries as to lose his right forearm after it was caught between a head pulley and conveyor belt as he was applying a gripping compound to the belt.

On March 18, 1970, at the north wall of the Jersey open pit of Bethlehem Copper Corporation Ltd., a major pit-wall failure was observed to be developing. Movement was subsequently arrested by unloading.

On March 21, 1970, in the Tide Lake tunnel of Granduc Operating Company, a fully charged acetylene cylinder, improperly left at the side of the track, was ripped open by the skirt of a man-car on an outbound passenger train. The resulting explosion and fire swept through two man-cars. Altogether 49 men were exposed, 14 of whom received burns and one man suffered a fractured leg.

On March 22, 1970, at the train bay machine shop of the Tide Lake concentrator building of Granduc mine, a welder was overcome by fumes developed from burning styrofoam insulation while making welding repairs to a man-car.

On April 1, 1970, at the 2200 level portal of Horn Silver mine of Utica Mines Ltd., a fire of unknown origin destroyed the surface lunchroom and toolroom. The fire spread to a nearby lean-to and exploded the blasting caps stored in it.

On April 6, 1970, in Granduc mine, a self-propelled drill jumbo went out of control while descending the 3100 inclined ramp and crashed into the drift wall. The two occupants were thrown off receiving minor injuries. It was believed the vehicle was being driven in too high of a gear.

On April 13, 1970, on 5400 level of Britannia mine of Anaconda American Brass Limited, a locomotive operator pressed a horn button which was defective. He received an electric shock which burned his right index finger and inner armpit. On jumping backward off the locomotive he received bruising injuries to his head and shoulders.

On April 13, 1970, at the Highland Valley property of Bethlehem Copper Corporation Ltd., an increased flow of water was noted at the toe of the tailings dam. The services of soil mechanics consultants were obtained and corrective measures adopted.

On April 14, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., a fire which started in the vicinity of an oil–fired heater near the garage doors destroyed that building, the assay laboratory, and other adjacent buildings.

On April 16, 1970, at the Highland Valley property of Bethlehem Copper Corporation Ltd., an improperly parked fuel truck, on which the parking brake was not set or wheel chocks used, ran away causing extensive collision damage to other vehicles parked in the area.

On April 22, 1970, at the Tasu mine of Wesfrob Mines Limited, a fork-lift loader went out of control while travelling at an excessively high speed while descending an access road. The operator reported loss of braking power so dropped the forks which in turn stalled the engine causing a loss of power steering. The vehicle left the road and dropped 20 feet, lodging between the fine ore bins. The operator was thrown off the vehicle and was seriously injured.

On April 23, 1970, at Granduc mine of Granduc Operating Company, a scooptram operator was exposed to an inadequately guarded blasting operation but fortunately escaped without injury.

On April 24, 1970, at the Bluebell mine of Cominco Ltd., a 22-hole sub-drift round was loaded with cartridge explosives and bottom primed with short period delay electric blasting caps. After firing the round the miners returned to the drift face and heard what was suspected to be a blast under the muck pile. An investigation showed at least seven of the loaded holes had not fired and that considerable force had to be applied in depressing the blasting machine plunger rapidly enough to generate its rated current. It was therefore presumed that insufficient current had been generated to fire the full round and that one of the holes that did explode ignited the explosives in a missed hole. The burning of the explosives in the missed hole continued until the detonator was reached when it exploded while the miners were at the drift face.

On April 24, 1970, at the Eagle mine of Davis-Keays Mining Co. Ltd., a miner while descending a wire-rope ladder in a 55-degree raise dislodged the ladder from its pin hanger. The miner received moderate injuries after sliding down a distance of 180 feet to the muck pile at the bottom of the raise.

On April 29, 1970, on the Tide Lake road of Granduc Operating Company, an employee on avalanche control allowed a pick-up truck to pass his guard point

while blasting was being done on a snow cornice above the road. A charge of 16 sticks of dynamite exploded within 50 feet of the truck. There were no injuries.

On April 30, 1970, at Granisle mine of Granisle Copper Limited, an unattended overheated stove set fire to a diamond-drill shack. The fire was extinguished with minor damage.

On May 5, 1970, at the Harmer Ridge breaker station of Kaiser Resources Ltd., a metal plate being replaced on the back of the motor control centre cabinet came in contact with the energized high voltage bus bars. Because the isolating and lockout procedure had not been observed an arc resulted and ignited the insulation and other combustible material causing extensive damage to the equipment.

On May 7, 1970, at the Granduc mine of Granduc Operating Company, a diesel-powered drilling jumbo was being moved on a 15 per cent grade when the brakes failed to hold. At the time the operator was shifting through neutral in order to reverse the direction of travel. The vehicle ran out of control for 8 feet and struck a Scooptram loader. The driver was pinned in his seat and suffered lacerations and bruises. The braking capacity on this and similar vehicles has since been considerably improved.

On May 9, 1970, at the open pit of Cassiar Asbestos Corporation Limited at Cassiar, a loaded truck backed too close to the edge of a bench road which was freshly covered with wet snow. The road shoulder slumped and the truck rolled over landing on its wheels 30 feet below. The operator was slightly injured.

On May 27, 1970, at the Britannia mine of Anaconda American Brass Limited, two men were trapped in a drift for eight hours when wet borehole-raise Machine-cuttings flooded out of a loading point and completely blocked the drift at that point.

On May 29, 1970, at the Boss Mountain mine of Brynnor Mines Limited, two men were severely jolted while descending in a shaft cage. An investigation showed the hinged bar at the top of the cage had jumped out of its slot, stuck in a shaft timber, and wrenched loose from the cage. The bar was replaced and securely bolted.

On June 3, 1970, at Britannia mine of Anaconda American Brass Limited, a miner was standing on the shaft timbers at a level waiting for a 5-pound plumb bob to be lowered from a level above. The plumb bob hung up on a timber and then fell, striking the miner on his hard hat. He sustained a cut and a hairline fracture to his skull. He was restrained from falling down the shaft by a fellow workman standing beside him.

During the first week of June at the Churchill Copper Corporation Ltd.'s, millsite, the camp-site in part was seriously threatened by spring flood water reverting to its former channel from which it had been diverted to impound the camp water supply. Only by round-the-clock use of bulldozers was it possible to divert the flood and to protect 12 mobile-housing units.

On June 10, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., two men partially drilled a drift round, loaded the holes, and left the drilling equipment at the face without notifying anyone of their actions. The men were discharged and their blasting certificates suspended.

On June 16, 1970, the tug servicing Granisle Copper Limited on Babine Lake was found to be sinking while making a regular crossing to the townsite dock. The captain beached the tug and its scow on a small island near the centre of the crossing. An investigation revealed a 4-inch hole in the hull where the propeller guard had been welded to it.

On June 17, 1970, at the Ruth Vermont mine of Copperline Mines Ltd., a workman received serious injuries when he caused a 500-gallon oil tank to explode as he was pressurizing it with about 20 pounds per square inch air pressure while

searching for leaks. One end of the tank suddenly blew out, violently throwing the workman a distance of 10 feet to strike against a pile of lumber.

On June 25, 1970, in the Tide Lake tunnel of Granduc mine, a threaded cast-iron flange on an 8-inch compressed-air line flew apart while under pressure at about 100 psi. No one was injured.

On July 3, 1970, at the Highland Valley assay office of Bethlehem Copper Corporation Ltd., a small fire occurred when clothing was hung too close to an electric heater.

On July 5, 1970, at the Lynx mine of Western Mines Limited, two miners received serious eye injuries and facial cuts when one of them drilled into a bootleg hole containing unexploded explosives. On investigation it was determined that eight bootleg holes had been deepened. A blasting certificate suspension was issued to the miner holding a certificate.

On July 6, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., a car and locomotive capsized over an outside dump when a large rock in the mine car struck the side of the car as it was being dumped. The hold-down arm on the car failed to engage the hold-down safety rail installed on the dump. Dumping procedures were revised and a safety chain located at each dump point with instructions issued to use this chain when dumping cars.

On July 9, 1970, at Britannia mine of Anaconda American Brass Limited, two miners were rendered unconscious from blasting gases after entering an unventilated area in which a heavy blast had been detonated. They had been adequately warned not to enter the area until satisfactory ventilation had been established.

On July 10, 1970, a fire occurred at the supply transformer in No. 6 entry, Balmer North mine, Kaiser Resources Ltd. The circuit-breaker on the high voltage side of the transformer supplying a continuous miner was observed to have tripped out on an overload. On reclosing the high voltage circuit-breaker an electric arc was observed on the low voltage side. This ignited the coal rib 12 inches from the arc. The fire was quickly put out with an extinguisher. Moisture in the plug connector had caused a short circuit.

On July 19, 1970, at the Highland Valley operation of Bethlehem Copper Corporation Ltd., subsequent to the excess leakage noted on April 13 at the toe of the tailings dam, failure cracks were noted in the dam. Following a consulting engineering firm's examination and report a major reinforcing of the dam toe was undertaken.

On July 19, 1970, in the Leduc mine of Granduc Operating Company, a truck driver, while driving down a ramp missed a ventilation door control and on endeavouring to stop found the brakes were not operating satisfactorily. In order to avoid running into the ventilation door he tried to stop the vehicle by running it against the drift wall. The truck capsized and the driver sustained minor injuries.

On July 19, 1970, at the Leduc mine of Granduc Operating Company, a 15-ton battery locomotive caught fire while on charge. Overheating at the resistor compartment caused the fire.

On July 28, 1970, at the Tasu open pit of Wesfrob Mines Limited, an ore truck with dump box raised parted a power shovel cable and, due to mechanical failure, the automatic de-energizing switch failed to function. As the junction box end of the cable was still energized and as switch lock-out procedure had not been observed, a workman received arc burns to his hands when he attempted repairs.

On August 2, 1970, at the Pride of Emory mine of Giant Mascot Mines Limited, a welder burned a small hole in a steel plate above the cone crusher. Some time later a fire was discovered two floors below. The two 30-pound dry chemical

extinguishers brought to combat the fire failed to function and the resulting fire completely destroyed the surface mine plant.

On August 6, 1970, at the Kitsault open pit of British Columbia Molybdenum Limited, a workman was slightly injured while dumping a load of ore on the stockpile when the edge collapsed and the truck rolled over the dump.

On August 7, 1970, two men were slightly injured on the Magnum mine road of Churchill Copper Corporation Ltd., when the truck in which they were riding capsized over the road edge after a tire burst.

On August 21, 1970, at the Glacier Gulch property of Climax Molybdenum Corporation of British Columbia Limited, the hydraulic chuck of a diamond-drill machine slipped while drilling an uphole. Approximately 500 feet of drill rods ran away and was destroyed. Some drift timber sets were damaged. The holding system has been modified.

On August 21, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., a 7-ton mine car capsized while being emptied at the 5200 level dump. A small stone was found in the pneumatic dumping piston and was believed to have caused a sufficiently erratic piston motion as to upset the car.

On August 27, 1970, at the 5900 level dump of the Magnum mine of Churchill Copper Corporation Ltd., a section of the dump slumped a vertical distance of 20 feet after a period of heavy rainfall. The dump was not being used at the time of the incident.

On September 7, 1970, at the Boss Mountain property of Brynnor Mines Limited, a mucking-machine operator sustained a fractured ankle when struck by a run of muck which trapped him after he had climbed into a draw point to release a hang-up.

On September 13, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., an employee became intoxicated while on duty and while driving a company truck, capsized it on the mine road, causing extensive damage to the truck. The employee was uninjured and was fired.

On September 22, 1970, at the Cassiar Asbestos Corporation Limited's open pit, a bulldozer operator was constructing a road ramp when an explosion occurred at the bulldozer blade. An investigation disclosed three Pentax primers and a piece of Primacord buried in the waste material but was not able to determine how these explosives came to be there.

On September 29, 1970, at the Highland Valley operation of Bethlehem Copper Corporation Ltd., two large trucks were involved in a collision. The cause of the accident was determined to be that the trucks were travelling too close to one another and one driver did not ensure the area behind him was clear before reversing.

On September 30, 1970, at the Jersey pit of Bethlehem Copper Corporation Ltd., a fully loaded, 50-ton truck was travelling up a ramp leading out of the pit when a transmission failure occurred. The driver stopped and then decided to back down the ramp to a safe place. After travelling about 250 feet the low air pressure warning signal on the brake system operated and he swung the rear of the truck into the bench wall. The rear wheels rode up the toe of the wall and the truck overturned on its side. The driver was slightly injured. The "fail-safe" braking system has now been modified to become operative sooner.

On October 5, 1970, at the 1300 level battery-charging station in the Lynx mine of Western Mines Limited, a leaking cell of a locomotive battery on charge went dry, overheated, and caught fire.

On October 11, 1970, at the Leduc camp of Granduc Operating Company, the driver of a mining contractor's truck fractured his kneecap when his truck went over the edge of a road and rolled 200 feet to a glacier.

On October 13, 1970, at the Lynx open-pit mine of Western Mines Limited, the driver of an ore truck received minor battery-acid burns when the truck he was driving rolled onto its side as he endeavoured to avoid an oncoming vehicle.

On October 14, 1970, at the Sukunka Project of Brameda Resources Ltd., an employee received minor burns while lighting a fire in a stove, using diesel fuel. The resulting fire destroyed a diamond-drill shack.

On October 24, 1970, at the open-pit rock reject stockpile of Cassiar Asbestos Corporation Limited, approximately 300,000 tons of waste material at the toe of the stockpile slid down the mountainside a vertical distance of about 700 feet and stopped at the mine road. No person was injured. Inasmuch as a former large dump slide occurred in the same area on October 25, 1965, it is conjectured the slide may have occurred as the result of the accumulation of a hydrostatic head behind newly frozen faces.

On October 26, 1970, at the Michel operations of Kaiser Resources Ltd., a driver-contractor stockpiling gravel for Kaiser Resources Ltd. received electrical burns to his hands, knees, and feet on grounding out his truck, the dump body of which had come into contact with a 72,000-volt transmission line.

On October 27, 1970, at the Sukunka Project of Brameda Resources Ltd., a fire of unknown origin destroyed the camp electric-generator building.

On October 29, 1970, at the 5900 level portal of the Eagle mine of Davis-Keays Mining Co. Ltd., a talus slide, of approximately 7,500 cubic yards of rock and soil buried the mine road. There were no injuries to anyone, and it was believed the slide was caused by recent heavy rains.

On November 1, 1970, at the Tasu open pit of Wesfrob Mines Limited, the driver of a truck advised that the truck brakes failed when he endeavoured to stop his loaded vehicle on a down grade to an ore dump, where a second truck was unloading. He also said the engine had stalled and the truck ran away over the dump, but that he had jumped out unharmed before the truck dropped. A subsequent examination failed to disclose any faulty braking equipment.

On November 5, 1970, at the Highland Valley open pit of Lornex Mining Corporation Ltd., the dipper bucket of a large power shovel struck the canopy of a bulldozer which had been moved too close into the "blind-side" area of the shovel operator. No one was injured but operating practices now require shovel operators to blow a siren warning 30 seconds prior to operating the shovel.

On November 12, 1970, at the Bull River mine of Placid Oil Company, the driver of a scraper escaped injury when he accidentally drove over the edge of a road and the scraper rolled down a bank.

On November 16, 1970, on the 800 level of the Annex mine of Reeves MacDonald Mines Limited, the arcing of the controller of a battery locomotive started a fire. Part of the mine was evacuated until the smoke and fumes cleared away.

On November 17, 1970, two men were injured on the Jersey mine road, of Canadian Exploration Limited, when their truck went off the road and rolled 100 feet down a hillside, after they endeavoured to pass another vehicle.

On November 18, 1970, in the mill of Britannia mine of Anaconda American Brass Limited, an employee when grinding a piece of steel allowed it to jam between the tool rest and the grinding wheel, thus causing the wheel to fly apart. No one was injured.

On November 24, 1970, at the open pit of Brenda Mines Limited, a loaded ore truck lost traction while going up one of the mine roads during a snowstorm. The truck was stopped and although the wheels were locked the truck slid backwards off the road and rolled over. The driver received minor injuries when he jumped off the truck prior to it going over the bank.

On November 25, 1970, at the Granduc underground crushing-plant of Granduc Operating Company, hot slag, produced during an oxy-acetylene welding operation, ignited acetylene gas leaking from a hose at its bottle connection.

On November 26, 1970, at the middle adit of the Trojan Horse tunnel on the road to the Tide Lake property of Granduc Operating Company, the operator of a front-end loader was slightly injured as he jumped off his machine when it left the road and rolled down to the shore of Summit Lake about 250 feet vertically below the road.

On November 26, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., a miner was constructing a drill staging in a shrinkage stope when the muck level dropped about 50 feet leaving him stranded on a sprag. Some muck had been drawn five days earlier from a chute below where the miner was working. At that time the muck level dropped about 4 feet and apparently had hung up but had not been adequately checked.

On December 15, 1970, at the Port McNeill concentrate-loading dock for the Benson Lake operation of Cominco Ltd., a fire destroyed the east wing of the dock after a welder had completed a steel-burning operation.

On December 21, 1970, at the Valley Copper mine of Cominco Ltd. in the Highland Valley, the property watchman received minor burn injuries resulting from a propane-gas explosion. Employees of Cigas Products Ltd., while making adjustments to a pipe on a 1,200-gallon propane storage tank at the kitchen complex broke the tank valve at its connection. These men left the immediate area but put a barricade on the highway about 300 yards from the tank. The watchman on returning to the property stopped his car at the barricade where the car ignited the gas which had seeped down to that point. The fire rolled back to the tank and caused a violent explosion which destroyed the office building, cookhouse and dining-hall, and heavily damaged a bunkhouse. The fire subsequently ignited two other 1,200-gallon tanks which later exploded.

PROSECUTIONS

Three prosecutions were instituted under the *Mines Regulation Act* and none under the *Coal Mines Regulation Act.*

A miner employed at the Leduc camp of Granduc Operating Company, while not on shift entered the mine in an intoxicated condition on April 19, 1970. He was charged under section 23, Rules 8 and 280 of the *Mines Regulation Act.* A plea of guilty was made for each charge and fines of $50 were levied for each infraction.

The manager of Hi-Lode Mining Co. Ltd., Ainsworth was, on July 29, 1970, charged with storing explosives in a building not approved as a magazine, contrary to section 23, Rule 24 of the *Mines Regulation Act.* A plea of guilty was made and a fine of $100 levied for the offense.

An electrical foreman at the Tide Lake camp of Granduc Operating Company was, on September 8, 1970, charged under section 22 and section 23, Rule 314 of the *Mines Regulation Act* for failing on August 10, 1970, to enforce and observe the electrical equipment lockout procedures for de-energizing electric circuits on which men were working. At the hearing on December 7, 1970, the defendant was found to be guilty and a fine of $50 was imposed.

BLASTING CERTIFICATE SUSPENSIONS

There were four blasting certificate suspensions made for violations of the explosives and blasting procedure provisions as contained in the *Mines Regulation Act.*

On June 10, 1970, at the Magnum mine of Churchill Copper Corporation Ltd., two miners partially drilled a blasting round, loaded the holes, left their drill at the face, and quit the job without reporting their actions. Their blasting certificates were suspended for a period of three months.

On July 5, 1970, two miners while drilling a drift round in the Lynx mine of Western Mines Limited, deliberately drilled several holes by deepening the sockets of holes which had been previously blasted. While one socket was being deepened an explosion occurred and the miners received serious eye injuries. The certificate of the only certified blaster was suspended for three months.

On October 6, 1970, at the Lynx mine of Western Mines Limited, a miner failed to properly wash out and clean the sockets of the previously blasted holes at his working place. His blasting certificate was suspended for a period of two months.

ELECTRICAL-MECHANICAL

An Electrical Inspector has directed the inspection of electrical equipment since 1946 in the mining industry and since 1954 in the oil industry. Since 1966, a Mechanical Inspector has assisted in the inspection of all mechanical equipment installed in any type of mine or quarry.

Electrical and mechanical reports as presented by L. Wardman, Senior Inspector, Electrical-Mechanical, follow.

ELECTRICAL

In 1970, electric power was used by 46 companies in operations at 49 metal mines and four collieries. Ten concentrators were completed. These were at Brenda mine, Canadian Exploration tungsten mine, Cinola (Midnight) mine, Copperline (Ruth Vermont) mine, Crownite quarry, Golconda mine, Granduc mine, Greyhound (Mother Lode) mine, Magnum mine, and Mount Copeland mine. A pilot plant was installed on the Adera claims of Adanac Mining and Exploration Ltd. Electric power was installed for use during the construction of the Newman mine of Noranda Mines, Limited (Bell Copper Division), Bull River mine, Fording Coal Limited, Gibraltar mine, Island Copper mine, Lornex mine, and Ingerbelle mines. Extensive alterations and additions were made at nine properties. The Giant Mascot mill was burned down in August but rebuilding was commenced immediately. Forty-nine gas and oil well-drilling rigs were operated.

The following table gives the kilovolt-ampere capacity of mining-company-owned plants at metalliferous mines and the amount of power generated in 1970:

Prime Mover	Generator Kva. Capacity	Kilowatt-hours Generated
Diesel engines	42,427	
Hydro	11,410	
Steam turbine	30,000	
Totals	83,837	150,542,186

In the 1969 Annual Report a generator capacity under steam was reported as 30,000,000 instead of 30,000.

The electric power purchased from public utilities and from the generating division of Cominco Ltd. amounted to 860,213,417 kilowatt-hours. This amount, added to that produced by privately owned plants, amounted to 1,010,755,603 kilowatt-hours.

151 in 1969. Of the 369 persons, 192 were instructed in surface mine-rescue work and 177 took the underground mine-rescue course. Lists of those receiving certificates follows:

MINE-RESCUE CERTIFICATES, 1970

Cert. No.	Name	Where Trained
4738	Thomas Travis	Fernie.
4739	Clifford Robertson	Jordan River.
4740	Robertson K. Sam	Jordan River.
4741	Walter Solonika	Jordan River.
4742	Allan M. MacDonald	Jordan River.
4743	Edward John Foran	Jordan River.
4744	Erwin Goertzen	Jordan River.
4745	Ewald Diewert	Jordan River.
4746	Garry Groen	Jordan River.
4747	James R. Aubry	Craigmont mine.
4748	Robert L. Bjarnason	Craigmont mine.
4749	Filmer T. Broadfoot	Craigmont mine.
4750	Michael K. Csaba	Craigmont mine.
4751	Lloyd A. Gavelin	Craigmont mine.
4752	Thomas C. Gronert	Craigmont mine.
4753	James Johnstone	Craigmont mine.
4754	Gerald R. Larson	Craigmont mine.
4755	Roy M. Lornsten	Craigmont mine.
4756	Hans H. Putz	Craigmont mine.
4757	David B. Smylie	Craigmont mine.
4758	Philip M. Dzioba	Pinchi Lake mine.
4759	Gordon E. Doyle	Pinchi Lake mine.
4760	Russell M. Alec	Pinchi Lake mine.
4761	Arthur T. Erickson	Pinchi Lake mine.
4762	Russel A. Gingrich	Pinchi Lake mine.
4763	Reginald G. Walters	Pinchi Lake mine.
4764	Alan D. Burgart	Pinchi Lake mine.
4765	James A. Polzin	Pinchi Lake mine.
4766	Howard J. Leggatt	Pinchi Lake mine.
4767	Alf Aalde (supervision only)	Britannia mine.
4768	John O'Neil	Britannia mine.
4769	William James Walker	Britannia mine.
4770	Clarence Cameron Lee	BCIT.
4771	Philip D. Burt	BCIT.
4772	Robert L. Cyr	BCIT.
4773	Frederick Hoechsmann	BCIT.
4774	Heinz W. Cremers	BCIT.
4775	Stanley T. Miyazaki	BCIT.
4776	Donald W. McKenna	BCIT.
4777	Loris S. Pellizzon	BCIT.
4778	Frederick W. Jarrett	BCIT.
4779	Peter L. Ngai	BCIT.
4780	John A. Cossarini	BCIT.
4781	Guenter K. Behrisch	BCIT.
4782	Ronald J. Elliott	BCIT.
4783	Ronald W. Townson	BCIT.
4784	Jerry T. Tickner	Kamloops.
4785	Robert J. Ramsey	Craigmont mine.
4786	Griffiths C. Taynton	Alwin mine (Ashcroft).
4787	Samuel Morosoff (supervision only)	Mt. Copeland mine.
4788	Albert D. Tidsbury	Prince George.
4789	Gordon James Bradley	Sullivan mine.
4790	Allan D. Purdy	Sullivan mine.
4791	Henry D. Krewenchuk	Sullivan mine.
4792	Harvey R. Jolie	Sullivan mine.
4793	Colin Graham Longmuir	Sullivan mine.
4794	Louis E. Pommier	Sullivan mine.
4795	Warner C. McKay	Sullivan mine.
4796	Donald A. Riva	Sullivan mine.
4797	Paul F. Saxton	Sullivan mine.
4798	Stanford B. Smith	Sullivan mine.
4799	John N. Ali	Sullivan mine.
4800	Kenneth A. Wodyga	Sullivan mine.
4801	Ralph Stewart Jones	Granduc mine.
4802	Barrie Blanchard	Granduc mine.
4803	Peter Rhys Jones	Granduc mine.
4804	John E. Tosney	Granduc mine.
4805	Christopher R. Coleman	Granduc mine.
4806	Terry Grant Martin	Granduc mine.
4807	James Arnold Smith	Granduc mine.
4808	Kent M. MacDonald	Granduc mine.

Equipment	Horsepower
Pumps	2,114
Workshops	715
Miscellaneous	2,644
Total	30,830

One battery locomotive was used for underground haulage.

At coal mines, electric power was used in three open pits, three underground mines, two processing plants, one screening plant, and at three surface operations. The Kaiser Resources Ltd. coal-processing plant was put into service and Fording Coal Limited was preparing to commence construction of a coal-processing plant. There were 10 incidents of damaged trailing cable in the underground coal mines which are not recorded as dangerous occurrences inasmuch as the power cut-off equipment prevented external arcing.

The distribution of the connected load at collieries in operation during 1970 was as follows:

	Horsepower	
Surface—		
Air compressors	2,100	
Electric shovels	15,050	
Electric drills	2,400	
Conveying	2,090	
Hoisting	45	
Haulage	40	
Coal breaker	180	
Coal washing	1,822	
Coal screening	1,010	
Pumping	2,148	
Coke production	1,575	
Ventilation	800	
Miscellaneous	1,267	
Total		30,527
Underground—		
Ventilation	316	
Pumping	166	
Air compressors	290	
Continuous miners	2,140	
Shuttlecars	750	
Loaders	270	
Conveying	1,460	
Hoisting	50	
Miscellaneous	28	
Total		5,480
Total surface and underground		36,007

The increase of 14,802 horsepower of connected load over that of 1969 is mainly that of Kaiser Resources Ltd. together with a small amount for Fording Coal Limited and Brameda Resources Ltd.

There was a total consumption of 96,430,894 kilowatt-hours of electrical power used for coal mining and coal processing during 1970.

A general breakdown of the connected load at mines which operated during 1970 is as follows:

Equipment	Horsepower
Hoists and overhead trams	8,758
Hoists (scraper)	7,640
Electric shovels	13,185
Electric rock drills	2,635
Mucking-machines	130
Fans (mine ventilating)	14,035
Pumps (mine)	9,303
Rectifiers and M.G. sets	11,934
Air compressors	28,089
Sink-float	2,043
Crushing plant	25,869
Grinding equipment	84,507
Concentrating equipment	38,246
Magnetic separators	215
Conveyors	15,532
Pumps (mill)	30,319
Pumps (fresh water)	12,509
Workshops	4,931
Miscellaneous	17,407
Total	327,287

On the track-haulage systems, there were in use 116 battery, 99 trolley, and 31 diesel locomotives.

In 1970, electric power was used at 64 structural-material and industrial-mineral mines and quarries. Power is produced by company-owned plants at 14 of these operations, but is purchased for the remainder. The amount of power produced and purchased is as follows:

	Kilowatt-hours
Produced by diesel-driven generators, 8,773-kva. capacity	23,563,670
Amount purchased	24,410,181
Total	47,973,851

A general breakdown of the connected load is as follows:

Equipment	Horsepower
Hoists and aerial trams	288
Hoists (scraper)	140
Fans	180
Pumps	114
Rectifiers and M.G. sets	8
Air compressors	581
Electric shovels	520
Electric rock drills	70
Drying plants	1,146
Crushing plants	10,113
Conveyors	5,945
Milling	4,732
Screens	1,520

Annual Consumption of Power (in Kilowatt-hours)

Year	Lode Mines	Industrial Minerals	Total	Coal	Total
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
1969	809,729,000	37,675,440	847,404,440	36,658,450	884,062,890
1970	1,010,755,603	47,973,851	1,058,729,374	96,430,894	1,155,160,268

Mechanical

During 1970, 100 new diesel permits were issued to cover the underground operation of diesel-powered equipment. At the end of the year, a total of 345 permits had been issued since the introduction of individual permits in 1968.

A summary of the diesel equipment put into use during the year is as follows:

Diesel Equipment	Number of Permits Issued	Total Horsepower
Locomotives	18	550
Load-haul-dump vehicles	28	2,984
Front-end loaders	2	419
Ore carriers	11	1,000
Tractors	5	262
Drilling jumbos	8	404
Service and personnel vehicles	17	1,226
Graders	3	269
Mobile crane	1	60
Concrete placing equipment	2	120
Scaling platform	1	7
Diamond drills	2	120
Compressors	2	370
Totals	100	7,791

Eight approvals were issued by the Department of Mines and Petroleum Resources during the year for diesel engines that had not been previously 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.

Approval Number	Date Approved	Engine Identification	Brake Horsepower	Minimum Ventilation Requirement
				(C.f.m.)
B.C. Dept. of Mines 1970-1	Mar. 9, 1970	Perkins 4.236	65	22,000
B.C. Dept. of Mines 1970-2	Apr. 22, 1970	Ford V-150 (Caterpillar 1140)	150	21,000
B.C. Dept. of Mines 1970-3	Apr. 30, 1970	Mercedes Benz OM 353	110	10,000
B.C. Dept. of Mines 1970-4	May 8, 1970	International Harvester D 188	60	8,000
B.C. Dept. of Mines 1970-5	June 9, 1970	General Motors 6-71N	197	33,000
B.C. Dept. of Mines 1970-6	July 31, 1970	Caterpillar D333 C-T	238	30,000
B.C. Dept. of Mines 1970-7	July 31, 1970	Caterpillar D343 (A)-TAC	428	36,000
B.C. Dept. of Mines 1970-8	Sept. 8, 1970	International Harvester BD154	40	6,750

Two men were electrocuted when they came in contact with live conductors. One man was fatally injured by electrically driven machinery when it was started while he was working on it. Three men were injured when a machine they were working on was started. There was also one electric fire which started when a live bus in a panel that was being worked on was short-circuited. The importance of ensuring that electrical circuits are de-energized and locked out when working on the circuits or equipment supplied cannot be too strongly stressed. That electrical circuits must be de-energized and locked out when work is being performed is a ruling in both the *Mines Regulation Act* and the *Coal Mines Regulation Act.*

The following graph and table show the power consumption in kilowatt-hours in mining operations since 1961. It will be noted that the total consumption has increased annually since 1961.

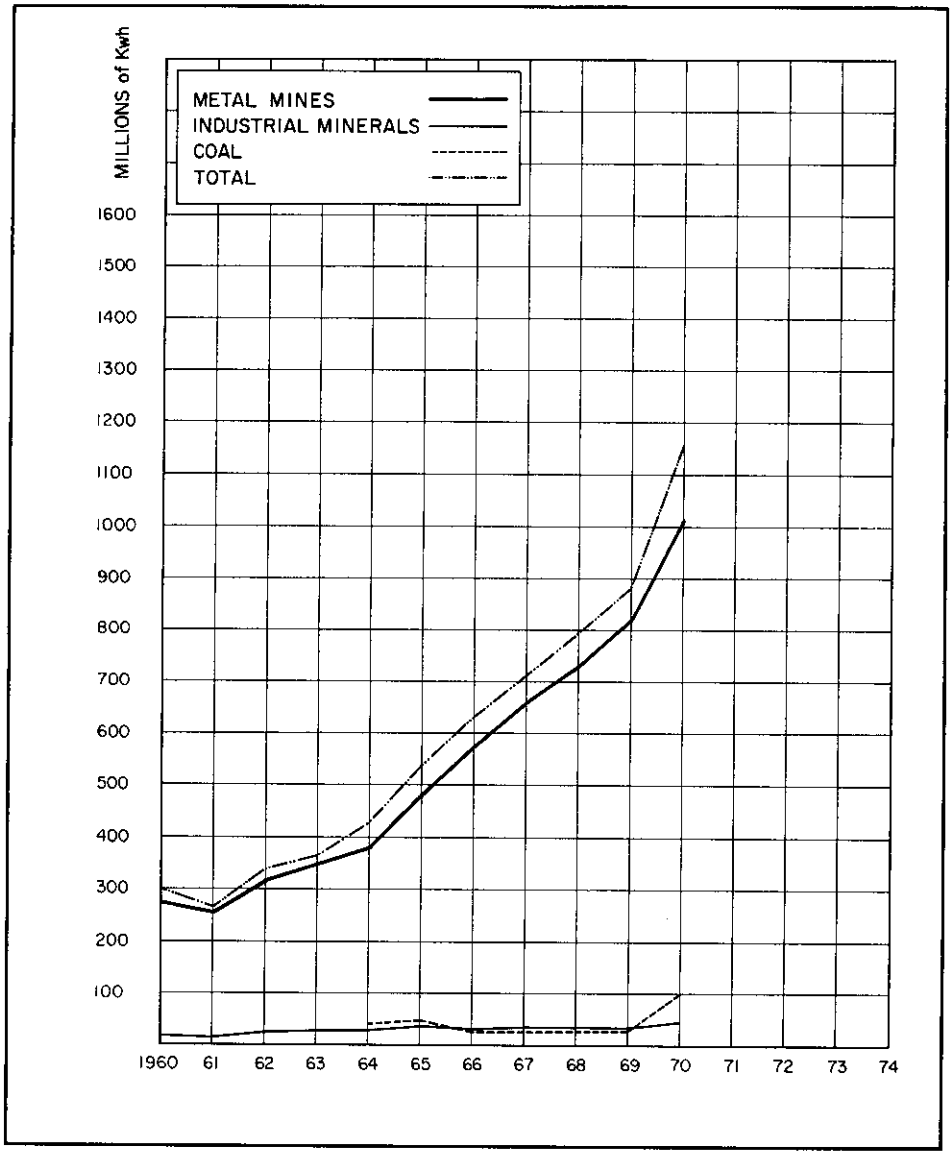


Figure 7. Annual consumption of power in kilowatt-hours, 1960–1970.

The following shaft hoists were put into service during 1970:

Mine	Hoist	Purpose
Anaconda American Brass Limited	Canadian General Electric, 80-inch, four-rope, friction hoist with disc brakes. Maximum rope speed, 2,200 feet per minute. 1,000 HP, DC drive motor	No. 10 shaft—production.
Anaconda American Brass Limited	700 HP, single-drum, 84-inch diameter, 54-inch face width hoist. Maximum allowable rope pull 26,500 lb.; maximum rope speed 1,500 ft./min. (This hoist previously used for sinking No. 10 shaft)	No. 10 shaft—service and personnel.
King Resources Company, Mount Copeland	150 HP, Vulcan Denver, single-drum 48-inch diameter, 48-inch face width hoist. Manufactured 1923. Maximum allowable rope pull 5,050 lb.; maximum rope speed 505 ft./min.	Personnel and service.
Reeves MacDonald Mines Ltd.	200 HP, Bertram Nordberg, 60-inch diameter, 54-inch face width, double-drum hoist. Maximum allowable rope pull 14,800 lb.; maximum rope speed 720 ft./min.	Annex shaft. Production, service, and personnel.

The Canadian General Electric friction hoist commissioned during September 1970 at the No. 10 shaft of Britannia mine is the largest hoist of its kind in British Columbia. The initial hoisting depth is 2,200 feet with a maximum rope speed of 2,200 feet per minute. A 1,000-HP, 105-RPM, 500-volt, DC motor, overhung from the drum shaft, drives the 80-inch diameter friction wheel on heavy-duty spherical roller bearings. There are four $1\frac{3}{16}$-inch diameter, locked-coil, hoisting ropes and two $1\frac{3}{8}$-inch diameter, nonrotating balance ropes. The hoist handles two Sala skips, with pneumatically-operated doors, each capable of carrying a 14,250-pound payload. The rope treads are made of poly-urethane blocks secured by wedge action between special retaining rings on the friction wheel. The maximum allowable suspended load is 95,000 pounds.

The brakes, which are known under the Canadian General Electric name "Axi Disc" are spring-applied, air-released disc brakes. The brake rings or discs which form an integral part of the friction wheel are gripped by eight separate brake engines arranged in four pairs. The brake units are mounted in heavy "C" frames located at each end of the friction wheel. Brake application is "fail safe" in that any failure of the control system, electrical or pneumatic, will cause a release of the springs and a consequent full brake application.

During 1970, 97 breaking-test reports were received for samples of hoisting ropes tested in accordance with Rule 164 of the *Mines Regulation Act.* During the same period of time, 107 nondestructive rope-test reports were received, of which 79 were performed by Wire Rope Industries of Canada, Limited of Vancouver, using the DC Defectograph and the remaining 28 tests were conducted by Rotesco Ltd. of Don Mills, Ontario (formerly McPhar Manufacturing Limited), using the AC Electromagnetic Rope Tester.

As a result of the continued use of nondestructive rope testing, 59 four-month rope life extensions were granted enabling hoisting ropes to remain in service beyond the normal two-year statutory limit.

The use of general nondestructive testing techniques was also continued during 1970 on hoisting equipment and other machine parts. Once again, several defects were discovered by these tests which would not have been discernible by visual inspection alone.

Free-fall drop tests were carried out on cages at the Sullivan No. 1 shaft on September 26, 1970, and at the No. 10 shaft of Britannia mine on November 10, 1970. As far as is known, these are the first free-fall tests to be performed in British Columbia.

Both of these tests were completely successful and proved that the safety catches were correctly designed for the cage involved.

In October 1970, two 35-ton Caterpillar 769 trucks were put into operation at the Invincible mine of Canadian Exploration Limited. These vehicles, which are the largest ever to be used underground in British Columbia mines, are powered by 428 horsepower turbo-charged engines and are 11 feet 8 inches wide, 11 feet 2 inches high, and 25 feet 6 inches long.

At the Benson Lake operation of Coast Copper Company Limited, a Mercedes-Benz Unimog tractor is being used to haul a 30-seat semi-trailer personnel carrier up and down the main 14-degree decline. The tractor engine is a Daimler-Benz OM 353 model developing 110 horsepower. The semi-trailer unit is completely enclosed and is equipped with a fail-safe air-brake system.

Dynamometer tests, conducted on two-cycle diesel engines during 1970 once again revealed much higher concentrations of carbon monoxide in the exhaust gases than for comparable four-cycle engines. Even when larger blowers were fitted in an attempt to obtain better scavenging, no noticeable improvement was detected. As a result of these findings, the only approvals that have been issued for two-cycle engines are for those having low fuel-injection rates with corresponding low horsepower outputs.

The following is a summary of all diesel-powered equipment operated underground during 1970:

Equipment	Number of Units Operated	Total Horsepower
Locomotives	40	1,604
Load-haul-dump vehicles (Wagner Scooptrams, Eimco loaders, Joy transloaders, etc.)	62	6,949
Standard front-end loaders	6	922
Ore carriers (Scootcretes, trucks, etc.)	35	3,396
Tractors	5	280
Drilling jumbos	28	1,589
Graders	6	517
Service and personnel vehicles	45	2,387
Air compressors	2	370
Diamond drills	2	120
Scaling equipment	2	138
Slushers	2	218
Concrete placing equipment	4	180
Welder	1	49
Mobile crane	1	60
Totals	241	18,779

The minimum total volume of mine ventilation required for all this equipment was approximately 2,320,000 cubic feet per minute.

The emergency-steering equipment should enable a vehicle to be brought to a safe stop after an engine failure or stall.

The problem has been solved for trucks by the installation of a battery-driven auxiliary hydraulic pump with either a dash-mounted manual switch or an automatic pressure sensing switch for bringing the pump into operation. This type of battery-driven pump operates very satisfactorily for any size of truck, even for the 200-ton model, because of the relatively small volume of hydraulic fluid required by the steering cylinders. Front-end loaders, however, generally have much larger steering cylinders and battery-driven pumps cannot meet the required demand. The problem has been referred to the various manufacturers of front-end loaders and similar equipment and they are now working on possible solutions.

One manufacturer has already developed a supplemental steering system for loaders using a secondary hydraulic pump driven from the transmission output shaft. This means that adequate hydraulic flow will be maintained as long as the road wheels are turning.

There are a few vehicles that have an over-running clutch built into the transmission which locks the input and output shafts together whenever the output tries to turn faster than the input. With this arrangement, also, the engine is driven by the road wheels and the steering pump output is maintained sufficiently to control the vehicle down to a creep speed.

One manufacturer uses hydraulic accumulators in some front-end loaders and these are very effective in providing emergency steering throughout the braking period after an engine stall.

The following is a summary of the heavy open-pit and quarry equipment in use during 1970:

Dump Trucks (Mostly Off-highway)

Size of Vehicle (Tons)	Number in Use
0–20	152
21–40	202
41–60	29
61–80	11
81–100	43
101–120	12
200	11
Totals	460

Pit Shovels

Size of Shovel (Cubic Yards)	Number in Use
0–2	36
2¼–4	25
4¼–6	14
6¼–8	3
10–11	5
13	1
15	4
25	4
54 (dragline)	1
Total	93

The Sullivan No. 1 shaft is inclined at 39 degrees from the vertical and the success of the test at this installation shows that the standard "double-tooth" safety catch can perform satisfactorily on such an inclination.

These free-fall tests are conducted by putting a load into the cage equal to the maximum man-load carried and allowing the cage to fall freely in the shaft until it reaches a speed equal to the normal maximum hoisting speed. When this speed is reached, the safety catches are released automatically and are pulled into the shaft guides by the spring.

It is only by performing tests such as these, that the correct design of any particular set of safety catches can be reasonably verified and, in future, therefore, a free-fall test report will be required for each new shaft conveyance at the time of its installation.

Trucks and Heavy Mobile Equipment

Once again, during 1970, the trend toward the use of larger and larger equipment in open pits and quarries continued.

Out of a total of 460 dump trucks in use, 77 or almost 17 per cent had a capacity in excess of 60 tons. All of the trucks in this size range have electric-motor wheel drives with diesel-powered prime movers and this type of diesel-electric combination appears to be a firmly established practice at the present time for larger trucks and rubber-tired loaders.

All electric-drive trucks now in use, except the eleven 200-ton units, are fitted with fully approved "fail-safe" braking systems incorporating substantial parking-brake arrangements. Discussions were held throughout the year with the manufacturer of the 200-ton vehicles in an effort to obtain a reliable parking-brake system for these large units, and an arrangement utilizing very heavy spring applied, air-released brakes in conjunction with hydraulically applied service brakes has now been accepted for installation on existing vehicles. The manufacturer has been asked to design a purely mechanical parking-brake system for future production models of these larger-size trucks.

The size of rubber-tired front-end loaders has also increased considerably over the past few years and there are now two of these machines in use with a bucket capacity of from 20 to 25 cubic yards. The mobility and versatility of these large loaders, combined with their lower initial cost, have made them an attractive alternative to shovels in many cases.

Much of the heavy equipment now in use is equipped with a torque-converter transmission system and this means that there is no positive mechanical connection between the final drive (road wheels) and the engine.

In the event of a stalled engine, therefore, there will be comparatively little driving effort on the engine from the wheels at slower speeds, and the output from an engine-driven hydraulic pump may then be insufficient for effective steering.

Several accidents have occurred in the past when the engine of a vehicle stalled and the operator could not steer due to the ensuing loss of hydraulic pressure. In one such instance, a front-end loader operator, having trouble with his brakes, dropped the bucket to the ground in an attempt to stop. This action, however, caused the engine to stall and having neither effective steering nor brakes, the vehicle left the road and overturned.

For these reasons, a new ruling was adopted, during 1970, requiring an emergency steering system for any vehicle that cannot be effectively steered by manual effort alone in the event of a stalled engine. This applies to most of the trucks and front-end loaders using full-hydraulic or hydraulic-assist steering systems.

Thirty-two per cent of the 1970 surveys at drilling operations underground showed averages of less than 300 particles per cubic centimetre of air. Auxiliary blowers with ventube to within 30 feet of the face, at a rate of 50 cubic feet per minute per square foot of face area, have shown good results in reducing the dust concentrations to an acceptable level. The majority of the mining companies practice this standard in development headings such as drifts and sublevels but at raise and drawhole development headings control is still a problem.

At "all other" underground locations excluding drilling operations the percentage of surveys with an average of 300 particles per cubic centimetre of air or less was 75 per cent. This compares with the 1969 results which was 76 per cent.

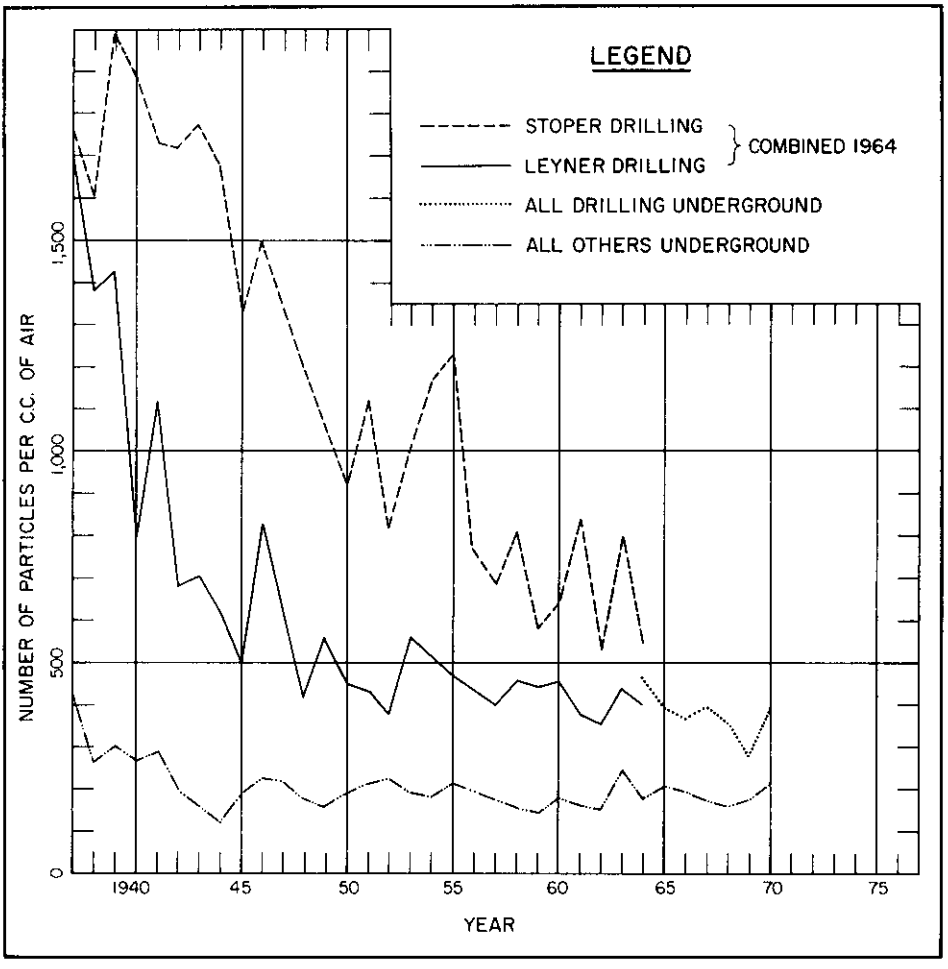


Figure 8. Average underground dust counts.

Front-end Loaders

Size of Bucket (Cubic Yards)	Number in Use
0–2	96
2¼–4	102
4¼–6	33
8¼–10	3
10¼–12	4
15	2
20–25	2
Total	242

ENVIRONMENTAL CONTROL

Dust and Ventilation

Again, as in 1969, owing to difficulties in obtaining an adequately experienced individual to fill a staff vacancy, the 59 surveys of dust and ventilation conditions completed at 56 operations were considerably less than desirable. The surveys were made in underground and open-pit lode and coal mines, rock quarries, sand and gravel pits, and an asbestos open-pit mine.

The summary of the report of the Senior Inspector, S. Elias, follows:

The threshold limit value of TLV or maximum allowable dust concentrations are periodically adjusted as more technical and medical evidence becomes available. The standards in use in British Columbia are as follows:

For silica dust in the metal-mining industry when using the Gathercole konimeter as the sampling instrument and using the standard processing and counting technique (also used in Ontario) the maximum is 300 particles per cubic centimetre of air.

For asbestos dust in the asbestos-mining industry 5 million particles per cubic foot of air is the standard when using the Midget Impinger sampler and the standard method for determining asbestos-dust concentrations as approved by The Asbestos Textile Institute and Quebec. This standard is presently under study for revision. A 2-million-particles-per-cubic-foot standard is being considered, should medical evidence indicate necessity.

For coal dust in the coal-mining industry the standard has been changed from the long-running thermal precipitator to the gravimetric sampling method. When using the gravimetric personal respirable dust sampler a temporary standard of 4.5 milligrams per cubic metre is used, but a standard of 3 milligrams per cubic metre is under study.

The gravimetric personal respirable dust sampler is a two-stage device. The first stage, a 10-millimetre nylon cyclone, perfoms as an elutriator or size selector whose penetration conforms to a curve which is in close agreement with the criterion reported by the U.S. Atomic Energy Commission. The second stage is a membrane filter that collects the respirable fraction of the dust. The dust collected is weighed to the nearest 0.1 milligram, and concentrations are expressed as milligrams of dust per cubic metre of air sampled. The personal sampler continuously samples air from the workers' breathing zone during the full working shift. The atmosphere is drawn through the device at 2 litres per minute by a portable battery-operated diaphragm pump. Correlation with the British Medical Research Establishment instrument may be made by multiplying the results by a constant factor of 1.6 to give an equivalent dust concentration.

cent of the surveys were less than 300 particles per cubic centimetre of air; at bagging operations, 33 per cent of the surveys were less than 300 particles per cubic centimetre of air. There are a number of crushing plants that are not equipped with adequate dust-control systems. All crushing plants require an exhaust system to maintain acceptable conditions.

In the asbestos mining and milling operations, 84 per cent of the samples taken were below 5 million particles per cubic foot.

Seventy-three per cent of the locations sampled about the coal mines were under 4.5 milligrams of dust per cubic metre of air temporary standard.

Certificates of medical fitness were checked at the mines. In the lode-mining industry, 97 per cent had the required certificates. In the asbestos-mining industry 100 per cent had the required certificates of fitness. In the coal-mining industry 1,647 workmen were given an X-ray and medical for certificates of fitness in 1970.

The foregoing graphs show the median of all dust-count averages in various operations in the lode mines obtained each year since 1937.

Noise Control

The maximum exposure criteria for hearing preservation of unprotected ears has been changed to conform with the standards set by the Canada Department of Labour Safety Code and is herewith detailed.

1.

Sound Level dBA (*a*)	Maximum Duration per Day in Hours (*b*)
90	8
92	6
95	4
97	3
100	2
102	1.5
105	1
110	0.5
115	0.25
Greater than 115	0.0

(*a*) *Sound level*—In decibels as measured on the A scale of a standard sound-level metre at slow response or the equivalent.

(*b*) *Maximum duration per day hours*—Based on continuous exposure for the period indicated for an 8-hour work day and a 40-hour work week.

2. Unprotected ears shall not be exposed to impulsive or impact noise which has a peak sound pressure level C in excess of 140 decibels.

Eighty-seven per cent of the workmen were wearing ear protection and 89 per cent of the drills used underground were muffled. All but one manufacturer of drilling equipment are producing some acceptable drills that are equipped with integral mufflers.

SHIFTBOSS CERTIFICATES

Section 21 of the *Mines Regulation Act* requires that every person employed underground or in open-pit workings must be under the daily supervision of an official who is the holder of a shiftboss certificate issued under that Act. In addition section 23 of the *Coal Mines Regulation Act* requires that every person employed in open-pit workings at a coal mine shall be under the daily supervision of a shiftboss or other official who is the holder of an open-pit shiftboss certificate issued under that Act.

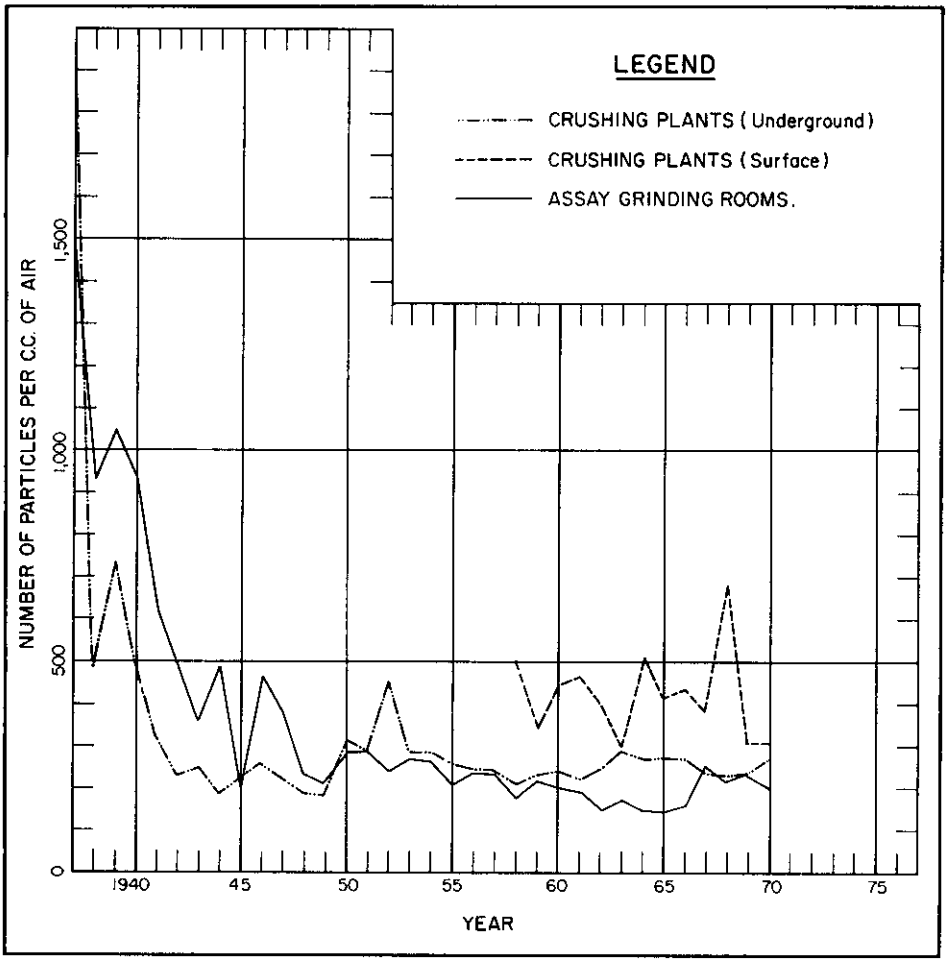


Figure 9. Average crushing and grinding dust counts.

In crushing plants at underground operations 56 per cent of the surveys showed an average dust concentration of less than 300 particles per cubic centimetre of air. All plants require an exhaust system to control the dust hazard. The present technology gives enough information that an adequate dust-control system may be designed that will maintain the desired standards.

In the open-pit mines the conditions found were as follows: At drilling operations, 75 per cent of the surveys were less than 300 particles per cubic centimetre of air. At all other operations in the pit, 100 per cent of the surveys were less than 300 particles per cubic centimetre of air. At crushing plants at open-pit mines, 46 per cent of the surveys were less than 300 particles per cubic centimetre of air.

Sixty-one per cent of the surveys made in the assay grinding rooms gave averages of less than 300 particles per cubic centimetre of air. Inadequate hood face velocity and the use of high pressure compressed air for cleaning appears to be the cause for the adverse conditions.

At rock and limestone quarries the results of the dust surveys showed the following: At drilling operations, 100 per cent of the surveys were less than 300 particles per cubic centimetre of air; at "all other" operations in the quarries, 100 per

CERTIFICATES OF COMPETENCY

Sections 23 and 24 of the *Coal Mines Regulation Act* require that managers and certain other supervisory officials of underground coal mines shall be holders of certificates of competency issued under this Act. A Board of Examiners is responsible for setting examinations from time to time for these certificates, for considering applications for interchange certificates, and advising the Minister in accordance with section 26 (3) of the Act. In 1970 there were two candidates who presented themselves for examinations and four applicants for interchange, all of whom were granted certificates.

CERTIFICATES OF COMPETENCY AS COAL MINE OFFICIALS, 1970

Cert. No.	Name	Date	Cert. No.	Name	Date
	First-class Certificates of Competency			*Third-class Certificates of Competency*	
A227	Grimley, Arthur Thomas	Mar. 23, 1970	C1044	McAdam, William	Jan. 13, 1970
A228	Sieling, Ronald E.	July 27, 1970	C1045	Taje, Edward	Nov. 2, 1970
	Second-class Certificates of Competency		C1046	Fuchs, Walter B.	Dec. 1, 1970
B337	McAdam, William A.	May 13, 1970			

MINE RESCUE, SAFETY, AND FIRST AID

Mine-rescue stations fully supplied with various types of mine-rescue equipment are maintained at Fernie, Kamloops, Nanaimo, and Nelson. At each station is a fully qualified instructor for mine-rescue and first-aid training. 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 supplied with sufficient self-contained oxygen-supplying equipment to maintain at least two mine-rescue teams of six men each should any emergency arise in nearby mines. In 1970 an additional 13 Aerorlox liquid-oxygen apparatuses were purchased, seven being forwarded to the Kamloops station and six to the Nanaimo station. In addition to the equipment at the stations, some is on loan to supplement that owned by various mining companies. The district instructors periodically check all rescue equipment to ensure its serviceability.

In 1969, the revision of the *Coal Mines Regulation Act* and the amendments to the *Mines Regulation Act* made it requisite that everyone employed in open-pit mining be under the daily supervision of a person who is the holder of an open-pit shiftboss certificate. In order to qualify for a certificate an applicant must pass an examination on the appropriate Act on regulations and rules pertaining to open-pit mining, to have a currently valid first-aid certificate, and hold a surface mine-rescue certificate. As the current underground mine-rescue training course was not completely practical for open-pit mining, it was revised and with additions made adaptable to surface-mining operations. The development of this course and the increased demand for the training in mine rescue and first aid for shiftboss certificate applicants greatly increased the work load for the instructors. Classes in both subjects were held at various mines and centres throughout the Province. At these classes the instructors trained or assisted in the training of 409 persons obtaining St. John Ambulance first-aid certificates and 54 candidates for Industrial first-aid certificates. In addition they trained 369 men in mine-rescue work in 1970 as compared with

An applicant for a shiftboss certificate must hold a mine-rescue certificate (surface or underground as requisite), a currently valid first-aid certificate, and is required to pass an examination on the regulations and rules as contained in the respective Acts. Two different certificates are issued, one for underground metal-mining operations and the other which is valid at both coal- and metal-mining open pits and at quarries. 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 1970, 184 provisional certificates were issued.

Examinations were held at various places throughout the Province, and of the 299 applicants, 197 wrote the examinations and 113 candidates passed. There were 89 shiftboss certificates issued, 42 to underground shiftbosses and 47 to those employed in open-pit mining. The recipients are listed in the following tables.

Underground Shiftboss Certificates, 1970

Cert. No.	Name	Date	Cert. No.	Name	Date
571	Hedley James Clayton	20/1/70	592	Lawrence Olson	2/6/70
572	Eloi J. Cormier	20/1/70	593	Robert Ross Kilmore	4/6/70
573	John Paul Emond	2/2/70	594	John Alexander Cossarini	4/6/70
574	William Burton Langille	6/2/70	595	George Gottfried Brisch	15/6/70
575	Gordon William Wright	12/2/70	596	Edward John Foran	22/6/70
576	Albert J. Skiffington	3/3/70	597	Kalman Borsos	23/6/70
577	Gerald Robert Larson	5/3/70	598	Kenneth Murray Bryson	29/6/70
578	James Ronald Aubry	5/3/70	599	Keith George McFadden	30/6/70
579	Orville Reverdy Maulsby	9/3/70	600	Charles Richard Bergstrom	6/7/70
580	Alf Aalde	26/3/70	601	John Robert Thomson	3/8/70
581	Teddy Pomarenski	31/3/70	602	Ernest Clarence Heichert	17/8/70
582	Brian H. Cudmore	10/4/70	603	Barrie Blanchard	17/8/70
583	Arne Olaf Egge	22/4/70	604	James Johnstone	18/8/70
584	Cornelius Robert Unruh	22/4/70	605	Lloyd Alexander Gavelin	18/8/70
585	Robert Wyka	29/4/70	606	Hans Herman Putz	25/8/70
586	Clayton Allan Dake	30/4/70	607	James Allan Brandle	1/9/70
587	David B. Smylie	4/5/70	608	Gordon Robert Gould	20/10/70
588	James Stewart	8/5/70	609	Henri Labelle	20/10/70
589	William Alexander Howe	15/5/70	610	John Joseph Retza	2/11/70
590	Michael L. Shields	15/5/70	611	Maurice Norman Balez	21/12/70
591	Howard Andrew Simpson	15/5/70	612	Royce James Stevenson	21/12/70

Open Pit Shiftboss Certificates, 1970

Cert. No.	Name	Date	Cert. No.	Name	Date
OP-1	Thomas Hayes Robertson	1/5/70	OP-25	Miklos Gyuricza	14/10/70
OP-2	James Joseph Elliot Anderson	5/5/70	OP-26	Roy C. Ashley	3/11/70
OP-3	Ian Douglas Graham	2/6/70	OP-27	Herman Sharkey	3/11/70
OP-4	Anthonie Luteijn	2/6/70	OP-28	Kenneth Howard Amundson	1/12/70
OP-5	Lawrence Wilfred Riffel	2/6/70	OP-29	Joseph Ernest Breland	1/12/70
OP-6	Arnold Webster	2/6/70	OP-30	Stuart Arnold Campbell	1/12/70
OP-7	George Gottfried Brisch	15/6/70	OP-31	Joseph Louis Alphonse Castagner	1/12/70
OP-8	Gordon Martin Begon	24/6/70	OP-32	James Joseph Denby	1/12/70
OP-9	Luke Thompson Kirby	24/6/70	OP-33	Terrance Ernest Gillespie	1/12/70
OP-10	David McNaughton Potter	29/6/70	OP-34	William Walter Alan Hogan	1/12/70
OP-11	Douglas Glen Bailey	7/7/70	OP-35	Larry Ellis Kniert	1/12/70
OP-12	Gordon Reay Garayt	7/7/70	OP-36	James Eugen Korski	1/12/70
OP-13	David Harry Hunt	7/7/70	OP-37	Jack Thomas Marasco	1/12/70
OP-14	John Thomas McIntosh	7/7/70	OP-38	Douglas Glen Peppard	1/12/70
OP-15	Arthur Robert Sharp	7/7/70	OP-39	Leonard Theodore Ricker	1/12/70
OP-16	George Arthur Sutherland	7/7/70	OP-40	William Savilow	1/12/70
OP-17	Dennis Hellewell	13/7/70	OP-41	James Edward Smith	1/12/70
OP-18	Larry W. Reaugh	20/7/70	OP-42	Robert James Willox	1/12/70
OP-19	Paul Napoleon Brulotte	20/7/70	OP-43	John Clendon Youd	1/12/70
OP-20	Glen Munro Willett	20/7/70	OP-44	Charles L. Stafford	2/12/70
OP-21	Roy Patterson Easton	21/7/70	OP-45	Albert Littler	8/12/70
OP-22	Raymond Bozzer	25/8/70	OP-46	Norman Leonard Ritchat	11/12/70
OP-23	Norman Harold Bennett	9/9/70	OP-47	Harold Cyrus Pennoyer	11/12/70
OP-24	Orion Malcolm Walmsley	5/10/70	OP-48	Richard J. J. Lampson	18/12/70

MINE-RESCUE CERTIFICATES, 1970—*Continued*

Cert. No.	Name	Where Trained
4809	Joseph P. Tourigny	Granduc mine.
4810	William James Crowson	Granduc mine.
4811	James J. Doyle	Granduc mine.
4812	Frederick G. Gibbons	Granduc mine.
4813	Edwin A. Teiber	Granduc mine.
4814	John Duffy	Granduc mine.
4815	Hans H. Baule	Granduc mine.
4816	Roy James Moss	Fernie.
4817	Peter George Reghenas	Fernie.
4818	William Norman Baddeley	Fernie.
4819	Edgar Clinton Hubbard	Highland Bell mine.
4820	Phillip E. O. Smith	Highland Bell mine.
4821	Donald Anton Gardner	Highland Bell mine.
4822	Eugene Larabie	Highland Bell mine.
4823	Jon C. Guy	Highland Bell mine.
4824	Ruben S. Verzos	Highland Bell mine.
4825	Gordon L. Frederick	Highland Bell mine.
4826	Peter L. Cousins	Granduc mine.
4827	Rene P. J. Bergeron	Reeves MacDonald mnie.
4828	Walter Greavison	Golac Construction (Nelson).
4829	Ole Peder Almaas	Sullivan mine.
4830	Vincent Cloudlesley Richards	Britannia mine.
4831	Fred J. Soltys	Ruth Vermont mine.
4832	Henry Fuhrmann	Davis-Keays (Eagle mine).
4833	Leo Tazzer	Davis-Keays (Eagle mine).
4834	Reinhold Sprott	Davis-Keays (Eagle mine).
4835	Ronald G. Ingimundson	Davis-Keays (Eagle mine).
4836	Gerald Bergeron	Davis-Keays (Eagle mine).
4837	Fred Fernand Tremblay	Davis-Keays (Eagle mine).
4838	Anthony L. Morin	Davis-Keays (Eagle mine).
4839	Leslie Toth	Davis-Keays (Eagle mine).
4840	Ewald Broeker	Davis-Keays (Eagle mine).
4841	Michael J. P. Lynch	Davis-Keays (Eagle mine).
4842	Richard Reimer	Davis-Keays (Eagle mine).
4843	Pat A. Borek	Davis-Keays (Eagle mine).
4844	Istan Steve Hliva	Davis-Keays (Eagle mine).
4845	Gordon F. Carruthers	Davis-Keays (Eagle mine).
4846	Doug John Fraser	Churchill Copper (Magnum mine).
4847	Donald K. Murphy	Churchill Copper (Magnum mine).
4848	Alan Eugene Craig	Churchill Copper (Magnum mine).
4849	James William Harrower	Churchill Copper (Magnum mine).
4850	Stephen George Voycheshin	Churchill Copper (Magnum mine).
4851	Eric P. Brown	Churchill Copper (Magnum mine).
4852	Murray McInnis	Churchill Copper (Magnum mine).
4853	Hugh Charles Ducasse	Churchill Copper (Magnum mine).
4854	Sandor Molnar	Churchill Copper (Magnum mine).
4855	Michael Patrick Noonan	Churchill Copper (Magnum mine).
4856	Ken Jakubowicz	Churchill Copper (Magnum mine).
4857	Terry W. MacLean	Churchill Copper (Magnum mine).
4858	Lorne Stephens	Churchill Copper (Magnum mine).
4859	Frederick James Johnson	Churchill Copper (Magnum mine).
4860	Ronald Wayne Osborne	Coast Copper (Old Sport mine).
4861	Cecil Edwin Donovan	Coast Copper (Old Sport mine).
4862	John Robert Mahylis	Coast Copper (Old Sport mine).
4863	Donald George Allibone	Coast Copper (Old Sport mine).
4864	Andre Morin	Coast Copper (Old Sport mine).
4865	David L. Anderson	Coast Copper (Old Sport mine).
4866	Stewart C. Clydesdale	Mt. Copeland mine.
4867	David G. Wilkinson	Mt. Copeland mine.
4868	Alfred C. Wiedemann	Mt. Copeland mine.
4869	Edward P. Wilkins	Mt. Copeland mine.
4870	Bodo F. Wiedemann	Mt. Copeland mine.
4871	Leo J. Bourassa	Gremac Construction (Rossland).
4872	Albert Jerome Gartner	Texada mine.
4873	Blaine Edwin Smith	Texada mine.
4874	Mainville Leclair	Texada mine.
4875	Harold M. Diggon	Texada mine.
4876	Puis P. Gartner	Texada mine.
4877	Patrick C. Robinson	Granduc mine.
4878	Ian James Donaldson	Granduc mine.
4879	Zedenek Fisher	Granduc mine.
4880	Keith J. Vallard	Granduc mine.
4881	Hilton J. Gillies	Granduc mine.

MINE-RESCUE CERTIFICATES, 1970—*Continued*

Cert. No.	Name	Where Trained
4882	Elie Bouchard	Granduc mine.
4883	David J. Bricknell	Granduc mine.
4884	Gordon D. Watts	Granduc mine.
4885	Klaus D. Merten	Granduc mine.
4886	Christopher A. Preston	Granduc mine.
4887	Vaclav V. Kadlec	Granduc mine.
4888	Eugene C. Nagy	Granduc mine.
4889	Witold Cichon	Granduc mine.
4890	Peter A. Blake	Granduc mine.
4891	Donald A. Davidson (supervision only)	Climax Molybdenum (Glacier Gulch).
4892	Gerhard Krausnig	Climax Molybdenum (Glacier Gulch).
4893	Kent E. Card	Climax Molybdenum (Glacier Gulch).
4894	George Braun	Silver Standard mine.
4895	Werner Wm. Dieno	Inspiration Drilling (Smithers).
4896	Yvon G. Baissonneault	Inspiration Drilling (Smithers).
4897	Norman D. Anderson	Inspiration Drilling (Smithers).

SURFACE MINE-RESCUE CERTIFICATES, 1970

Cert. No.	Name	Where Trained
O-201	Herman E. Sharkey	Ashcroft.
O-21	Roy C. Ashley	Ashcroft.
O-22	Gordon M. Begon	Ashcroft.
O-23	Glen G. Walters	Ashcroft.
O-24	Luke T. Kirby	Ashcroft.
O-25	Leslie R. Archibald	Ashcroft.
O-26	Larry W. Reaugh	Ashcroft.
O-27	Richard L. Bouck	Ashcroft.
O-28	Jerry R. LeBlanc	Ashcroft.
O-29	John E. Merrett	Ashcroft.
O-30	Edward S. Sadar	Ashcroft.
O-31	George J. Lee	Ashcroft.
O-32	Ruth C. Smith (supervision only)	Tasu.
O-33	Stuart J. MacDonald (supervision only)	Tasu.
O-34	Henry B. Sanders (supervision only)	Tasu.
O-35	Harry Bapty	Tasu.
O-36	Dwight O. St. Germain	Tasu.
O-37	Kenneth R. Speer	Tasu.
O-38	Steven A. Wulf	Tasu.
O-39	Peter B. Hermiston	Tasu.
O-40	Raymond A. Gagnon	Tasu.
O-41	Frank Kovacs	Tasu.
O-42	Norman H. Bennett	Tasu.
O-43	William G. Sanders	Tasu.
O-44	John G. Csurdi	Tasu.
O-45	Siegfried W. Tittle	Tasu.
O-46	Norman S. Smith	Tasu.
O-47	Charles L. Stafford	Tasu.
O-48	Joe J. Fumic	Tasu.
O-49	Julian R. J. Gagnon	Tasu.
O-50	Richard W. Lewis	Fernie.
O-51	Albert Littler	Fernie.
O-52	Lanny E. Kniert	Fernie.
O-53	Leonard T. Ricker	Fernie.
O-54	Jack T. Marasco	Fernie.
O-55	Klaas Velting	Fernie.
O-56	Stuart A. Campbell	Fernie.
O-57	David M. Potter	Fernie.
O-58	John C. Youd	Fernie.
O-59	Orion M. Walmsley	Fernie.
O-60	Dennis Hellewell	Fernie.
O-61	Norman L. Ritchat	Fernie.
O-62	Ernest Breland	Fernie.
O-63	Miklos Gyuricza	Fernie.
O-64	Ian D. Graham	Fernie.
O-65	Arnold Webster	Fernie.
O-66	James J. E. Anderson	Fernie.
O-67	Glen M. Willett	Fernie.

O signifies open-pit training.

SURFACE MINE-RESCUE CERTIFICATES, 1970—*Continued*

Cert. No.	Name	Where Trained
O-68	Anthonie Luteijn	Fernie.
O-69	Louis A. J. Castagner	Fernie.
O-70	Lawrence W. Riffel	Fernie.
O-71	Harold C. Pennoyer	Fernie.
O-72	Fred Caldwell	Fernie.
O-73	Paul N. Brulotte	Fernie.
O-74	Frederick Panisiak	Fernie.
O-75	Marc Lemieux	Kitsault.
O-76	John W. Sanders	Kitsault.
O-77	Alan R. Paul	Kitsault.
O-78	Gregory D. Savage	Kitsault.
O-79	Robert R. Schwartz	Kitsault.
O-80	John C. Ross	Kitsault.
O-81	David J. Forsyth	Kitsault.
O-82	Gary Crossman	Kitsault.
O-83	Rueben J. Beck	Kitsault.
O-84	R. Douglas B. Linzey	Kitsault.
O-85	Roy F. Fogarty	Kitsault.
O-86	Howard A. Wilhelm	Kitsault.
O-87	Grant McFarlane	Kitsault.
O-88	Arthur S. Morris	Kitsault.
O-89	William S. Browning	Kitsault.
O-90	Karl M. Butler	Kitsault.
O-91	William Geluk	Kitsault.
O-92	Hans J. Auer	Kitsault.
O-93	John A. MacDonald	Kitsault.
O-94	Harvey S. Clarke	Kitsault.
O-95	Robert S. Cram	Kitsault.
O-96	Kenneth Fraser	Kitsault.
O-97	William F. Klingbell	Kitsault.
O-98	Nestor D. Cherwonak	Granisle.
O-99	Bernard F. Hartinger	Granisle.
O-100	John E. Lane	Granisle.
O-101	Robert G. Morris	Granisle.
O-102	Raymond Bozzer	Granisle.
O-103	Edward V. Morris	Granisle.
O-104	Andrew A. Corden	Granisle.
O-105	Edward H. Moroz	Granisle.
O-106	Robert G. Gemmell	Granisle.
O-107	Edward Eftodie	Granisle.
O-108	Edward L. Greengrove	Granisle.
O-109	Michael Hawley	Granisle.
O-110	William A. Zelisney	Granisle.
O-111	George G. Brisch	Granisle.
O-112	Marvin A. Carlson	Granisle.
O-113	Ronald P. Materi	Granisle.
O-114	John P. Oleshko	Granisle.
O-115	Larry B. Carlson	Granisle.
O-116	Larry Gunst	Granisle.
O-117	Dennis L. Gerard	Granisle.
O-118	Richard D. Martens	Granisle.
O-119	Robert Mullin	Granisle.
O-120	Albert D. Tidsbury	Prince George.
O-121	George Kaisner	Natal.
O-122	Fergus Patrick Kerr	Fernie.
O-123	Robert James Willox	Invermere.
O-124	James Edward Smith	Invermere.
O-125	Douglas Glen Peppard	Fernie.
O-126	Ian W. Pond	Granisle.
O-127	Wilf W. Larmour (supervision only)	Kitsault.
O-128	Joseph J. Denby	Invermere.
O-129	John William Robinson	Vancouver.
O-130	William Cuthbert Robinson	Vancouver.
O-131	William David Webster	Vananda.
O-132	Joseph Graham Murray	Vananda.
O-133	Grant Waldorf	Vananda.
O-134	Robert Frederick Cuthbertson	Vananda.
O-135	Donald Fredrick Lockstead	Vananda.
O-136	Peter Marlatt Stiles	Vananda.
O-137	Gordon Coupland	Vananda.
O-138	Glen Vernon Downing	Vananda.
O-139	Alexander Fielkowich	Vananda.
O-140	Frederick Matthew Raleigh	Vananda.

O signifies open-pit training.

SURFACE MINE-RESCUE CERTIFICATES, 1970—*Continued*

Cert. No.	Name	Where Trained
O-141	Harold Melvin Diggon	Vananda.
O-142	Joseph Frederick Flynn	Vananda.
O-143	Royce James Stevenson	Vananda.
O-144	Richard Alexander McKay	Vananda.
O-145	Walter Richard Liebick (supervision only)	Vananda.
O-146	James E. Korski	Fernie.
O-147	Alan J. Merritt	Fernie.
O-148	William Savilow	Fernie.
O-149	William A. Hogan	Fernie.
O-150	Kenneth H. Amundson	Fernie.
O-151	Terrance E. Gillespie	Fernie.
O-152	Douglas G. Matheson	Brenda Mines.
O-153	Earl A. Hargrove	Brenda Mines.
O-154	Donald G. Miller	Brenda Mines.
O-155	William D. Scribner	Brenda Mines.
O-156	David E. Kostuik	Brenda Mines.
O-157	George E. Colby	Brenda Mines.
O-158	Ronald George Bradburn	Brenda Mines.
O-159	John C. Slivinski	Brenda Mines.
O-160	Bert Maxey	Brenda Mines.
O-161	James Adrien Bertrand	Brenda Mines.
O-162	Norman Dawson	Brenda Mines.
O-163	Edward Bolton	Brenda Mines.
O-164	Gilbert Calvin Erback	Brenda Mines.
O-165	Douglas F. H. Whitford	Brenda Mines.
O-166	David Smith	Kamloops.
O-167	Philip Edward Olson	Nelson.
O-168	Norman G. Aasen	Grand Forks.
O-169	John Peter Anderson	Grand Forks.
O-170	Peter R. H. Armes	Grand Forks.
O-171	William John Beck	Grand Forks.
O-172	Lawrence Cheveldieff	Grand Forks.
O-173	John David Crellin	Grand Forks.
O-174	William Hingley	Grand Forks.
O-175	Lloyd Evan Iverson	Grand Forks.
O-176	William Gwyn Jones	Grand Forks.
O-177	Thomas John Keogh	Grand Forks.
O-178	Noel James Kirby	Grand Forks.
O-179	Norman B. MacNab	Grand Forks.
O-180	William Ortis	Grand Forks.
O-181	Kay Osachoff	Grand Forks.
O-182	William George Palm	Grand Forks.
O-183	William Papove	Grand Forks.
O-184	Paul Papove	Grand Forks.
O-185	Edwin Alfred Shannon	Grand Forks.
O-186	Nick S. Strukoff	Grand Forks.
O-187	Roger Philip Taylor	Grand Forks.
O-188	Roger William Turner	Grand Forks.
O-189	Norman Varabioff	Grand Forks.
O-190	Arthur Wilkinson	Grand Forks.
O-191	Steve Bernard	Greenwood.
O-192	Les Bolen	Greenwood.
O-193	Alan Lee Cudworth	Greenwood.
O-194	James Thomas Fox	Greenwood.
O-195	Clarence Martin	Greenwood.
O-196	Albert Larry Scott	Greenwood.
O-197	James A. Wallace	Greenwood.
O-198	Gerald Wilkie	Greenwood.
O-199	Jerry Silver	Pinchi Lake mine.
O-200	Roy G. McLeish Sr.	Pinchi Lake mine.
O-201	Robert G. Colthorp	Pinchi Lake mine.
O-202	Roy P. Easton	Pinchi Lake mine.
O-203	Howard J. Leggatt	Pinchi Lake mine.
O-204	Alexander Borodula	Fernie.
O-205	Benjamin Thomas Palmer	Fernie.
O-206	Anthony Cerny	Fernie.
O-207	Gilbert Brust	Fernie.
O-208	Gary K. Livingstone	Fernie.
O-209	George Herbert Lancaster	Fernie.
O-210	Blake B. Anderson	Fernie.
O-211	Paul E. Dyer	Fernie.

[1] O signifies open-pit training.

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 56th annual competition in Nanaimo on May 23. The four teams that competed in the mine-rescue event came from Britannia, Coast Copper, Texada, and Lynx mines. The winning team was that of Texada Mines Ltd. and was captained by Donald C. Legault.

The West Kootenay Mine Safety Association held its 24th annual competition at Nelson on May 23, 1970. The four competing mine-rescue teams came from Bluebell, Jersey, Phoenix, and Reeves MacDonald mines. The Canadian Exploration Company team from the Jersey mine and captained by A. Nord won the district shield.

The Central British Columbia Mine Safety Association held its 22nd annual competition at Kamloops on May 30, 1970. The five teams participating in the mine-rescue event were from Brynnor, Craigmont, Granduc, and Pinchi mines and an entry from Versatile Mining Services Ltd., Kamloops. The Brynnor Mines Limited (Boss Mountain Division) team captained by A. Skiffington won the district shield.

The East Kootenay Mine Safety Association held its 49th annual competition on May 30, 1970, at Kimberley, with four teams competing in the mine-rescue event. Two teams were from the Sullivan mine of Cominco Ltd., and one team each from Michel and Fernie who represented Kaiser Resources Ltd. The Sullivan No. 2 team, captained by A. Burrows, was successful in winning 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 15th Provincial mine-rescue competition held in Nelson on June 6, 1970. The Texada Mines Ltd. team, captained by Donald C. Legault won the Provincial trophy, and the Canadian Exploration Limited team, captained by A. Nord, placed second.

Concurrently with the 15th Provincial mine-rescue competition, the Workmen's Compensation Board sponsored the 14th Provincial first-aid competition in which the competing teams had won the district events at Kamloops, Kimberley, Nanaimo, Nelson, Prince George, Vancouver, and Victoria. The Totem Trophy was won by the British Columbia Telephone Company team from Victoria and captained by Eric Horsley.

The 4th Canadian Mine Rescue Championship was held at Yellowknife, Northwest Territories, on June 13, 1970. Competing teams were from Alberta, British Columbia, Nova Scotia, Saskatchewan, and the Northwest and Yukon Territories. The winning team was that of Texada Mines Ltd. in British Columbia and captained by Donald C. Legault. The team from Nova Scotia placed second.

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 1970 the regional trophy for metal mines was won by Bralorne mine with an accident frequency of 9.59.

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.

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 1970 the award was won by Bralorne mine with an accident frequency of .067 per thousand-man shifts.

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 1970 the A trophy was won jointly by Canada Cement Lafarge Ltd. (Quarry Division), Texada Island; Domtar Chemicals Ltd. (Lime Division), Texada Island; Gretsinger and MacDonald Construction Ltd., at the Lynx mine open pit; and Western Gypsum Ltd., at their Invermere operations. All operators had zero accident frequencies.

Bethlehem Copper Corporation Ltd. at their Highland Valley property won the B trophy with an accident frequency of 4.04 per million man-hours.

In addition to the foregoing operations, certificates of achievement were won by the Giant Mascot quarry of Baroid of Canada, Ltd.; the Cobble Hill quarry of Ocean Cement Ltd., B.C. Cement Division; the Vananda quarry of Canada Cement Lafarge Ltd.; the Coquitlam gravel pit of Lafarge Concrete Ltd.; Domtar Chemicals Ltd. (Lime Division); the Kamloops Division of Ocean Cement Limited; the Prince George Division of Ocean Cement Limited; the Langley Division of Ocean Cement Limited; and Western Gypsum Limited.

RECLAMATION

During the calendar year 1970, 32 temporary permits authorizing surface work (reclamation permits) were issued by the Minister of Mines and Petroleum Resources under the authority of section 8 of the *Coal Mines Regulation Act* or section 11 of the *Mines Regulation Act*. These are the total of permits issued since the reclamation legislation was enacted on April 2, 1969.

Temporary permits only, good for three to five years, have been issued. The main stipulation of the temporary permit is that the mining company shall carry out, to the satisfaction of the Minister, investigation and research into the reclamation of the surface of the land and watercourses affected. When sufficient information and data on reclamation have been determined so that a detailed reclamation programme can be developed, then a full report covering this programme is to be prepared and presented to the Minister for his approval.

Temporary permits were issued in 1970 for the following mining operations:

Permit Number	Company Name	Location of Operation
1	Wesfrob Mines Limited	Tasu.
C 2	Kaiser Resources Limited	Natal.
C 3	Fording Coal Limited	Sparwood.
4	Endako Mines Ltd.	Endako.
5	Cominco Ltd. (Pinchi Lake operations)	Pinchi Lake.
6	Granisle Copper Limited	Granisle.
7	The Granby Mining Company Limited (Phoenix Copper Division)	Greenwood.
8	Red Mountain Mines Limited	Rossland.
9	Utah Construction & Mining Co. (Island Copper mine)	Port Hardy.
10	British Columbia Molybdenum Limited	Kitsault.
11	Bethlehem Copper Corporation Ltd.	Highland Valley.
12	Brenda Mines Ltd.	Peachland.
C 13	Forestburg Collieries Limited	Telkwa.
14	Canada Cement Lafarge Ltd. (Limestone Quarry Division)	Texada Island.
15	Ideal Cement Company	Texada Island.
16	Imperial Limestone Company Limited	Texada Island.
17	Domtar Chemicals Limited (Lime Division)	Texada Island.
18	Cassiar Asbestos Corporation Limited	Cassiar.
19	Baroid of Canada, Ltd.	Spillimacheen.
20	Western Gypsum Limited	Windermere.
21	Canada Cement Lafarge Ltd., Dunsmuir quarry	Nanaimo.
22	Valley Granite Products Limited	Cheam View.
23	Greyhound Mines Ltd.	Greenwood.
24	British Columbia Lightweight Aggregates Ltd.	Saturna Island.

C—*Coal Mines Regulation Act.*

Permit Number	Company Name	Location of Operation
26	Western Mines Limited	Myra Creek.
27	Lornex Mining Corporation Ltd.	Highland Valley.
28	Lafarge Canada Ltd., Limestone quarry	Kamloops.
29	Similkameen Mining Company, Limited	Princeton.
30	Crownite Industrial Minerals Ltd.	Quesnel.
32	Canada Cement Lafarge Ltd., silica quarry	Buse Lake (Kamloops).
33	Placid Oil Company (Bull River mine)	Bull River.
35	Noranda Mines, Limited (Bell Copper Division)	Newman Peninsula, Babine Lake.

There is overlapping jurisdiction between the reclamation legislation at the Provincial level, and reclamation of surface mines coming under other levels and departments of government, viz:

(1) Under the *Municipal Act*, municipalities have the authority to regulate or prohibit, by by-law, surface mines within their territories.

(2) A number of surface mines operate in Provincial forests, under Special Use Permits issued by the Forest Service, which permits specify the reclamation of these operations.

(3) Surface mines located on Indian reserves are not subject to the Provincial reclamation legislation.

(4) The Department of Highways operates numerous gravel pits and quarries, with possible conflict of authority with the Department of Mines and Petroleum Resources in the reclamation of these operations.

The foregoing areas of overlapping jurisdiction and authority in the matter of reclamation have been studied at detail and at depth. Based on the results of these studies, recommendations have been made to the Minister covering these matters. At the end of the year, the matters were still under consideration.

AID TO THE SECURITIES COMMISSION

A. R. C. James, P.Eng., Senior Inspector, Coal, acts as adviser in technical mining matters to the British Columbia Securities Commission. This duty is mainly advice to the Commission in regard to engineering reports submitted in support of prospectuses by mining companies as required by Regulation 17 under the *Securities Act*. Engineering advice is also required from time to time by the Commission on certain other matters, such as in connection with programmes financed by rights offerings to shareholders, on the assessment of reports of work done on mining properties, on prices paid for mining properties, conditions of option agreements, and in approval of company press releases.

In 1970, a total of 194 engineers' reports were examined and the Commission advised on their contents. These reports were submitted by 133 companies, mainly in support of prospectuses.

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Printed by K. M. MACDONALD, Printer to the Queen's Most Excellent Majesty
in right of the Province of British Columbia.
1971

2,030-971-6872