ONTARIO

DEPARTMENT OF MINES

Statistical Review of the Mineral Industry and Mining Operations for 1963

By

G. S. RIDDELL

Annual Report for the Year 1963

Volume 73

TORONTO

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INTRODUCTORY LETTER

To The Honourable G. C. Wardrope
Minister of Mines

Sir: The undersigned has the honour to submit to you the Seventy-third Annual Report of the Ontario Department of Mines.

Geological reports, previously bound as parts of the annual volume, are not included. These now constitute a new series of Geological Reports.

Respectfully submitted,
D. P. Douglass
Deputy Minister of Mines

Department of Mines
Toronto, 1965.

CONTENTS

Statistical Review of the Mineral Industry and Mining Operations for 1963

By

G. S. Riddell[1]

Note: Prior to the publication of Volume LXX, the Annual Report consisted of: Statistical Review of the Mineral Industry (Part 1); Mining Operations (Part 2); subsequent parts of the volume were geological reports.

Starting with Volume LXX, the Annual Report consists of only former Parts 1 and 2, which are now combined. Geological reports that refer to specific geographical areas have been separated from the Annual Report to form a new series of Geological Reports.

GENERAL SUMMARY

MINERAL PRODUCTION

The total value of mineral production in Ontario for 1963 decreased 4.33 percent, from $913,342,174 in 1962 to $873,828,297 in 1963. The decrease is accounted for mainly by a drop in the production value of copper, gold, nickel, platinum metals, and uranium oxide. Increased production values were recorded for iron ore, magnesium, and silver of the metallics; gypsum and sulphur products of the non-metallics; sand and gravel, and clay products of the structural materials.

Metallics accounted for 78.18 percent; non-metallics 4.17 percent; and structural materials 17.65 percent, of the total value of mineral production for Ontario in 1963. Compared with 1962 the value of metallic production decreased 6.38 percent, from $729,769,944 in 1962 to $683,175,291 in 1963; non-metallics decreased 0.95 percent, from $36,784,690 in 1962 to $36,435,466 in 1963; structural materials increased 5.06 percent from $146,787,540 in 1962 to $154,217,540 in 1963.

The value of metallic production from the various areas, in percentage of the total value, was as follows: Sudbury 53.94, Blind River 14.51 Rainy River and Kenora 8.48, Porcupine 6.22, Thunder Bay 7.13, Kirkland Lake and Larder Lake 3.30, Eastern Ontario 2.71, Algoma 2.66, and Cobalt 1.05.

The gold, nickel-copper, silver-cobalt, and uranium mines paid out $116,082,151 in dividends during the year. Twenty-five of the twenty-nine producing gold mines received assistance under the Emergency Gold Mining Assistance Act.

[1]P.Eng., Engineer of Mines.

SUMMARY OF MINERAL STATISTICS, 1963

Product	Quantity	Value	Wage Earners[1]	Wages
METALLICS[2]				
Gold	2,338,854 oz.	$ 88,291,739	9,597	$ 36,850,312
Silver	9,601,621 oz.	13,288,643	424	1,747,914
Bismuth	65 lb.	146		
Copper in matte exported	28,252,036 lb.	8,842,887		
Copper, metal and concentrates	329,667,500 lb.	103,205,567		
Nickel, matte, metal and salts	298,178,570 lb.	246,252,488	17,330	87,908,146
Platinum metals	357,649 oz.	22,585,055		
Selenium	95,100 lb.	461,235		
Tellurium	7,705 lb.	50,082		
Cobalt, metal and salts	2,156,732 lb.	4,409,262	(3)	(3)
Iron ore	6,749,617 tons	70,033,690	1,633	9,568,401
Calcium	98,673 lb.	117,247	———	———
Magnesium	17,810,348 lb.	5,357,816	———	———
Lead	3,077,814 lb.	338,560	659	3,568,239
Zinc	132,939,970 lb.	16,989,728		
Uranium Oxide (U_3O_8)	12,770,421 lb.	102,951,146	2,870	16,963,666
Total	———	$683,175,291	32,513	$156,606,678
NON-METALLICS AND FUELS[4]				
Arsenic trioxide	187,450 lb.	$ 7,498	(5)	(5)
Mica	342,185 lb.	5,114	———	———
Natural gas	15,920,055 M. cu. ft.	6,049,621	not available	not available

Quartz	tons	952,166	644,287	74	$ 291,227
Salt	tons	3,187,491	14,793,161	458	2,346,260
Sulphur[6]	tons	———	1,460,438	(7)	(7)
Asbestos	tons	33,715	5,372,645		
Gypsum	tons	439,206	1,225,301		
Nepheline syenite	tons	254,000	2,699,202	427	2,337,681
Peat moss	tons	30,659	610,784		
Talc	tons	6,903	107,986		
Total		———	$ 36,435,466	959	$ 4,975,168

Structural Materials[8]

Cement	tons	2,552,665	39,551,719	841	$ 4,721,918
Lime	tons	952,945	11,434,223	347	1,617,379
Sand and gravel	tons	80,259,750	56,338,204	1,927	7,708,437
Stone	tons	20,402,614	25,073,707	1,029	4,106,954
Clay products		———	21,819,687	2,057	6,537,196
Total		———	$154,217,540	6,201	$ 24,691,884
Grand Total, 1963		———	$873,828,297	39,673	$186,273,730
Grand Total, 1962		———	$913,342,174	41,094	$194,444,402

(1)"Wage Earners" for any mineral industry represents the employees of companies whose chief product is that mineral, or employees of the companies who produce the greater part of the total quantity of that mineral.
(2)Further information is given in the "Metallics" section.
(3)Included with Nickel and Copper, and Silver and Cobalt.
(4)Further information is given in the "Non-Metallics and Fuels" section.
(5)Included with Silver and Cobalt.
(6)Value of elemental sulphur, and sulphur content of liquid sulphur dioxide and sulphuric acid produced from smelter gases.
(7)Included with Nickel and Copper.
(8)Further information is given in "Structural Materials" section.

Comparative Output and Value of Mineral Production

Product		1959	1960	1961	1962	1963
Metallics						
Bismuth	lb.	31,457	37,835	19,923	———	65
	$	37,748	45,402	22,388	———	146
Calcium	lb.	67,429	134,801	99,355	123,511	98,673
	$	76,409	159,241	100,881	124,412	117,247
Cobalt	lb.	2,835,684	3,258,401	2,884,420	2,649,193	2,156,732
	$	5,414,246	6,312,921	4,309,912	4,765,808	4,409,262
Copper	lb.	376,544,371	412,544,528	423,293,547	377,990,690	357,919,536
	$	110,547,037	123,750,235	122,421,860	116,347,723	112,048,454
Gold	oz.	2,683,449	2,732,673	2,637,720	2,421,249	2,338,854
	$	90,083,383	92,774,248	93,533,551	90,578,924	88,291,739
Iron Ore	tons	6,018,089	5,325,197	5,772,664	6,414,936	6,749,617
	$	50,830,404	48,399,442	62,350,773	64,479,510	70,033,690
Lead	lb.	3,222,447	1,661,896	1,670,535	2,287,087	3,077,814
	$	341,902	177,490	170,562	226,879	338,560
Magnesium	lb.	8,144,940	14,577,138	15,270,618	17,631,310	17,810,348
	$	2,202,392	4,313,987	4,307,570	4,821,823	5,357,816
Nickel	lb.	347,929,183	403,300,283	392,435,773	333,163,344	298,178,570
	$	240,053,265	277,924,234	295,423,149	274,219,955	246,252,488
Platinum metals	oz.	328,091	483,585	418,278	470,782	357,649
	$	16,932,178	28,871,955	24,534,349	28,848,262	22,585,055

Pyrrhotite	tons	———	———	———	———	———
	$	632,140	762,661	———	———	———
Selenium	lb.	101,400	144,500	164,800	142,915	95,100
	$	709,800	1,011,500	1,071,200	821,761	461,235
Silver	oz.	10,540,856	11,220,823	8,870,402	9,383,445	9,601,621
	$	9,252,763	9,976,434	8,361,240	10,931,713	13,288,643
Tellurium	lb.	6,900	7,450	8,050	7,011	7,705
	$	14,835	26,075	39,043	42,066	50,082
Thorium	lb.	47,447	(1)	(1)	(1)	———
	$	105,676	(1)	(1)	(1)	———
Uranium Oxide (U_3O_8)	lb.	25,492,171	19,793,727	14,970,593	12,805,203	12,770,421
	$	268,529,993	211,983,533	151,060,610	118,283,081	102,951,146
Zinc	lb.	89,963,215	90,459,368	103,874,146	126,264,684	132,939,970
	$	11,011,498	12,076,326	13,077,755	15,278,027	16,989,728
Total Value	$	806,775,669	818,565,684	780,784,843	729,769,944	683,175,291
NON-METALLICS						
Arsenic trioxide	lb.	1,578,307	1,724,326	419,300	160,750	187,450
	$	63,786	70,400	16,772	6,832	7,498
Asbestos	tons	24,350	23,284	25,047	35,551	33,715
	$	4,327,628	4,128,920	4,362,668	5,686,720	5,372,645
Fluorspar	tons	———	———	———	———	———
	$	100,594	100,811	38,400	———	———

(1)Not available.

COMPARATIVE OUTPUT AND VALUE OF MINERAL PRODUCTION—*Continued*

Product		1959	1960	1961	1962	1963
NON-METALLICS—*Continued*						
Garnet	tons	———	32	80	———	———
	$	———	4,480	3,200	———	———
Gypsum	tons	412,100	355,603	425,287	435,140	439,206
	$	1,017,340	871,408	991,944	1,007,818	1,225,301
Mica	lb.	35,758	345,777	192,960	501,272	342,185
	$	959	5,745	14,962	9,248	5,114
Mineral water	gals.	3,025	2,626	6,985	5,200	———
	$	1,936	1,890	2,786	2,780	———
Natural gas	M cu. ft.	16,839,236	16,987,056	14,544,165	15,648,294	15,920,055
	$	16,335,742	6,573,990	5,614,048	5,802,387	6,049,621
Nepheline syenite	tons	228,722	240,636	240,320	254,418	254,000
	$	2,930,932	2,891,095	2,572,169	2,605,421	2,699,202
Peat moss	tons	10,925	13,566	15,113	24,801	30,659
	$	295,390	338,614	251,352	455,826	610,784
Petroleum, crude	bbls.	1,001,580	1,005,030	1,149,087	1,134,534	1,205,376
	$	3,194,000	3,150,065	3,546,740	3,661,174	3,459,429
Quartz and quartzite	tons	1,600,352	1,659,410	1,540,016	1,352,613	952,166
	$	1,363,541	998,281	827,061	1,077,784	644,287
Silica brick	M	1,123	———	———	———	———
	$	114,684	———	———	———	———

Salt	tons	3,036,230	3,007,599	2,861,705	3,155,589	3,187,491
	$	13,228,977	13,994,545	13,586,373	15,387,911	14,793,161
Sulphur[1]	tons	———	———	———	———	———
	$	1,041,857	985,717	855,058	952,877	1,460,438
Talc and soapstone	tons	8,796	7,189	7,417	8,082	6,903
	$	125,903	102,645	107,660	127,912	107,986
Total Value	$	44,143,269	34,218,606	32,791,193	36,784,690	36,435,466
STRUCTURAL MATERIALS						
Portland cement	tons	2,386,334	2,007,044	2,226,923	2,510,783	2,552,665
	$	31,731,767	30,699,800	35,671,569	38,704,090	39,551,719
Lime, hydrated, and quicklime	tons	1,130,055	990,088	865,130	910,930	952,945
	$	14,006,532	12,278,630	11,548,132	10,527,910	11,434,223
Sand and gravel	tons	73,981,703	77,660,833	70,208,199[2]	76,600,813	80,259,750
	$	39,695,602	43,929,708	40,344,071	52,365,204	56,338,204
Stone	tons	17,288,796	17,938,583	18,361,843[2]	18,797,648	20,402,614
	$	22,053,425	23,220,659	23,493,092	25,043,550	25,073,707
Clay products	$	22,174,895	20,191,325	19,036,556	20,146,786	21,819,687
Total Value	$	129,662,221	130,320,122	130,093,420	146,787,540	154,217,540
Grand Total	$	980,581,159	983,104,412	943,669,456	913,342,174	873,828,297

[1]Value of elemental sulphur and sulphur content of sulphuric acid produced from smelter gases.
[2]Revised figures.

TOTAL MINERAL PRODUCTION

Year	Metallics	Non-Metallics	Structural Materials	Clay Products	Total
To 31 Dec. 1958	$8,662,080,206	$642,780,905	$1,172,157,492	$337,980,221	$10,814,998,824
1959.....	806,775,669	44,143,269	107,487,326	22,174,895	980,581,159
1960.....	818,565,684	34,218,606	110,128,797	20,191,325	983,104,412
1961.....	780,784,843	32,791,193	111,056,864	19,036,556	943,669,456
1962.....	729,769,944	36,784,690	126,640,754	20,146,786	913,342,174
1963.....	683,175,291	36,435,466	132,397,853	21,819,687	873,828,297
To 31 Dec. 1963.....	$12,481,151,637	$827,154,129	$1,759,869,086	$441,349,470	$15,509,524,322

Metal Production

Metallic minerals have accounted for 80.47 percent of the accumulated mineral production value for the recorded history of the mining industry in Ontario.

METAL PRODUCTION TO 31 DECEMBER 1963

Metal or Product	To 31 December 1962	1963	To 31 December 1963
Barium	$ 9,266	———	$ 9,266
Bismuth	416,066	146	416,212
Calcium	11,662,005	117,247	11,779,252
Cerium, rare earths	988	———	988
Chromite	55,090	———	55,090
Cobalt	103,802,381	4,409,262	108,211,643
Copper	1,905,721,934	112,048,454	2,017,770,388
Gold	3,059,429,652	88,291,739	3,147,721,391
Iron Ore	538,840,809	70,033,690	608,874,499
Lead	8,095,484	338,560	8,434,044
Magnesium	51,420,944	5,357,816	56,778,760
Molybdenum	224,110	———	224,110
Nickel	4,006,511,810	246,252,488	4,252,764,298
Pig iron, from domestic ore	98,257,508	———	98,257,508
Platinum metals	499,964,876	22,585,055	522,549,931
Pyrrhotite	3,495,154	———	3,495,154
Selenium	12,429,355	461,235	12,890,590
Silver	377,148,752	13,288,643	390,437,395
Tellurium	440,000	50,082	490,082
Thorium	105,676	———	105,676
Tungsten	808,338	———	808,338
Uranium oxide (U_3O_8)	1,052,796,601	102,951,146	1,155,747,747
Zinc in ore and concentrates	66,339,547	16,989,728	83,329,275
Total	11,797,976,346	683,175,291	12,481,151,637

Dividends

DIVIDENDS PAID BY METAL MINING COMPANIES TO 31 DECEMBER 1963

Industry	To 31 December 1962	1963	To 31 December 1963
Gold	$ 758,701,996	$ 23,845,487	$ 782,547,483
Nickel-copper	1,250,451,962	79,057,256	1,329,509,218
Silver-cobalt	107,718,962	215,000	107,933,962
Uranium	68,854,822	12,964,408	81,819,230
Total	$2,185,727,742	$116,082,151	$2,301,809,893

Metal Prices and Exchange

METAL PRICES AND EXCHANGE, 1962 AND 1963

Month	Average Exchange Rate, U.S. Dollar in Canadian Dollars	Pound Sterling in Canadian Dollars	Silver Cents per Ounce		Copper, Cents per Pound, New York Export, U.S. Funds	Gold in Canadian Dollars per Ounce
			New York Market, U.S. Funds	Montreal, Canadian Funds		
1962						
January	1.0450	2.9378	104.284	109.93	28.060	36.577
February	1.0487	2.9521	102.472	108.68	28.620	36.706
March	1.0494	2.9545	101.500	107.25	28.600	36.727
April	1.0498	2.9545	101.500	107.28	28.598	36.763
May	1.0823	3.0437	101.500	110.32	28.545	37.873
June	1.0878	3.0553	102.274	111.97	28.571	38.062
July	1.0789	3.0284	103.548	112.37	28.538	37.762
August	1.0776	3.0218	108.304	116.90	28.564	37.717
September	1.0768	3.0167	115.461	124.34	28.588	37.687
October	1.0760	3.0147	120.614	130.00	28.529	37.660
November	1.0768	3.0173	119.171	129.17	28.488	37.687
December	1.0760	3.0166	119.875	129.43	28.488	37.660
Average	[1]1.0689	[1]3.0015	108.375	116.47	28.516	37.406
1963						
January	1.0771	3.0213	124.382	134.07	28.433	37.700
February	1.0776	3.0211	125.644	135.90	28.439	37.715
March	1.0780	3.0194	127.138	137.42	28.400	37.731
April	1.0768	3.0161	127.290	137.75	28.404	37.688
May	1.0772	3.0162	127.873	138.16	28.405	37.703
June	1.0782	3.0196	127.685	138.17	28.396	37.738
July	1.0797	3.0242	128.991	139.75	28.397	37.790
August	1.0829	3.0319	128.782	139.96	28.409	37.899
September	1.0798	3.0212	129.260	140.17	28.390	37.796
October	1.0779	3.0158	129.300	139.92	28.389	37.725
November	1.0776	3.0152	129.300	139.90	28.380	37.716
December	1.0793	3.0186	129.300	140.05	28.515	37.777
Average	[1]1.0785	[1]3.0201	127.912	138.43	28.413	37.748

[1]Computed from daily quotations.

Prospecting

There was a slight increase in prospecting activity during 1963; a total of 17,407 claims was recorded as compared with 17,157 in 1962. The recording offices in the Fort Frances, Montreal River, Parry Sound, Porcupine, Port Arthur, Sault Ste. Marie, Sudbury and Timiskaming mining divisions reported more claims recorded in 1963 than in 1962. The greatest number of claims recorded was 3,678 in the Port Arthur mining division, immediately followed by those recorded in Sault Ste. Marie, Porcupine, Montreal River, Larder Lake, Sudbury and Timiskaming mining divisions. There were 5,156 miners' licenses issued and renewed in 1963; 5,274 in 1962.

MINERS' LICENCES AND MINING CLAIMS, 1963

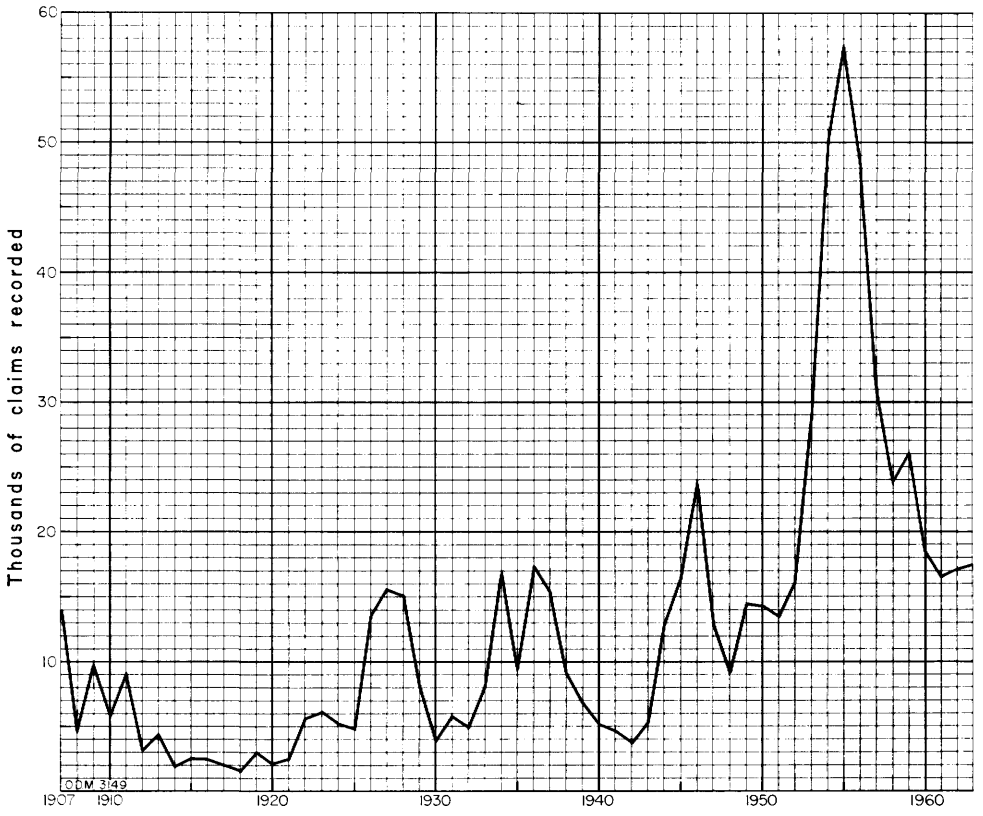
Mining Division	Miners' Licences		Mining Claims	
	Issued	Renewed	Recorded	Cancelled
Eastern Ontario	——	——	383	729
Fort Frances	30	55	699	333
Kenora	55	78	347	957
Kowkash[1]	——	——	388	1,139
Larder Lake	110	178	1,505	1,631
Montreal River	80	138	1,871	1,125
Parry Sound	——	——	152	134
Patricia	65	58	739	1,780
Porcupine	172	182	1,971	1,326
Port Arthur	379	379	3,678	2,382
Red Lake	21	102	423	1,041
Sault Ste. Marie	193	166	2,472	1,789
Sudbury	157	231	1,445	1,742
Timiskaming	104	180	1,334	1,139
Toronto Office	458	1,585	——	——
Total	1,824	3,332	17,407	17,247

[1]Handled by the office of the Patricia Mining Division since 1 April 1956.

MINING CLAIMS RECORDED IN THE ONTARIO MINING DIVISIONS

Mining Division	1957	1958	1959	1960	1961	1962	1963
Eastern Ontario	2,003	987	993	507	806	504	383
Fort Frances	433	801	422	402	199	444	699
Kenora	1,247	1,090	1,146	1,162	961	856	347
Kowkash	3,549	896	1,368	774	1,043	1,362	388
Larder Lake	1,630	2,276	3,540	1,430	1,421	1,701	1,505
Montreal River	1,458	1,462	1,579	1,670	1,211	1,705	1,871
Parry Sound	291	39	182	186	136	58	152
Patricia	3,074	2,002	2,628	1,912	1,612	1,272	739
Porcupine	2,456	1,451	2,247	1,321	1,443	1,440	1,971
Port Arthur	4,351	4,027	3,479	3,095	2,064	2,088	3,678
Red Lake	1,078	2,657	2,554	1,227	1,076	1,055	423
Sault Ste. Marie	2,842	1,385	1,112	943	1,436	2,055	2,472
Sudbury	4,959	3,063	3,481	1,921	2,098	1,348	1,445
Timiskaming	1,576	1,844	1,300	1,924	1,117	1,269	1,334
Total	30,947	23,980	26,031	18,474	16,623	17,157	17,407

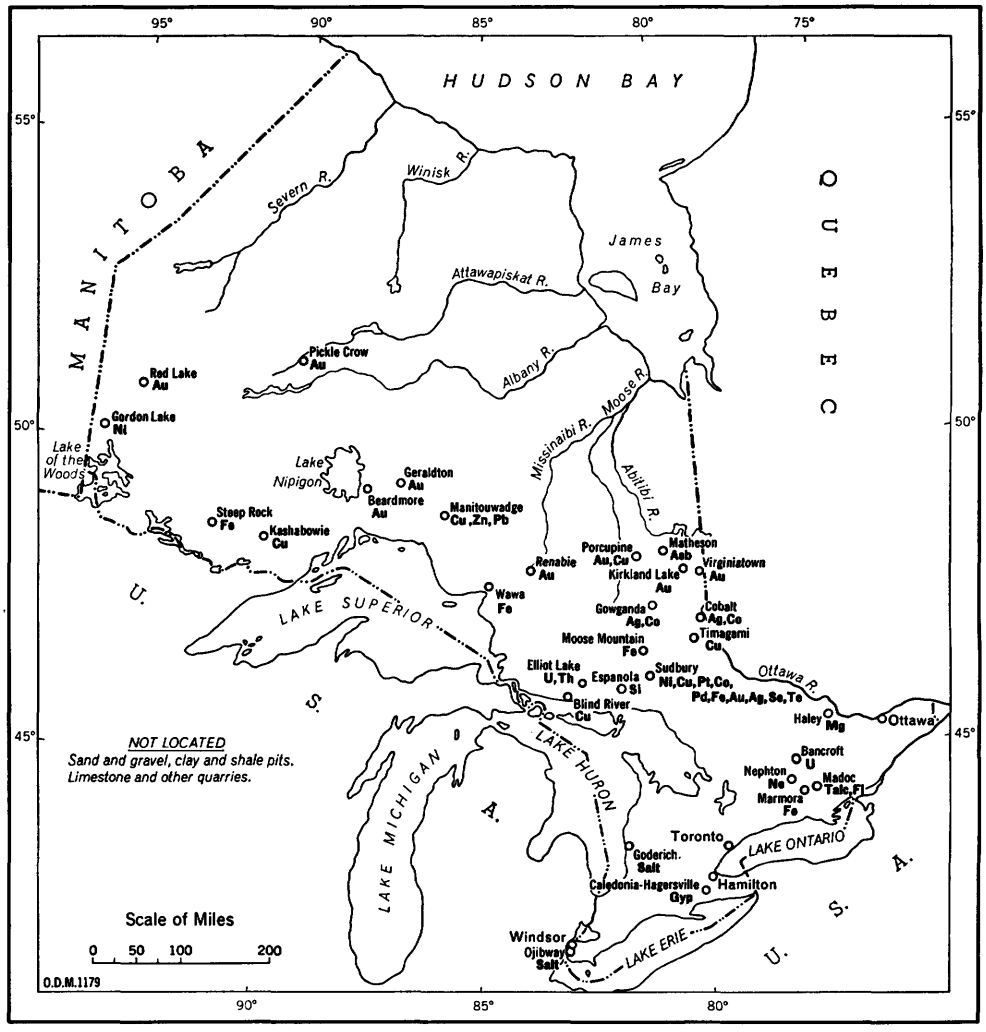
Mining Claims Recorded, 1907–1963



Mining Claims Cancelled in the Ontario Mining Divisions

Mining Division	1957	1958	1959	1960	1961	1962	1963
Eastern Ontario	4,974	3,270	1,701	1,629	728	658	729
Fort Frances	1,177	833	630	619	356	305	333
Kenora	3,595	2,433	1,697	1,368	1,133	1,195	957
Kowkash	3,288	1,526	1,228	1,975	1,412	1,805	1,139
Larder Lake	2,004	2,201	1,604	3,667	1,450	1,452	1,631
Montreal River	2,196	1,911	1,858	1,986	1,494	999	1,125
Parry Sound	468	640	122	196	281	60	134
Patricia	1,064	1,725	1,273	2,560	3,089	2,043	1,780
Porcupine	2,440	2,147	1,803	2,296	1,578	1,425	1,326
Port Arthur	8,362	5,791	4,265	3,833	3,549	2,823	2,382
Red Lake	1,569	1,345	1,843	3,081	1,859	1,342	1,041
Sault Ste. Marie	9,362	4,570	2,203	2,004	1,020	1,284	1,789
Sudbury	9,821	8,160	4,036	4,409	2,245	1,949	1,742
Timiskaming	4,012	2,996	2,132	1,094	1,507	1,577	1,139
Total	54,332	39,548	26,395	30,717	21,701	18,917	17,247

Principal Mining Areas of the Province of Ontario



Keys to Symbols

Ag	— Silver	Gyp	— Gypsum	Se	— Selenium
Asb	— Asbestos	Mg	— Magnesium	Si	— Silica
Au	— Gold	Ne	— Nepheline syenite	Te	— Tellurium
Co	— Cobalt	Ni	— Nickel	Th	— Thorium
Cu	— Copper	Pb	— Lead	U	— Uranium
Fe	— Iron	Pd	— Palladium	Zn	— Zinc
Fl	— Fluorspar	Pt	— Platinum		

STATISTICS AND MINING OPERATIONS

Metallics

BISMUTH

The production of bismuth in Ontario in 1963 amounted to 65 pounds, valued at $146; it was recovered from the smelting of the silver-cobalt ores, from the Cobalt-Gowganda area.

CALCIUM—*see* MAGNESIUM AND CALCIUM

COBALT—*see* NICKEL AND COPPER, *and* SILVER AND COBALT

COPPER—*see* NICKEL AND COPPER

GOLD

In 1963 there were 29 gold mines operating in Ontario; one of these ceased operations before the year's end. The mines reported milling 7,976,641 tons of ore, from which were recovered 2,278,892 ounces of gold and 344,867 ounces of silver for a total value of $86,081,044. The average recovery value per ton of ore milled was $10.79. In the operations of the nickel-copper mines there was a recovery of 48,862 ounces of gold; the base metal mines recovered a further 11,100 ounces; hence the total production of gold was 2,338,854 ounces valued at $88,291,739, a decrease of 3.41 percent in quantity and 2.52 percent in value from the 2,421,429 ounces produced in 1962, valued at $90,578,924.

The gold mines paid $7,971,354 to 1,350 salaried employees and $36,850,312 to 9,597 wage earners; fuel and electricity cost $4,382,821, and process supplies cost $19,601,902.

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, BY AREAS

Year	Porcupine	Kirkland Lake Larder Lake and Sudbury	Northwestern Ontario	Total
1912–1958	$337,119,255	$289,643,828	$60,242,895	$687,005,978
1959	14,313,084	5,052,304	3,341,028	22,706,416
1960	7,395,037	5,099,131	3,427,517	15,921,685
1961	7,540,668	4,950,034	3,347,096	15,837,798
1962	8,192,173	5,451,358	3,586,588	17,230,119
1963	16,354,446	3,543,946	3,947,095	23,845,487
Total	$390,914,663	$313,740,601	$77,892,219	$782,547,483

Gold Production, 1963

Areas and Mines	Rated Daily Mill Capacity	Daily Operating Average	Ore Milled	Bullion Recovered				Total Value of Bullion Canadian Dollars
				Gold Content		Silver Content		
				Quantity	Value	Quantity	Value	
	tons	tons	tons	ounces		ounces		
Porcupine								
Aunor	750	757	276,633	89,426	$ 3,375,653	6,291	$ 8,707	$ 3,384,360
Broulan Reef	750	553	157,251	25,468	961,836	1,666	2,303	964,139
Delnite	520	504	183,901	51,665	1,950,194	3,913	5,383	1,955,577
Dome	1,985	1,985	714,800	175,048	6,608,511	34,856	48,105	6,656,616
Hallnor	400	364	133,014	44,129	1,665,781	3,051	4,223	1,670,004
Hollinger	3,900	3,574	965,094	248,271	9,371,279	37,235	51,441	9,422,720
Hugh-Pam	milled at Broulan Reef		44,970	5,056	190,831	———	———	190,831
McIntyre	2,500	1,192	687,082	199,145	7,517,724	40,540	55,945	7,573,669
Pamour	1,750	1,720	627,974	64,869	2,448,675	9,176	12,702	2,461,377
Paymaster	750	481	175,654	29,416	1,110,313	6,497	8,994	1,119,307
Preston	800	546	199,400	39,902	1,506,002	4,323	5,958	1,511,960
Ross	450	430	147,822	20,395	769,609	31,013	42,798	812,407
Total	14,555	12,106	4,313,595	992,790	$37,476,408	178,561	$246,559	$37,722,967
Kirkland Lake								
Lake Shore	1,200	1,182	134,711	56,817	$ 2,145,383	23,562	$ 32,355	$ 2,177,738
Macassa	500	386	140,800	66,140	2,496,653	9,514	13,167	2,509,820
Teck Corporation	650	346	126,350	23,622	891,892	3,507	4,836	896,728
Upper Canada	500	556	203,272	55,142	2,081,793	24,921	34,261	2,116,054
Wright-Hargreaves	milled at Lake Shore		143,000	57,725	2,179,490	14,316	19,684	2,199,174
Total	2,850	2,470	748,133	259,446	$ 9,795,211	75,820	$104,303	$ 9,899,514
Larder Lake								
Kerr-Addison	3,000	2,620	956,217	333,896	$12,604,536	20,004	$ 27,686	$12,632,222
Sudbury								
Renabie	550	500	182,552	34,627	$ 1,307,353	9,791	$ 13,502	$ 1,320,855
Patricia Portion of Kenora								
Campbell Red Lake	700	706	257,793	168,628	$ 6,386,333	10,865	$ 14,956	$ 6,401,289
Cochenour Willans	275	292	106,634	74,624	2,826,054	4,783	6,599	2,832,653

Dickenson	470	491	178,527	93,046	3,515,333	8,005	11,012	3,526,345
Madsen Red Lake	850	839	306,247	107,114	4,044,060	16,889	23,287	4,067,347
McKenzie Red Lake	300	245	89,616	25,398	958,852	4,904	6,751	965,603
Pickle Crow	400	274	100,209	34,983	1,320,608	3,389	4,677	1,325,285
Young H. G.	——	——	18,427	3,677	139,527	——	——	139,527
Total	2,995	2,847	1,057,453	507,470	$19,190,767	48,835	$ 67,282	$19,258,049
THUNDER BAY								
Consolidated Mosher	milled at M-Cockshutt		563,064	79,704	$ 3,020,602	8,155	$ 11,252	$ 3,031,854
Leitch	120	104	38,092	56,575	2,142,965	2,249	3,104	2,146,069
MacLeod-Cockshutt	1,900	1,866	117,535	13,773	520,137	1,399	1,927	522,064
Total	2,020	1,970	718,691	150,052	$ 5,683,704	11,803	$ 16,283	$ 5,699,987
SUNDRIES								
Clean-up, abandoned operations etc.	——	——	——	611	23,065	53	73	23,138
Total for Gold Mines	25,970	22,513	7,976,641	2,278,892	$86,081,044	344,867	$475,688	$86,556,732
Nickel-Copper refining	——	——	——	48,862	1,801,670	——	——	——
Base metal mines	——	——	——	11,100	409,025	——	——	——
Total Gold Production, 1963	——	——	——	2,338,854	$88,291,739	——	——	——

GOLD PRODUCTION, 1962

Porcupine	——	——	4,345,946	1,005,108	$37,601,090	209,805	$244,422	$37,845,512
Kirkland Lake	——	——	767,574	249,331	9,327,472	84,659	98,627	9,426,099
Larder Lake	——	——	1,242,933	422,263	15,796,859	25,528	29,740	15,826,599
Sudbury	——	——	198,019	35,735	1,336,846	12,073	14,065	1,350,911
Patricia Portion of Kenora	——	——	1,153,275	507,660	18,991,560	54,527	63,524	19,055,084
Thunder Bay	——	——	733,317	132,728	4,965,354	10,279	11,975	4,977,329
Sundries	——	——	——	2,271	84,959	329	385	84,258
Total for Gold Mines, 1962	——	——	8,441,064	2,355,096	$88,104,140	397,200	$462,738	$88,565,792
Nickel-Copper refining	——	——	——	55,922	2,092,042	——	——	——
Base metal mines	——	——	——	10,231	382,742	——	——	——
Total Gold Production, 1962	——	——	——	2,421,249	$90,578,924	——	——	——

Aunor Gold Mines Limited

Aunor Gold Mines Limited was incorporated in May 1939, with an authorized capitalization of 2,000,000 shares of $1 par value, all of which have been issued. The directors and officers were: J. R. Bradfield, president and director; W. S. Row, vice-president and director; R. V. Porritt, N. C. Urquhart, and K. C. Gray, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The head office is at Suite 1700, Bank of Nova Scotia Building, Toronto. The mine address is Box 2001, Timmins.

The company's property consists of eleven claims in Deloro township, Porcupine area, District of Cochrane.

Mining and milling continued throughout 1963.

SHAFTS, AUNOR MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth below Surface
				feet	feet
No. 1	H.S.850	Vertical	3	Surface	3,082
No. 2	T.R.S.828 H.R.1246	62°	2	2,110	2,907

Development work consisted of 4,777 feet of drifting, 63 feet of crosscutting and 44 feet of raising. The total development footage to 31 December 1963 was as follows: 75,991 feet of drifts, 13,470 feet of crosscuts, 32,988 feet of raises.

New levels were established at the 3,100-and 3,300-foot horizons in Aunor ground from the Delnite No. 3 winze. A loading pocket was established below the Delnite 4,000-foot level to complete an Aunor ore-pass system that extends downward from the Aunor 2,900-foot level—all in Delnite ground. The yearly and accumulated total of Aunor development on Delnite ground appears under Delnite Mines Limited in this report. Diamond-drilling in 1963 consisted of 444 holes, totalling 38,295 feet, from underground.

New added equipment included the following:

4 locomotive batteries (type KV, 420 amps, 15 plate, Hart Battery Co. Ltd.).
1 truck (Ford ½-ton, McDowell Motors Co. Ltd.).

The following is taken from the company annual report for the year ending 31 December 1963.

Production

Mining was carried on between the 2,125- and 2,900-foot levels.

Total ore mined during the year amounted to 276,000 tons with an average grade of 0.34 ounces of gold per ton. This compares with 723,400 tons averaging 0.31 ounces of gold in 1962. About 1 percent of the ore was drawn from the 1,875-foot level.

Development

An agreement was signed in April 1963, which provides for Aunor to purchase the two operating Delnite shafts complete with hoists, related equipment, and adjacent surface buildings when Delnite ceases mining operations, probably late in 1964. Meanwhile, Delnite continues to service Aunor development crews below the 2,900-foot level through its No. 3 shaft, which extends from 2,900 to 5,250 feet below surface.

On the 3,100 and the 3,300-foot levels, drifts were advanced to a section 1,480 feet east of the Delnite-Aunor boundary. Preparation of the 3,500-foot level exploration drift as a haulageway has been extended to 1,400 feet east of the boundary.

Samples from drifts and diamond-drilling on these levels continue to indicate ore conditions similar to those above the 2,900-foot level. Raising for stope preparation and to check continuity of ore shoots between levels in the block below 2,900-foot level will begin within the next year.

Ore Reserves

At year's end, proven ore reserves were 1,193,000 tons averaging 0.35 ounces of gold per ton. Compared with 276,600 tons mined, 287,600 tons of new ore was proved, all between the 2,125 and the 2,900-foot levels due to extension of mining widths.

Mill

The following tabulation provides mill production and performance figures for the year, as compared with 1962 and the period since production commenced in January 1940.

	1963	1962	Total To Date
Milled.....tons	277,000	274,000	4,584,000
Milled per calendar day.....tons	760	750	524
Average gold content.....oz. per ton	0.338	0.314	0.351
Average tailings loss.....oz. per ton	0.015	0.014	0.012
Total recovery.....percent	95.5	95.4	96.7
Total production of gold.....oz.	89,420	81,970	1,556,350
Value of total production.....	$3,384,500	$3,072,200	$56,029,000
Recovery per ton.....	$12.23	$11.20	$12.22

The average number of employees was 429: 310 underground, and 119 on surface. R. E. Findlay was manager.

Broulan Reef Mines Limited

Broulan Reef Mines Limited was incorporated in June 1951, with an authorized capitalization of 6,000,000 shares of $1 par value, of which 5,961,142 shares have been issued. The directors and officers were: H. F. Brownbill, president and director; W. H. Maedel, vice-president, secretary-treasurer and director; F. G. Lawson, vice-president and director; L. B. Harder, D. G. Lawson, G. A. MacMillan, and Mrs. V. R. MacMillan, directors. The head office is at 7th floor, 105 Adelaide Street West, Toronto 1., The mine address is Pamour.

The company owns the Broulan Reef mine and the old Bonetal and Bonwhit mines, consisting of eighty-one claims, in Whitney, Murphy, and Tisdale townships, Porcupine area, District of Cochrane. It also operates the property of Hugh-Pam Porcupine Mines Limited in the same group and further reported on in this report under that heading. No work has been done for a number of years in the Broulan, Bonetal, or Banner sections of the property.

Work in the Reef section and the Hugh-Pam property continued throughout 1963.

SHAFTS, BROULAN REEF MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth below Surface
				feet	feet	feet
1.....	13091	Vertical	3	Surface	——	2,556
A.....	13091	Vertical	——	Surface	——	35
1A.....	13092	Vertical	2	2,500	36	2,673

The 2,650-foot level was established 150 feet below the collar of 1A winze.

Development work in 1963 consisted of: drifting, 1,814 feet; crosscutting, 949 feet; raising, 2,737 feet. Total development footage to 31 December 1963 was as follows: 39,780 feet of drifts, 13,323 feet of crosscuts; 20,175 feet of raises. Diamond-drilling during the year consisted of 136 holes, totalling 20,043 feet, from underground, and one hole, totalling 503 feet, from surface.

The following is taken from the company annual report for the year ending 31 December 1963.

Production and Treatment

During the year, 157,251 tons of ore was mined and milled from the Broulan Reef Mine, producing 25,467.96 ounces of gold valued at $961,835.81, and 1,665.52 ounces of silver valued at $2,303.02. In addition, $261,683 was claimed under the terms of the Emergency Gold Mining Assistance Act.

Average recovery was 0.162 ounces of gold or $6.13 per ton milled based on the Mint price, plus an additional $1.66 per ton milled under the Emergency Gold Mining Assistance Act.

Ore Reserves

Proven ore reserves at the Broulan Reef Mine are calculated to be 189,000 tons, having an average uncut grade of 0.25 ounces of gold per ton or a grade cut to one ounce of 0.17 ounces per ton, after allowing for 10 percent dilution.

Milling

During the year, the mill treated 157,251 tons from the Broulan Reef Mine and 44,970 tons from the Hugh-Pam Mine for a total of 202,221 tons of ore; daily average was 555 tons, from which were recovered 30,523.57 ounces of gold and 1,665.52 ounces of silver. Recovery averaged 96.7 percent.

General

In all, 7,848 tons of waste rock was broken and hoisted from exploration and development work.

A total of 55,160 cubic yards of sand backfill was delivered underground.

Operating costs for the 157,251 tons of ore mined and milled during the year from the Broulan Reef Mine including head office, including administrative and general expenses, amounted to $7.79 per ton.

The average number of employees for Broulan Reef Mines Limited and Hugh-Pam Porcupine Mines Limited was 194: 107 underground, and 87 on surface. W. F. Atkins was manager of mining operations; J. M. Bracken was mine manager.

Campbell Red Lake Mines Limited

Campbell Red Lake Mines Limited was incorporated in August 1944, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 3,999,500 shares have been issued. The company is controlled by Dome Mines Limited. The directors and officers were: C. W. Michel, chairman of the board; J. B. Redpath, president and director; B. R. MacKenzie, secretary and director; W. F. James and J. K. McCausland, directors; E. J. Andrecheck, treasurer. The head office is at Suite 702, 360 Bay Street, Toronto 1. The mine address is Balmertown.

The company owns 27 claims, about 1,175 acres, in Balmer township, Red Lake area, District of Kenora (Patricia portion).

Mining and milling continued throughout 1963.

The vertical, four-compartment No. 1 shaft, located on claim K.R.L. 20071, is 3,281 feet in depth below the collar.

Development work in 1963 was as follows: 6,530 feet of drifting; 3,333 feet of crosscutting; 3,354 feet of raising. Total development to 31 December 1963 was as follows: 135,081 feet of drifts; 26,486 feet of crosscuts, 39,856 feet of raises. Diamond-drilling in 1963 included 6 holes, totalling 6,997 feet, from surface and 300 holes, totalling 49,032 feet, from underground.

New construction in 1963 consisted of an addition to No. 1 substation (20 x 15 ft., steel frame, transitop walls, cavity deck roof); and a bulk storage lime bin in the mill (10 x 10 x 20 ft. steel construction).

Major equipment added included a ventilation fan, (Vane Axial 48 in., 70,000 cfm. with 60-hp. motor, Canadian Blower & Forge Co. Ltd.); and three transformers, (600 kva. single-phase and switch gear in No. 1 substation, Northern Electric Co. Ltd.).

The following is taken from the company annual report for the year ending 31 December 1963:

Mining

Broken ore totalling 243,700 tons remains in the stopes, an increase of 2,500 tons from the previous year.

In all, 220,188 tons of a grade of 14.04 pennyweight was drawn from the stopes and sent to the mill.

The main stoping operations were above the 10th level or 1,450-foot horizon. Several stopes are being prepared for the cut-and-fill type of mining.

Ore Production

The mine produced 257,793 tons of ore during the year, which averaged 13.83 pennyweight. The stopes produced 220,188 tons averaging 14.04 pennyweight, and development work produced 37,605 tons averaging 12.59 pennyweight.

Ore Reserves

The ore reserves are estimated at 1,137,600 tons, an increase of 6,000 tons over last year. The ore reserves include 243,700 tons of broken ore, an increase of 2,500 tons from last year.

A summary of the distribution of ore in place, broken ore and total ore extracted from stopes to the end of 1963 is as follows:

Summary of Ore Reserves and Extraction by Levels

Level	Ore in Place	Average Grade	Broken Ore	Total Ore Extracted from Stopes to End of 1963
	tons	dwt. per ton	tons	tons
Surface to 1st	9,100	11.73	———	243,390
1st to 2nd	18,200	11.82	———	300,724
2nd to 3rd	40,400	9.77	4,700	281,231
3rd to 4th	37,800	8.99	12,200	374,702
4th to 5th	38,400	11.75	51,400	349,109
5th to 6th	88,700	14.18	47,800	340,356
6th to 7th	109,200	13.76	15,400	262,683
7th to 8th	37,800	12.33	23,600	225,734
8th to 9th	79,500	13.42	21,200	155,166
9th to 10th	28,500	13.52	59,900	52,662
10th to 11th	77,600	12.53	400	7,470
11th to 12th	79,400	12.04	100	16,610
12th to 13th	100,100	14.84	300	1,098
13th to 14th	149,200	15.25	6,700	6,808
Total	893,900	13.28	243,700	2,617,743

Milling

The following are the results of milling operations:

Ore treated	tons	257,793
Average per calendar day	tons	706
Average grade of ore treated	dwt. per ton	13.83
Recovery	dwt. per ton	12.88
Recovery	percent	93.17

Milling recovery showed an improvement due mainly to the less refractory type of ore processed. A lime bin was built in the mill, which will permit delivery and storage of lime in bulk with a resulting cost saving.

Costs

The expenditure on mining was $922,777, or $3.58 per ton milled.

The expenditure on development (including work done by H. G. Young Mines Limited for the company's account) was $640,123, or $2.48 per ton milled.

Operating costs (including the above-mentioned item) were $9.64 per ton milled.

The average number of employees was 281: 157 underground, and 124 on surface. Joseph Chisholm was general manager.

Cochenour Willans Gold Mines Limited

Cochenour Willans Gold Mines Limited was incorporated in April 1936, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,974,655 shares have been issued. The directors and officers were: E. C. Cochenour, president and director; W. M. Cochenour, vice-president and director; J. E. J. Fahlgren, vice-president, manager, and director; F. J. Mills, secretary-treasurer and director; M. C. Mosher and R. M. Elliot, directors; C. V. Maltby, assistant secretary. The head office is at Suite 1203, 2200 Yonge Street, Toronto 12. The mine address is Cochenour.

The property consists of forty-nine claims in Dome township, Red Lake area, District of Kenora (Patricia portion).

Mining and milling continued throughout 1963.

SHAFTS, COCHENOUR WILLANS MINE

Shaft	Claim No.	Inclination	Number of Compartments	Depth below Surface
				feet
No. 1	K.R.L.322	Vertical	3	2,246
No. 2	K.R.L.462	Vertical	3	446

Development work in 1963 consisted of the following: drifting, 12,233 feet; crosscutting, 3,909 feet; raising, 6,394 feet. Development footage to 31 December 1963 was as follows: 105,549 feet of drifts; 74,581 feet of crosscuts; 63,381 feet of raises. Diamond-drilling in 1963 consisted of 627 holes, totalling 89,720 feet, from underground, and 81 holes, totalling 6,903 feet, from surface for Cochenour; also 84 holes, totalling 24,992 feet, from underground, and 22 holes, totalling 11,822 feet, from surface for Wilmar; 19 holes, totalling 4,590 feet, from underground for Annco.

Equipment added in 1963 included the following:

1 sprinkler system, Grinell.
10 mine cars, Granby.
1 rocker shovel (Eimco 21-55).
1 diamond-drill, Boyles surface.
2 drills, Atlas Copco Cobra.
2 jackdrills (C.I.R. 300 A).
1 jumbo drill (Joy D.J.A.).
2 trolleys (C.G.E. 6 ton).
2 power rectifiers (50 kw.).
showers and steel lockers.

The following is taken from the company annual report for the year ending 31 December 1963.

Production and Costs

During the year 207,924 tons was hoisted, of which 106,634 tons was ore and 101,290 tons was waste (includes waste from Marcus, Wilmar, and Annco drives). Mining produced 99,202 tons of the ore milled, and the balance of 7,432 tons came from development.

The 106,634 tons of ore milled yielded a recovery of 74,624 ounces of gold and 4,783 ounces of silver. The total value of this bullion was $2,832,653, for an average of $26.56 per ton milled. The price received for gold during the year averaged $37.87 Canadian per ounce and for silver $1.38 per ounce.

An average of 292 tons daily was milled. It became necessary to increase daily tonnage by 18 tons per day to maintain normal production with the change in mill feed to talcose ores from deeper levels. These talc ores, low in sulphide content, have to be mixed with a high-sulphide ore such as the chert ores or clean-up ores from upper levels to obtain satisfactory extraction. The present sulphide ores are low-grade. The final result reduces the over-all grade to 0.75 ounces per ton.

Cost Per Ton Milled

	Total	1963	1962	1961	1960	1959
Development	$ 472,672	$ 4.433	$ 4.077	$ 4.863	$ 4.836	$ 4.965
Mining	622,477	5.838	6.283	6.120	5.955	5.967
Milling	322,336	3.023	3.105	3.367	3.136	2.990
General and administrative	260,046	2.438	2.322	2.584	2.585	2.755
Marketing	21,241	.199	.212	.186	.194	.177
Total Operating Costs	$1,698,772	$15.931	$15.999	$17.120	$16.706	$16.854
Milled tons	——	106,634	100,001	96,155	90,010	84,004

Mining

The mill feed was supplied from the mining of 106 stopes that produced 99,202 tons of ore averaging 0.771 ounces of gold per ton, and from 58 development drifts and raises that produced 7,432 tons of ore averaging 0.390 ounces of gold per ton.

It will be noted the pattern has not changed, and the 99,202 tons from the mining of 106 stopes averages less than 1,000 tons per stope, which illustrates the limited size of individual mining blocks due to the severe faulting of the Cochenour ore deposits. These factors continue to preclude any accurate estimation of ore reserves. Faulting in the ore horizon is even more severe on the deeper horizons, which has the tendency to shorten strike lengths of the individual blocks and increases the amount of stope preparation.

Milling and Metallurgy

There has been no major development in milling during the year. Rather, the emphasis has been on increased tonnage and efficient operation.

Talc has been the most abundant source of ore supply. Due to its character and moisture, particular attention is required to its crushing, screening, and conveying. Crushing time has been greatly extended, and the crew had to be increased by three men in this department.

Grinding efficiency has not been affected adversely due to increased tonnage. Conversely, it has improved due to the judicious use of classifier and cyclone operation within the grinding circuit. This has been reflected in a slightly higher increase in the percentage of gold recovered.

The Consolidated Marcus Exploration

The Marcus drive on the 1,300-foot level was advanced 4,322 feet for completion during 1963, placing the drift face 14,523 feet from the Cochenour No. 1 shaft. Fifteen double diamond-drill stations have been cut, and the long-awaited program of underground diamond-drilling is now under way.

The drive, which runs east for 5,432 feet from the Cochenour property then northeast for 4,025 feet paralleling the Consolidated Marcus-Campbell Red Lake boundary, encountered numerous chert and quartz carbonate vein structures in which visible gold was noted and chip sample assay values were returned. Although none of these structures are considered ore, they do indicate potential areas that will be investigated by the underground diamond-drilling program.

The first area to be explored is the northeast section of the property. It was in this area that surface diamond-drilling, some years ago, discovered three gold-bearing zones that were considered excellent ore prospects.

This drilling program will take at least two years to complete.

The Wilmar Exploration

The 1963 exploration program consisted of both underground and surface diamond-drilling along with extensive drift development of the known mineralized zones on the 1,300-foot level horizon.

Exploratory underground diamond-drilling from the 1,300-foot level located a third mineralized zone some 250 feet northeast of the previously located No. 2 East Breccia zone. A wide low-grade structure was also encountered, called the Fault-Dike-Carbonate zone, located 100 feet south of the No. 3 East Breccia zone.

Several drillholes, directed to explore for up-dip extensions of the known mineralized zones on the 1,300-foot level, encountered economic gold and silver values at positions 100–300 feet above the drift.

Surface diamond-drilling was conducted during the summer to explore for extensions to surface of the known mineralized area. In general, the several shallow holes drilled encountered low gold and silver values but within favourable geological conditions similar to those recognized at greater depths. One of the deeper holes encountered strong gold and silver telluride mineralization in several structures at a depth of 600 feet below surface. Several of the shallow holes encountered a flat-dipping fractured dioritic dike structure within the competent hanging-wall lavas. The first two discovery holes indicated thicknesses of 20 feet at 0.25 ounces gold per ton grade, but follow-up drilling only encountered scattered low-grade values. This structure is still potential ore, but will require underground exploration development to obtain a true evaluation of the grade.

In August 1963, a program of drift development and detailed diamond-drilling was commenced on the 1,300-foot level to expose and outline the major mineralized zones indicated by previous diamond-drilling. This program is now near completion. The results to date, part of which must be estimated, indicate 954 tons per vertical foot with an uncut grade of 0.345 ounces gold and 2.00 ounces silver per ton. No allowance has been made for possible dilution in mining. In addition, a similar tonnage of low-grade is indicated on this horizon, which is being carefully assessed.

Preliminary milling extraction tests indicate a recovery of 94 percent of the gold content, and 80 percent of the silver content may be expected from free milling or cyanidation methods. Further tests are being carried out by Imperial Chemicals of London, England.

In assessing the results and potential of this property to date, the following points must be made:

1. Only 2,500 feet, out of a total potential strike length of 8,000 feet, has been explored to date.
2. Geological conditions suggest additional ore structures along strike can be anticipated.
3. Additional parallel mineralized zones are possible, both to the north and south.
4. There is as yet no reason to assume that indications on the 1,300-foot horizon are any better or worse than any other level.
5. The Diorite zone, which tops some 300 feet below the 1,300-foot level horizon, indicated by diamond-drilling down to the 2,000-foot horizon and traced for almost 1,000 feet and a width of 12 feet or over, requires drift development and bulk sampling to assess its true grade.

Ore developments on the 1,300-foot horizon, supplemented by diamond-drilling results above the level and down to the 2,000-foot horizon, warrant consideration of a 2,000-foot shaft to develop the known and indicated ore zones and explore for possible others. However, as less than one third of the potential strike length has been explored, it is recommended that further exploration along strike be planned by extending the drifts another 3,000 feet and establishing diamond-drilling bases to check this area. If other ore structures were located as a result, their locations could have a direct bearing on the final shaft location.

When the proposed exploration along strike is completed, final shaft and plant plans can be made. As an alternative, it should be noted that it is possible to sink an internal shaft from the

1,300-foot level on the Wilmar to the 2,050-foot horizon and establish five new levels. If this is decided upon, the time of the year would not deter shaft-sinking plans, and the program could be completed without the need of erecting a surface plant at inception. Electric power and compressed air are now available on the 1,300-foot level to carry out a sinking program. A double-drum hoist, capable of hoisting this depth, is on hand at Cochenour. An internal shaft could then be carried through to surface at a later date by raising.

The Wilmar known ore zones are beneath the Red Lake airport, which had surface rights transferred to it years ago by the original owners of the claims. The Department of Transport airport regulations control the erection of tall structures in close proximity to airports and flightways. The Wilmar shaft location can, therefore, be affected. Fortunately, an area south and west of the known ore zones, in competent rock, offers an acceptable shaft location, which is fairly central to the known ore zones and any future extension along strike.

A firm of geological consultants has been engaged to study the development results and submit an independent report on the property.

The Annco Exploration

Since the last annual report a new company, Annco Mines Limited, has been formed to develop that group of claims lying south of and adjoining the central part of the Cochenour property. These five claims were purchased by Annco from Wilmar Mines Limited.

In 1963 the Cochenour mine drove their 2,050-foot level crosscut south to the boundary, and it was then extended into Annco for 340 feet. From a position 240 feet south of the boundary a drift was driven west for 1,040 feet to set up an exploration base. Subsequent diamond-drilling has established that a portion of the Cochenour west zone ore extends across the boundary. This drilling exploration has been carried out from the 2,050-foot drift and positions on the Cochenour 1,800-, 1,675-, and 1,550-foot levels. The 1,925-foot level crosscut is presently being advanced south from the Cochenour shaft, and will be extended into the Annco to provide another exploration base.

Exploration of this property is proceeding rapidly. Five drills are in operation outlining for mining the complex block-faulted ore structures. Drift and raise development is now planned to commence in the latter part of April 1964. The development program is designed to prepare this property for production at the earliest possible date, which could be in the first half of 1965. Production plans will be geared to take the fullest advantage of the three-year tax exemption legislation. Ore indications from diamond-drilling results suggest that about 150,000 tons plus is possible above the 2,050-foot level, and additional ore would be developed on lower horizons.

A peridotite dike, located in and to the south of the 2,050 west drift, may affect depth extensions of the known Annco ore zone. Long exploration diamond-drillholes are now being drilled to the south through this dike, which is 300–600 feet wide, to test for favourable geological conditions. One hole now completed picked up a narrow but rich gold intersection at a position 800 feet south of the 2,050 west drift. Any significance to this occurrence should be established by current drilling.

The average number of employees at the Cochenour, Wilmar, Marcus, and Annco operations was 236: 108 underground, and 128 on surface. J. E. J. Fahlgren was vice-president and general manager.

Consolidated Mosher Mines Limited

New Mosher Longlac Mines Limited was incorporated in June 1950, to succeed Mosher Long Lac Gold Mines Limited. In February 1954 the name was changed to Consolidated Mosher Mines Limited. At the same time the authorized capitalization was changed from 5,000,000 shares of $1 par value to 5,000,000 shares of $2 par value; 3,264,810 shares have been issued. The directors and officers were: J. G. Boeckh, president and director; P. K. Hanley, vice-president and director; J. C. L. Allen, executive vice-president and director; R. C. Stanley Jr., and S. J. Bird, directors; Miss B. A. Argo, secretary. The head office is at Suite 400, 112 King Street West, Toronto 1. The mine address is Geraldton.

The main property comprises twenty claims, west of the MacLeod-Cockshutt mine in Errington township, District of Thunder Bay.

SHAFTS, CONSOLIDATED MOSHER MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth from Surface
				feet	feet	feet
No. 1	T.B.10046	Vertical	3	Surface	——	2,530
No. 2	T.B.10065	Vertical	4	Surface	——	52
No. 3	——	Vertical	3	2,022	941	2,963

The No. 3 internal shaft was sunk 941 feet below the collar at 2,022 feet, to reach a depth of 2,963 feet below surface in 1963. The 14th, 15th, 16th, 17th, 18th, and 19th levels were established at depths of 168, 315, 462, 609, 756 and 903 feet, respectively, below the collar.

Development work in 1963 consisted of: 43 feet of drifting, 629 feet of crosscutting, and 772 feet of raising. Total development footage to 31 December 1963 was as follows: 11,396 feet of drifts; 7,579 feet of crosscuts; 4,767 feet of raises. Diamond-drilling in 1963 consisted of 14 holes, totalling 3,515 feet, from underground, and 3 holes, totalling 1,536 feet, from surface.

New construction consisted of an extension to the compressor building (frame construction); a 62,000-gallon water tank and tower was moved and re-erected.

Major equipment added included the following:

1 hoist (Nordberg 8 x 4 feet plus equipment), 13th level No. 3 winze.
1 power cable (3,000 feet, 2,000 v.), from No. 1 shaft to No. 3 winze.
1 air line (3,000 feet 6–8 in.), to No. 3 winze.
1 vent pipe (2,500 ft. 26 in. with 2 fans, 2 motors), 13th level.
1 vent fan (60 in. with 100 hp. motor), 12 level.
1 compressor (CIR 900 cfm. with 150 hp. Westinghouse motor), surface.

During 1963 the mine produced 563,064 tons of ore, which was milled at an average of 1,564 tons per working day at MacLeod-Cockshutt Gold Mines and yielded 79,704 ounces of gold and 8,155 ounces of silver. Revenue from production amounted to $3,020,602 or $5.36 per ton. It is estimated that an additional $546,000 will be received from E.G.M.A., which will bring the total revenue to $3,566,602 or $6.33 per ton.

All of this ore was mined from the main ore zone (F Zone) above the 2,040-foot level. At the year's end, reserves in this block were estimated to be 1,727,214 tons averaging 0.132 ounces per ton, of which 1,203,374 tons were within projected stope outlines and 523,840 tons in pillars.

The extension of the ore zone below the 2,040-foot level was investigated by dip-drilling, and it is estimated that the first 200 feet of vertical depth below the level contains approximately 900,000 tons of similar grade ore.

No. 3 shaft was collared on the 2,040-foot level, 3,000 feet west of No. 1 shaft, and at the year's end had been sunk to a depth of 941 feet. Six stations had been established for lateral development, the bottom level being at the 2,925-foot elevation.

Lateral development will first be concentrated on the upper three levels to outline the ore to the east of No. 3 shaft and prepare it for mining.

H. E. Rudd was general manager, and the operation was carried on by the MacLeod-Cockshutt organization.

Delnite Mines Limited

Delnite Mines Limited was incorporated in October 1934, with an authorized capitalization of 3,000,000 shares of 80 cents par value, of which 2,978,767 shares have been issued. The directors and officers were: W. V. Moot, president and managing director; Whitworth Ferguson and K. C. Gray, vice-presidents and directors; W. S. Walton, secretary-treasurer and director; W. L. Marcy, F. R. Burton, and A. F. Osborn, directors. The address of both the head office and mine office is Box 590, Timmins.

The property consists of eight claims in Deloro township, Porcupine area, District of Cochrane, three miles southeast of Timmins.

Mining and milling continued throughout 1963.

SHAFTS, DELNITE MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Depth from Surface
				feet	feet
No. 1	T.R.S.825	Vertical	2 (inactive)	Surface	391
No. 2	T.R.S.825	Vertical	3	Surface	3,030
No. 3	T.R.S.825	Vertical	4	2,888	5,395

Development work in 1963 consisted of 231 feet of drifting and 2,644 feet of raising. Total development footage to 31 December 1963 was as follows: 93,046 feet of drifts; 47,048 feet of crosscuts; 61,010 feet of raises. The total amount of development work completed by Aunor mine in Delnite ground to 31 December 1963 was as follows: 1,922 feet of drifts; 45 feet of crosscuts; 1,461 feet of raises. Diamond-drilling in 1963 consisted of 44 holes, totalling 4,346 feet, from underground.

The following was additional equipment in 1963:

2 feeders, Syntron electric.
2 pumps (Triplex 3 x 5).
3 motors (electric, used).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

Ore treated.....tons	183,901
Gross value	$2,031,225
Bullion recovered:	
Gold—50,661.425 oz. at $37.75 per oz.	$1,912,392
Silver—3,838.59 oz. at $1.38 per oz.	5,293
Total value	$1,917,685
Value per ton	$11.05
Recovery per ton	$10.43
Recovery.....percent	94.41

Broken Ore Reserves

Broken ore reserves are estimated at 8,659 tons.

Costs

	Total Cost	Cost per Ton Milled		Cost per Ounce Gold Produced
		1963	1962	1963
OPERATING COSTS (before cost-aid)				
Development and exploration	$ 12,265	$ .07	$ .46	$ .24
Mining	1,302,413	7.08	6.75	25.71
Milling	307,033	1.67	1.66	6.06
General mine charges after deducting sundry revenue	182,635	.99	1.22	3.61
Administrative expense (partly mine)	55,934	.30	.32	1.10
Bullion marketing expense including Mint handling and refining charges	12,631	.07	.07	.25
Total	$1,872,911	$10.18	$10.48	$36.97
OTHER COSTS				
Depreciation	$ 15,289	$ .08	$ .09	$ .30
Shaft sinking and development write-off	44,793	.25	.20	.88
Provision for Ontario mining taxes	18,155	.10	.09	.36
Outside exploration	27,375	.15	.01	.54
Total	$ 105,612	$ .58	$ .39	$ 2.08
Total Costs	$1,978,523	$10.76	$10.87	$39.05

Development

A total of 231 feet of drifting on the bottom five levels of the mine developed 58 feet of ore. Subdrifting from stopes and box-holes developed an additional 142 feet of ore.

Mining

Stoping was done on nine levels, all of which were in No. 3 shaft area.

By the year's end, 65 percent of the ore reserves was concentrated on the three levels below the 4,875-foot horizon.

Milling

The mill operated continuously throughout the year at an average daily rate of 504 tons, as compared with 496 tons for the operating period in 1962.

Extraction improved slightly to 94.4 percent.

General

Due to exhaustion of the ore reserve, the mine will close this year, and it is expected that the last ore will be hoisted about the middle of August 1964.

The average number of employees was 267: 192 underground, and 75 on surface. G. A. Vary was general manager.

Dickenson Mines Limited

Dickenson Red Lake Mines Limited was incorporated in November 1944; in June 1947 the capitalization was increased; in June 1949 the company was reorganized, and the name changed to New Dickenson Mines Limited; in October 1960 the name was changed to Dickenson Mines Limited on amalgamation of New Dickenson Mines Limited and Lake Cinch Mines Limited. The authorized capitalization was 3,750,000 shares of $1 par value of which 3,510,340 shares have been issued. The directors and officers were: A. W. White, president and director

C. R. Diebold, vice-president and director; F. A. Fell, general manager and director; R. A. Jodrey, S. C. Smith, M. L. Urquhart, and R. F. Rock, directors; H. R. Heard, secretary-treasurer; L. W. McIlmurray, assistant secretary; L. V. Barbisan, assistant-treasurer. The head office is at Suite 416, 25 Adelaide Street West, Toronto 1. The mine address is Balmertown.

The property comprises thirty-one claims in Balmer township, Red Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1963.

SHAFTS, DICKENSON MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft	K.R.L.19497	Vertical	3 to 8th level 4 to bottom	3,589
Detta shaft	K.R.L.19502	Vertical	3 (inactive)	280

A total of 5,001 feet of drifting, 6,918 feet of crosscutting, and 4,096 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 69,727 feet of drifts; 57,102 feet of crosscuts; 43,944 feet of raises. Diamond-drilling in 1963 consisted of 385 holes totalling 54,295 feet from underground.

New construction in 1963 included an addition to the mine dry (87 x 20 ft.), two duplex residences (46 x 24 ft.), and seven (28- x 14-foot) additions to houses in Balmertown, all frame construction.

Major equipment added was as follows:

Surface:

1 heating boiler (Chromalox electric CCH-750, 15 psi. in mill building).
3 transformers (CGE, 500 kva, 44,000–550v, in substation).
1 payloader (Hough H-60 with ¾ yd. H.D. bucket on surface).
1 motor (C.G.E., 700 hp., 2,300 v., drip-proof induction on main hoist).

Underground:

2 Tugger hoists (C.I.R. D6v., 5 hp., reconditioned).
4 Tugger hoists (C.I.R. EU-5hp., reconditioned).
6 slusher hoists (C.I.R., H5NN1J-10 hp., reconditioned).
1 slusher hoist (Pillman model 1F, 7.5–10 hp., reconditioned).
1 slusher hoist (Pillman model 2F, 15–20 hp., reconditioned).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

A total of 178,527 tons of ore was milled yielding 91,708.649 ounces of gold and 7,925.99 ounces of silver. The total value of this bullion was $3,476,000, or a recovery of $19.47 per ton milled.

The company continued to sell gold to the Bank of Nova Scotia. The average value received from the bank was $37.78 per ounce for gold, and $1.38 per ounce for silver. No benefits were received under the Emergency Gold Mining Assistance Act.

To date the mine has produced 993,907.734 ounces of gold and 86,616.99 ounces of silver with a total value of $34,962,797, for an average value received from the Mint and the Bank of Nova Scotia of $35.18 per ounce of gold and 94.8 cents per ounce of silver; total tons milled amount to 2,038,385 for a recovery of 0.49 ounces of gold per ton.

Operating Costs

	1963			1962
	Total	Per Ton Milled	Per Ounce	Per Ounce
Ore passes (shaft)	$ 28,754	$ 0.16	$ 0.31	$ 0.40
Exploration and development	553,541	3.10	6.04	4.55
Mining	900,373	5.04	9.82	8.41
Milling	470,492	2.64	5.13	5 03
Mine general expense	340,881	1.91	3.72	3.70
Head office expense	127,437	.71	1.39	1.23
Marketing charges	17,603	.10	.19	.23
Total	$2,439,081	$13.66	$26.60	$23.55

Mining

Broken ore totalling 114,159 tons remained in the stopes, a decrease of 14,104 tons from the previous year. Also 1,866 tons remained in ore bins and ore passes at the year's end.

Of the 178,436 tons of ore hoisted, 28,407 tons grading 0.532 ounces per ton was obtained from development, and 150,029 tons grading 0.538 ounces per ton was obtained from stoping and stope preparation.

Stoping operations were carried on in the North "C", South "C", East South "C", "D", "F", and "H" zones on the upper nineteen levels. Of the total ore hoisted, the percentages from the zones were: North "C" 8.3; South "C" 33.3; East South "C" 26.4; "D" 8.0; "F" 16.0; "H" 4.4; miscellaneous ("E", "I", and Robin) 3.6.

At the year's end, ten stopes were operating as cut-and-fill stopes and five were shrinkage stopes. All new stopes are being prepared for cut-and-fill. Tons broken per rock-drill shift in stopes and backstopes was 41.8 compared to 39.5 in 1962. The average stope width was 6.7 feet compared to 6.0 feet the previous year.

Ore Reserves

At 31 December 1963, positive ore reserves, broken and in place, were calculated to be 591,369 tons having an average grade of 0.507 ounces of gold per ton. This compares with 576,717 tons grading 0.515 ounces per ton at 31 December 1962.

Milling

Summary of mill operations, with the previous year given as comparison, are as follows:

	1963	1962
Treated ..... tons	178,527	175,767
Operating time ..... percent	99.10	99.03
Treated per day ..... tons	489.1	481.6
Average millheads ..... oz. per ton	0.554	0.559
Mill tails ..... oz. per ton	0.040	0.043
Recovery ..... oz. per ton	0.514	0.516
Recovery ..... percent	92.7	92.3

Robin Red Lake Mines Limited

During 1963 a total of 1,270 feet of lateral development and 1,300 feet of diamond-drilling was done on extensions of the Dickenson 17th and 19th levels into the Robin property.

Under a further agreement with Robin, Dome, and Noranda, Dickenson has started a line drive from the 23rd level main haulageway to explore Robin at this horizon. The cost of this drive, which at the end of the year was about 952 feet from the Robin boundary, is being absorbed equally by Dickenson Mines and Robin Red Lake Mines.

The average number of employees was 297: 164 underground, and 133 on surface. F. A. Fell was general manager.

Dome Mines Limited

Dome Mines Limited was incorporated in July 1923, to succeed Dome Mines Company Limited. The authorized capitalization is 2,000,000 shares of no par value, of which 1,946,668 shares have been issued. The directors and officers were: C. W. Michel, chairman, treasurer, and director; J. B. Redpath, president and director; B. R. MacKenzie, secretary and director; W. R. Biggs, F. W. Pershing, A. T. Lambert, H. C. Brunie, A. B. Matthews, and W. F. James, directors; C. P. Girdwood, vice-president and general manager. The head office and mine office address is South Porcupine. The secretary's office is at 36 Toronto Street, Toronto.

The company owns sixty-two claims and parts of the beds of Porcupine and Simpson lakes, in Tisdale, Whitney, Bond, and Shaw townships, Porcupine area, District of Cochrane.

Mining and milling continued throughout 1963.

SHAFTS, DOME MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth from Surface
				feet	feet	feet
No. 1 shaft	P.12866	Vertical	3 (inactive)	Surface	——	105
No. 2 shaft	P.12864	Vertical	3 (inactive)	Surface	——	805
No. 3 shaft	P.12864	Vertical	4 to 10th level; 6 below 10th level	Surface	——	2,456
No. 4 shaft	——	Vertical	Inactive	1,587	——	2,053
No. 5 shaft	——	Vertical	3	2,026	——	3,137
No. 6 shaft	——	Vertical	5	2,000	——	4,062
No. 7 shaft	——	Vertical	3	3,950	220	4,860
No. 1 Dome Ext.	P.13191	Vertical	Inactive	Surface	——	222
No. 1 Foley-O'Brien	P.13403	Vertical	Inactive	Surface	——	70
No. 2 Foley-O'Brien	P.13403	Vertical	Inactive	Surface	——	160
No. 3 Foley-O'Brien	Lot 2, con. 2, Tisdale twp.	Vertical	Inactive	Surface	——	240
Foley-O'Brien winze	——	70°	Inactive	160	——	250
No. 1 Temiskaming	Lot 3, con. 2, Tisdale twp.	Vertical	Inactive	Surface	——	260
No. 2 Temiskaming	Lot 3, con. 2, Tisdale twp.	Vertical	Inactive	Surface	——	60

The 35th level was established 913 feet below the collar of No. 7 winze.

Development work in 1963 consisted of 11,499 feet of drifting; 6,007 feet of crosscutting; and 4,022 feet of raising. Total development footage to 31 December 1963 was as follows: 423,375 feet of drifts; 192,881 feet of crosscuts; 238,571 feet of raises. Diamond-drilling in 1963 consisted of 564 holes, totalling 107,195 feet, from underground.

New construction in 1963 consisted of an assay office (42 x 20 x 15 ft., concrete-block walls, asbestos-board ceiling, galvanized metal roof).

New equipment installed was as follows:

4 aftercoolers with separators for air compressors (S. A. Armstrong, 3,000 cfm. at 100 psi.).
1 dust control filter (Sly, size 56, 3,000 cfm.) in assay office.

The following is taken from the company annual report for the year ending 31 December 1963:

Costs

The expenditure on development was $1,184,480, or $1.66 per ton as compared with $1,186,617, or $1.66 per ton milled in 1962.

The above figures for development in 1963 include $70,311, or $0.10 per ton expenditure on shaft sinking as compared with $233,415, or $0.33 per ton milled in 1962.

The expenditure on mining was $3,626,047, or $5.07 per ton, as compared with $3,588,872, or $5.02 per ton milled in 1962.

The total operating charges for the year were $6,060,086, or $8.48 per ton, as compared with $6,023,146, or $8.43 per ton milled in 1962.

Mining

The 714,800 tons of ore milled during the year was produced as follows:

Source of Ore	Mined	Average Grade
	tons	dwt. per ton
From stopes	615,600	5.31
From development	99,200	3.17
Total	714,800	5.01

The following tabulation is presented to indicate the sections of the mine from which the ore came:

Source of Ore	Mined	Average Grade
	tons	dwt. per ton
5th level to surface	771	4.69
Ankerite veins	163,984	4.38
Area serviced by No. 6 internal shaft	297,000	4.66
Remainder of mine	253,045	5.84
Total	714,800	5.01

All mining during the year was by cut-and-fill methods using hydraulic backfill produced from mill tailings, with a total of 320,500 tons being placed in current cut-and-fill and old shrinkage stopes. The two underground storage stopes supply 95 tons per hour, and since this method was introduced in 1957 a total of 1,531,100 tons has been handled through the pipe-line system. Shaft sinking at No. 7 internal shaft was completed to a depth of 970 feet below the collar on the 29th level. The bottom of this shaft is 4,860 feet below surface. Crosscutting on the 34th level at 4,628 feet commenced in August and was well advanced by the end of the year. Efforts will be concentrated at this horizon during 1964 to explore the potential ore areas projected from the 4,000-foot level.

Ore Reserves

Ore reserves at the close of the year were estimated at 2,405,000 tons with an average grade of 5.25 pennyweight as compared with 2,426,000 tons with an average grade of 5.13 pennyweight for 1962.

Ore	1963	1962
	tons	tons
Unbroken ore	2,181,000	2,160,000
Broken ore	224,000	266,000
Total	2,405,000	2,426,000

Ankerite ore comprises 40 percent of the reserves. This ore is more refractory to the milling process than the normal ore in the mine.

Mill

Following are the milling results:

Ore treated	tons	714,800
Average per day worked	tons	1,986
Average grade of ore treated	dwt. per ton	5.01
Recovery	dwt. per ton	4.90
Recovery	percent	97.68

The average number of employees was 881: 671 underground and 210 on surface. C. P. Girdwood was general manager.

Hallnor Mines Limited

Hallnor Mines Limited was incorporated in April 1936, with an authorized capitalization of 2,000,000 shares of $1 par value, all of which have been issued. The directors and officers were: J. R. Bradfield, president and director; R. V. Porritt, vice-president and director; J. H. Stovel, general manager and director; F. M. Connell, W. S. Row, and L. H. Timmins, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The head office is at 44 King Street West, Toronto 1. The mine address is Pamour.

The property comprises eight claims in Whitney township, Porcupine area, District of Cochrane, adjoining the west boundary of the Pamour Porcupine mine.

Mining and milling continued throughout 1963.

SHAFTS, HALLNOR MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth from Surface
				feet	feet	feet
Main shaft	N.½ Lot 7, con. V, Whitney twp.	Vertical	3	Surface	——	3,477
2230 winze	——	45°	2	3,354	——	3,742
No. 3 shaft	——	Vertical	3	3,198	564	4,455

The 26th, 27th, and 28th levels were established at depths of 813, 964, and 1,115 feet, respectively, below the collar.

Development work in 1963 consisted of: 1,942 feet of drifting; 1,687 feet of crosscutting; and 1,030 feet of raising. Total development footage to 31 December 1963 was as follows: 65,592 feet of drifts; 19,799 feet of crosscuts; 24,429 feet of raises. Diamond-drilling consisted of 302 holes, totalling 24,487 feet, from underground. New equipment consisted of a tandem drum hoist (6 x 6 feet, Canadian Ingersoll-Rand) installed at No. 3 internal shaft.

The following is taken from the company annual report for the year ending 31 December 1963:

Underground

Most of the development work was directed toward the completion of No. 3 shaft to a depth of 4,450 feet below surface, and the access crosscuts and exploration drifts connected to it. Following completion of No. 3 shaft in May to 1,257 feet below the 21st (3,200-foot) level, the ore-pass system was raised 680 feet from the 28th (4,300-foot) level to the 24th (3,700-foot) level. Crosscuts were driven to 19 vein on the 25th level where 740 feet of drifting exposed 700 feet of ore averaging 0.54 ounces of gold per ton, and on the 26th level where 530 feet of drifting exposed 150 feet of ore averaging 0.55 ounces per ton. Muck samples in drifting to the west on the 26th level indicate disappointing gaps in ore values.

Stoping

Ore broken in stopes amounted to 128,600 tons, and ore drawn off was 123,000 tons. The broken-ore reserve was 10,900 tons at the year's end. Tonnage hoisted from below the 17th (2,600-foot) level amounted to 74 percent of the total.

Some 1,775 feet of diamond-drillholes were drilled and reamed for the hydraulic fill system to service the 19 vein area. Relatively flat dips on some sections of the vein preclude the use of sand fill. The hydraulic fill system is expected to be in operation in March.

Sand backfill placed in stopes amounted to 63,600 tons.

A tabulation of ore production by levels for the year 1963, and since production commenced in June 1936, follows:

Level	Below Surface	1963	1936 to 1963
	feet	tons	tons
1st to 8th	1,400	33,545	2,497,305
18th	2,750	——	24,740
19th	2,900	45,340	176,480
20th	3,050	31,060	125,870
21st	3,200	3,320	30,150
22nd	3,350	355	11,215
23rd	3,500	5,500	20,550
24th	3,700	1,730	6,415
25th	3,850	1,970	1,970
26th	4,000	200	200
Stoping total	——	123,020	2,894,895
Development	——	10,230	208,470
Total	——	133,250	3,103,365

Ore Reserves

At 31 December 1963, ore reserves were estimated at 199,400 tons, averaging 0.34 ounces of gold per ton, as compared to 148,000 tons at 0.31 ounces per ton at the end of 1962. These reserves include 100,000 tons at 0.40 ounces per ton of 19 vein ore from the 22nd level down to the 26th level. Some 41,600 tons at a grade of 0.21 ounces per ton remain above the 8th level, compared to 46,800 tons grading 0.23 ounce per ton at the end of 1962.

Mill

The mill was in continuous operation throughout the year. The primary ball mill operated 98.4 percent of the possible running time, and averaged 364 tons per day compared to 352 tons per day in 1962.

The mill treated 133,000 tons of ore averaging 0.34 ounce of gold per ton and, with a recovery of 97.7 percent production, amounted to 43,830 ounces of gold and 2,615 ounces of silver.

To 31 December 1963 the mill has treated 3,102,200 tons of ore, from which were recovered 1,225,600 ounces of gold and 94,100 ounces of silver, having a combined value of $44,547,500.

The average number of employees was 200: 127 underground and 73 on surface. J. M. Gordon was manager.

H. G. Young Mines Limited

H. G. Young Mines Limited was incorporated in January 1946; in 1962 the authorized capitalization was increased to 7,000,000 shares of $1 par value of which 5,296,485 shares have been issued. The directors and officers were: W. H. Maedel, president and director; J. D. Streit, vice-president and director; J. M. Godfrey, secretary and director; E. G. Bishop, H. G. Young, and B. W. Lang, directors. The head office is at 1702, 80 Richmond Street West, Toronto 1. The mine address is Box 130, Balmertown.

The property, consisting of nineteen claims, is located in Balmer township, Red Lake area, District of Kenora (Patricia Portion). It adjoins part of the east boundary of Campbell Red Lake property, and includes part of the land under the water of Balmer Lake.

The mine operated from 1 January to 20 February; the mill from 1 January to 6 March 1963.

The mine was serviced by the vertical, three-compartment No. 1 shaft, 1,052 feet deep, located on claim K.R.L.20068.

There was no development work completed in 1963. The accompanying table gives the accumulated development footages up to the date of mine closure 20 February 1963:

Development

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
259-foot	—	155	319
509-foot	3,000	1,286	914
634-foot	2,339	1,343	369
784-foot	750	158	—
934-foot	2,989	2,880	2,548
Total	9,078	5,822	4,150

A total of 18,306 tons of ore was hoisted; 18,481 tons was milled. The mill treated 325 tons daily from 1 January until operations ceased 6 March 1963.

The average number of employees was 15: 7 underground, and 8 on surface. W. R. McDonald was mine manager; V. N. Aultman, accountant, was in charge after operations ceased.

Hollinger Consolidated Gold Mines Limited

Hollinger Consolidated Gold Mines Limited was incorporated in January 1916. The authorized capitalization was 5,000,000 shares of $5 par value, of which 4,920,000 shares have been issued. The directors and officers were: J. R. Timmins, chairman of the board and director; A. A. McMartin, president and director; N. A. Timmins, vice-president and director; P. C. Finlay, vice-president, treasurer, and director; Hon. Edouard Asselin, Duncan McMartin, J. A. McDougald, M. C. G. Meighen, and W. E. Phillips, directors; C. G. Cowan, secretary; E. A. Perry, general manager of Hollinger and Ross Mines. The mine office and head office is at Timmins. The general office is at 44 King Street West, Toronto 1.

The Timmins property operated by the company, consists of twenty-six claims located in Tisdale township, Porcupine area, District of Cochrane, and includes part of the ground underlying the town of Timmins. The company has numerous holdings and interests. It owns and operates the Ross mine in Hislop township, District of Cochrane.

HOLLINGER MINE

Mining and milling operations continued throughout 1963.

SHAFTS, HOLLINGER MINE

Shaft	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
Main	P.13156	Vertical	3	Surface	2,770
Central	P.13157	Vertical	6	Surface	3,194
No. 26	P.13156	Vertical	5	Surface	3,063
No. 11	P.13144	Vertical	2	Surface	2,755
No. 19	Schumacher veteran lot	Vertical	3	Surface	3,954
No. 6	P.13218	Vertical	2{0–200 ft. filled; 200–425 ft. travel}	Surface	425
No. 21	———	Vertical	2{1,550–2,750 ft. filled; 2,750–3,950 ft. travel}	1,550	3,950
No. 25[1]	———	Vertical	3	3,950	5,438
No. 27[2]	———	Vertical	4	2,750	5,293

[1]No. 25 shaft—Hoist is on 3,800-foot level.
[2]No. 27 shaft—Hoist is on 2,450-foot level.

All other shafts have been stoped, filled, etc. Inactive shafts from surface have been bulkheaded. Development work during the year consisted of 4,951 feet of drifting; 3,448 feet of crosscutting; and 21,225 feet of rock-passes, development, and stope raising. Total development from 1931 to 31 December 1963 included: 1,307,282 feet of drifts; 688,895 feet of crosscuts; 951,610 feet of raises. Diamond-drilling in 1963 consisted of 714 holes, totalling 71,343 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1963:

Production	1963	1962
Worked ..... days	270	270
Milled ..... tons	965,094	1,049,369
Millhead grade per ton ..... oz.	0.264	0.265
Millhead value per ton	$ 10.04	$ 9.98
Average value of tailings per ton	$ 0.30	$ 0.30
Gold produced ..... oz.	247,310	269,529
Average value received per ounce of gold sold	$ 37.75	$ 37.39
Bullion production	$ 9,399,970	$10,162,174
Operating Cost (before taxes and depreciation)	$ 9,764,666	$10,254,831

Cost Summary

Cost Per Ton	1963	1962
Mining	$ 6.67	$ 6.51
Milling	0.86	0.82
General	1.08	1.04
Vacation pay, insurance, and other employee benefits	0.61	0.55
Administrative	0.90	0.86
Total	$10.12	$ 9.78

Productivity dropped from 2.55 tons per man-shift in 1962 to 2.49 tons per man-shift in 1963. Cost per ton at $10.12 was 34 cents higher due principally to a wage increase of 3 cents per hour, instituted in late 1962, and to the higher fixed charges resulting from lower tonnage milled. The cost of producing an ounce of gold rose from $37.94 to $39.48.

The price received per ounce of gold varied between $37.66 and $37.89 and averaged $37.75 for each ounce sold.

The long term program for effecting an orderly recovery of all ore remnants is in its final stages, and extensive areas of the mine have been almost worked out. The ore reserve at the year's end was estimated to be 1,033,000 tons having a grade of 0.275 ounces of gold per ton, and value of $9.62 per ton with gold at $35.00 per ounce. The comparable figures for 1962 were 1,597,000 tons at 0.282 ounces per ton, valued at $9.87 per ton.

The ore reserve estimate of 1,033,000 tons is the total of those blocks of ore that are economic to mine at present mining cost. Any adverse changes in the conditions that affect costs would automatically be reflected in a reduction of the tonnage, which could then be considered as actual reserve.

The average number of employees was 1,518: 973 underground, and 545 on surface. E. A. Perry was general manager.

ROSS MINE

The Ross property comprises 456 acres located in Hislop township, District of Cochrane. The mine address is Holtyre.

Mining and milling continued throughout 1963.

SHAFTS, ROSS MINE

	Location	Inclination	Number of Compartments	Collar Depth	Depth from Surface
				feet	feet
No. 1 shaft	N.½ lot 1, con. II, Hislop twp.	Vertical	3	Surface	2,646
No. 2 winze	———	Vertical	2	291	1,526

Development work in 1963 consisted of 1,662 feet of drifting; 5,085 feet of crosscutting; and 1,696 feet of raising. Total development footage to 31 December 1963 included: 42,753 feet of drifts; 42,095 feet of crosscuts; 32,198 feet of raises. Diamond-drilling consisted of 210 holes, totalling 28,514 feet, from underground.

A former bunkhouse was converted into a residence.

New equipment added included: a new spur gear and pinion for a Nordberg hoist; 2 pumps (Allis-Chalmers, 5 x 5 in. S.R.L.); a concrete barren solution tank (20 x 10 ft.).

The following is taken from the company annual report for the year ending 31 December 1963:

The testing of known ore zones at the lowest horizon has been completed and, while results have met expectations, further exploration at a greater depth is not warranted at this time. Operating cost continued to exceed the value of bullion produced, in spite of some improvement in both tonnage milled and millhead values over those of the previous year.

Costs

	1963	1962
Mining charges	$3.03	$3.24
Milling charges	1.93	1.78
General charges	0.72	0.80
Vacation pay, insurance, and other employee benefits	0.25	0.27
Administrative charges	0.40	0.40
Total Charges	$6.33	$6.49

Development efforts were concentrated on increasing the ore reserve and proving untested zones, with particular attention being directed to the lowest mine level. Both objectives were met without interference with normal production schedules. As a step toward lowering mining costs, the tempo of development has been reduced, and further work of this nature will be carried on when necessary to complement stoping operations.

The ore reserve at the end of 1963 was 478,600 tons with an estimated grade of 0.181 ounces of gold per ton, equal to $6.35 per ton with gold valued at $35.00 per ounce. At the end of 1962 the comparative figures were 473,600 tons grading 0.184 ounces of gold per ton, equal to $6.46 per ton.

Production

	1963	1962
Worked ..... days	344	344
Milled ..... tons	147,822	139,506
Millhead grade per ton ..... oz.	0.152	0.146
Millhead value per ton	$ 6.04	$ 5.78
Average value of tailings per ton	$ 0.54	$ 0.44
Gold produced ..... oz.	20,387	18,724
Average value received per oz. of gold sold	$ 37.75	$ 37.45
Bullion production	$812,254	$745,363
Operating cost (before taxes and depreciation)	$935,877	$904,613

The average number of employees was 109: 56 underground, and 53 on surface. J. J. Caty was resident manager.

Hugh-Pam Porcupine Mines Limited

Hugh-Pam Porcupine Mines Limited was incorporated in December 1935, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 3,999,399 shares have been issued. The directors and officers were: H. F. Brownbill president and director; W. H. Maedel, vice-president, secretary-treasurer, and director; F. G. Lawson, vice-president and director; D. G. Lawson and G. A. MacMillan, directors. The head office is at 7th floor, 105 Adelaide Street West, Toronto 1. The mine address is Pamour.

The company owns fifteen claims in Whitney township, Porcupine area, District of Cochrane. The mine is operated under the management of Broulan Reef Mines Limited, and the ore is treated in the Broulan mill.

SHAFTS, HUGH-PAM MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
Mulholland	12708	Vertical	2 (inactive)	0	200
Hughes	13096	Vertical	2 (inactive)	0	200
No. 1 winze	——	70°	2 (inactive)	200	318
No. 2 winze	——	Vertical	2	2,500	2,628

All work on the Hugh-Pam property is done through extensions of the Reef workings of Broulan Reef mine; surface hoisting is through the Reef shaft.

Development footage in 1963 consisted of 1,025 feet of drifting; 183 feet of crosscutting and 798 feet of raising. Total development footage to 31 December

1963 was as follows: 19,198 feet of drifts; 2,047 feet of crosscuts; 7,383 feet of raises. Diamond-drilling in 1963 consisted of 36 holes, totalling 3,271 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1963:

Production and Treatment

During the year 44,970 tons of ore were mined and milled.

Production was 5,055.61 ounces of fine gold valued at $190,830.60, and in addition it is estimated that $51,946 will be received under the terms of the Emergency Gold Mining Assistance Act.

Average recovery was 0.112 ounces of gold or $4.24 per ton milled, based on the Mint price, plus an additional $1.16 per ton milled under the Emergency Gold Mining Assistance Act.

Ore Reserves

Proven ore reserves are calculated to be 31,000 tons having an average uncut grade of 0.27 ounces of gold per ton or a grade cut to one ounce of 0.19 ounces per ton, after allowing for 10 percent dilution.

Operating costs for the 44,970 tons mined and milled during the year, including head office administrative and general expense, amounted to $8.07 per ton.

The employment figures are given in this report under Broulan Reef Mines Limited. W. F. Atkins was manager of mining operations; J. M. Bracken was mine manager.

Kenilworth Mines Limited

Kenilworth Mines Limited was incorporated in January 1962 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 2,762,703 shares have been issued. The directors and officers were: H. L. Pountney, president and directors; C. W. Miller, manager and director; V. E. Irons, treasurer and director; J. A. McConnell, secretary; June M. Miller, assistant treasurer and assistant secretary. The head office and mine address is Box 945, Timmins.

The property, formerly known as the Naybob Gold Mine, consists of sixteen claims in Ogden and Deloro townships, Porcupine area, District of Cochrane.

Operations proceeded from October to December 1963.

The vertical, three compartment No. 1 shaft, located in claim HR-938, has a depth of 1,347 feet below surface. Development work in 1963 consisted of 214 feet of drifting and 302 feet of raising. Total development footage to 31 December 1963 (including Naybob to year's end 1947) was: 23,681 feet of drifts; 8,566 feet of crosscuts; 8,672 feet of raises. Some 4 diamond-drillholes, totalling 687 feet, were completed from surface, and 145 holes, totalling 11,151 feet, from underground.

New construction in 1963 included the following:

1 gate-house building (10 x 10 feet, concrete-block).
1 weigh-scale building (15 x 29 feet, concrete-block).
1 garage (28 x 38 feet, concrete-block).
1 shop building (25 x 65 feet, concrete-block).

A total of 6,430 tons of ore was hoisted. The mill commenced operations in November, treating 5,220 tons of ore at an average of 160 tons per operating day.

The average number of employees was 52: 15 underground, and 37 on surface. C. W. Miller was general manager.

Kerr-Addison Mines Limited

Kerr-Addison Gold Mines Limited was incorporated in April 1936. In November 1963, on amalgamation of Kerr-Addison Gold Mines Limited, Anglo-Huronian Limited, Bouzan Mines Limited, and Prospectors Airways Company Limited, the name was changed to Kerr-Addison Mines Limited. The authorized capitalization was increased to 10,000,000 shares of no par value, of which 7,013,902 shares have been issued. The directors and officers were: W. S. Row, president and director; K. C. Gray, vice-president and director; M. S. Fotheringham, F. M. Connell, J. R. Bradfield, H. E. Langford, R. V. Porritt, W. H. Rea, H. H. Leather, and W. D. Smith, directors; B. C. Bone, treasurer; R. D. Stewart, secretary; J. B. Sage, assistant secretary. The head office is at Suite 1600, 44 King Street West, Toronto 1. The mine address is Virginiatown.

The company's main property consists of thirty-four claims in McGarry township, Larder Lake area, District of Timiskaming.

Mining and milling continued throughout 1963.

SHAFTS, KERR-ADDISON MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Total Depth from Surface
				feet	feet
No. 3	T.1751	Vertical	5	Surface	3,995
No. 4	T.2018	Vertical	3	3,850	6,022

Development work in 1963 included: 988 feet of drifting, 544 feet of crosscutting, and 3,182 feet of raising. Total development footage to 31 December 1963 was as follows: 216,448 feet of drifts; 84,810 feet of crosscuts; 161,922 feet of raises. The total footage includes some development work on the Chesterville and Arjon properties. Diamond-drilling in 1963 consisted of 102 holes, totalling 17,108 feet, from underground.

Equipment added in 1963 included the following:

1 sheave (14-ft. diameter, complete with shaft and bearings for No. 3 headframe, United Steel Corp.).
9 scrapers (42-in., Joy Manufacturing Company).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

	1963	1962
Milled ..... tons	956,217	1,242,933
Average milled per day ..... tons	2,619.8	3,405.3
Total gold recovered ..... oz.	324,986.31	418,150.29
Total silver recovered ..... oz.	19,872.40	25,394.05
Average mill-head value per ton (bullion plus tails) ..... oz. per ton	0.3477	0.3439
Average mill-head value (gold at $35.00 per oz.) ..... per ton	$12.169	$12.038
Recovery ..... percent	97.7	97.8
Total realized value of bullion (Canadian funds)	$12,299,153.50	$15,742,590.26
Total realized value of bullion per ounce of gold	$37.85	$37.65
Total realized value of bullion per ton milled	$12.862	$12.666

Mine Development and Mining

On the 5,600-foot level, the 5605 east drift was extended to section 80 east to permit additional deep drilling. No drifting was done on the 4,800-foot level.

On the 4,400-foot level, stope development continued, and stoping is now underway in the northwest zone of No. 21 orebody. Stoping in this zone has also been started on the 4,200-foot level. On the 3,850-foot level, stopes are being developed in the northeast and in the south zones of No. 21 orebody. Stoping in this zone has also been started on the 4,200-foot level. On the 3,850-foot level, stopes are being developed in the northeast and in the south zones of No. 21 orebody.

In order to preserve the established mining sequence, stoping operations in the No. 21 orebody on the 3,550-foot level are being curtailed pending the advancement of stoping on the 3,250-foot level. Rehabilitation work between the 3,250-foot and 3,100-foot levels, following a series of ground failures in 1962, is proceeding, but has been slowed by additional movements in August 1963. The mining sequence that was decided upon in 1962 is being followed closely.

Pillar recovery in Nos. 6, 14, 16, and 21 orebodies is continuing, and accounted for 15 percent of the total tons broken in 1963.

The distribution of ore production from the mine is shown in the accompanying table:

Source of Ore	1963		1962	
	tons	percent	tons	percent
Surface to 1,900-foot level	230,678	24.3	275,496	22.2
1,900-foot to 2,500-foot level	223,078	23.4	287,231	23.1
2,500-foot to 3,100-foot level	224,678	23.6	260,856	21.0
3,100-foot to 3,700-foot level	161,239	16.9	250,298	20.2
Below 3,700-foot level	112,468	11.8	168,229	13.5
Total Ore Produced	952,141	100.0	1,242,110	100.0

A summary of the tonnages of ore broken by the different mining methods follows:

Mining Method	1963		1962	
	tons broken	percent	tons broken	percent
Cut-and-fill stoping	353,669	39.0	711,487	60.4
Cut-and-fill pillar recovery	5,981	0.6	27,784	2.4
Total Cut-and-fill Mining	359,650	39.6	739,271	62.8
Square-set stoping	377,660	41.7	272,691	23.2
Square-set pillar recovery	130,885	14.4	119,966	10.2
Total square-set mining	508,545	56.1	392,657	33.4
Total cut-and-fill and square-set mining	868,195	95.7	1,131,928	96.2
Shrinkage stoping	15,909	1.8	15,841	1.3
Total mining	884,104	97.5	1,147,769	97.5
Development ore	22,875	2.5	29,404	2.5
Total Ore Broken	906,979	100.0	1,177,173	100.0
Percentage of tons milled	———	94.8	———	94.7

A total of 413,451 cubic yards of backfill was placed in the mine. Of this, 404,903 cubic yards or 97.9 percent was obtained from mill tailings.

Cost of Production

	1963		1962	
	In Full	Per Ton	In Full	Per Ton
Development	$ 199,869.05	$0.209	$ 435,463.64	$0.351
Stope development	112,615.29	0.118	236,584.64	0.191
Mining	3,046,413.20	3.186	3,414,604.14	2.747
Haulage	350,333.16	0.366	482,666.76	0.388
Hoisting	359,345.57	0.376	360,079.03	0.290
General mine charges	1,850,424.82	1.935	2,144,483.59	1.725
Crushing and conveying	167,168.89	0.175	219,032.15	0.176
Milling	1,021,118.08	1.068	1,275,348.42	1.026
General expense	674,329.93	0.705	689,857.12	0.555
Bullion marketing	90,809.99	0.095	110,587.57	0.089
Total Operating Cost at Mine	$7,872,427.98	$8.233	$9,368,707.06	$7.538

Ore Reserves

At the end of 1963, proven ore reserves including allowances for dilution were as follows:

	Tons	Ounces Per Ton
Surface to 1,600-foot level	429,203	0.2792
1,600-foot to 2,500-foot level	1,614,740	0.3145
2,500-foot to 3,700-foot level	1,535,573	0.4005
3,700-foot to 4,550-foot horizon	2,465,361	0.5270
Total reserve at the end of 1963	6,044,877	0.4205
Total reserve at the end of 1962	6,817,143	0.4114

The total reserve at the end of 1963 includes 12,747 tons of broken ore reserves having an average grade of 0.3059. Total reserves were decreased by 772,266 tons, although 956,217 tons were milled. There were some minor revisions to ore estimates, but extensions to known orebodies by sub-drifting and slashing accounted for most of the gain of 183,951 tons.

The average number of employees was 1,094: 653 underground, and 441 on surface. S. C. Yule was manager.

Kostynuk Brothers

The gold prospect, comprising twenty claims, is located on the north shore of Richardson Lake in the Patricia Portion of the District of Kenora. The property is privately owned and located about 60 miles northeast of the town of Red Lake and about 3 miles north of the old Jason mine at Casummit Lake.

Mining operations progressed from 5 June to 12 October. A 5-ton Gibson mill, which recovers the gold as amalgam, was operated from 1 August to 4 October 1963. The work was completed by four Kostynuk brothers, with A. Kostynuk P.O. Box 25, Red Lake, in charge.

The vertical, two-compartment No. 1 shaft, collared on claim 43655, was sunk 40 feet below the collar. Some 50 feet of drifting, and 35 feet of crosscutting, and surface trenching about 50 feet in length averaging 2 feet in depth, was completed. A headframe and concrete foundation for the mill were constructed. Some 62 tons of ore mostly from the top section of the shaft was treated in the Gibson mill.

Lake Shore Mines Limited

Lake Shore Mines Limited was incorporated in February 1914, with an authorized capitalization of 2,000,000 shares of $1 par value, all of which have been issued. The directors and officers were: R. C. Stanley, Jr., president and director; J. G. Boeckh, executive vice-president, treasurer, and director; J.C. Adamson, P. K. Hanley, J. C. L. Allen, and S. J. Bird, directors; Miss B. A. Argo, secretary; H. W. Wright, comptroller. The head office and mine office is at Kirkland Lake. The executive office is at Suite 400, 112 King Street West, Toronto 1.

The company's main property, consisting of about 287 acres, is in Teck township, Kirkland Lake area, District of Timiskaming.

Mining and milling continued throughout 1963.

SHAFTS, LAKE SHORE MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft	L.1557	Vertical	3 (inactive)	Surface	2,250
No. 1 shaft extension	———	Vertical	3 (inactive)	2,000	4,507
No. 2 shaft	L.2243	19°	1	Surface	200
No. 3 shaft	L.2506	Vertical	5	Surface	3,995
No. 4 shaft	———	Vertical	3	4,325	8,176
No. 5 shaft	L.2506	Vertical	5	Surface	3,995
No. 6 shaft	———	Vertical	5	3,575	6,124

Development work during the year consisted of 79 feet of drifting, 181 feet of crosscutting, and 392 feet of raising. Total development footage to 31 December 1963 was as follows: 278,944 feet of drifts; 107,990 feet of crosscuts; 154,261 feet of raises. Diamond-drilling in 1963 consisted of 94 holes, totalling 5,866 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1963:

Production

	1963	1962
Ore milled, tons	134,711	141,075
Average milled per day, tons	369	387
Gold produced, oz.	57,063.622	51,625.421
Silver produced, oz.	22,806.280	27,494.932
Average gold recovery per ton, oz.	0.4236	0.3659
Price per ounce for gold	$37.76	$37.49
Gross value of production estimated	$2,548,392	$2,463,255
Average value per ton	$18.92	$17.46
Total operating expense	$2,226,440	$2,313,293
Operating expense per ton milled	$16.53	$16.40
Operating cost per ounce of gold recovered	$39.02	$44.81
Total Operating Profit	$321,952	$149,962
Operating profit per ton milled	$2.39	$1.06

The price received from the Mint for gold produced in 1963 remained within a narrow range of from $37.658 to $37.905 per ounce. At $37.76, the average price for the year was 27 cents per ounce higher than in 1962.

The recovery of gold per ton of ore treated during the year was higher than in the preceding period by 0.0577 ounces or $2.18 per ton milled.

The total tonnage milled was less by 6,364 tons, but largely because of the better recovery per ton there was a satisfactory improvement in the operating profit for the year.

From the start of milling operations in March 1918 to 31 December 1963, the mine has produced and the mill has treated 16,430,072 tons of ore, from which was recovered bullion having a gross value of $267,522,331.

Operating Costs

	Cost Per Ton Milled	
	1963	1962
Mine development	$ 0.372	$ 1.058
Mining	9.492	8.910
Milling	2.407	2.379
Marketing expense	0.124	0.111
General expense at the property	2.515	2.506
Mine office and supervision	1.018	1.006
Provincial mining tax	0.091	0.040
Administrative and corporate expense	0.508	0.388
Total Operating Cost	$16.527	$16.398

Milling

Milling operations were continuous throughout the year. In the period the mill treated 134,711 tons of Lake Shore ore for an average daily milling rate of 369 tons, compared with 141,075 total tons and 387 tons per day in 1962. Largely because of the higher average grade of the ore treated during the year, there was an improvement in the percentage recovery of contained gold, which in 1963 reached 97.54 percent as against 97.35 percent in 1962.

The mill also treated 143,000 tons of ore from the Wright-Hargreaves mine, equivalent to 392 tons per day for the period. Additionally, 140,215 tons of cyanide tailings from the mill of Macassa Gold Mines Limited was processed in the tailings re-treatment plant.

Mining

Ore production was from seventeen of the fifty-eight main levels in the mine down to the 8,075-foot level. A tabulation based on the stages of hoisting required to raise the ore to surface follows:

	Tons from Development	Tons from Stoping	Total Tons	Percent of Total	Hoisting Stages
Surface to 3,950-foot level	520	35,385	35,905	26.6	1
4,075 to 6,075-foot level	166	27,661	27,827	20.7	2
Below 6,075-foot level	1,932	69,047	70,979	52.7	3
Total	2,618	132,093	134,711	100.0	——

Of the total ore produced, 1.9 percent came from development work compared with 6.8 percent in 1962 and 12.4 percent in 1961.

Over the year there was a gradual decline in the tonnage of ore recovered from workings below the 6,075-foot level, reflecting the fact that stoping operations on the lower-level orebodies have progressed to the stage where fewer stoping sections can be operated. There was also an appreciable drop in the gold content per ton of ore recovered from these lower-level orebodies, because some of the stoping sections were working in fringe areas of the ore-shoots.

For the whole of 1963, 52.7 percent of the total ore production came from below the 6,075-foot level compared with 62.6 percent in 1962. For the last quarter of the year the proportion dropped to 40.5 percent, although in December 1963 it was 35.1 percent.

Part of the loss in ore production was replaced by increased output from workings at higher elevations in the mine, but at the same time the lower recovery per ton, obtained from the ore produced on the deep levels, was more than offset by the production of higher than average grade ore from some of the stoping sections on the upper and middle levels of the mine. At 0.4236 ounces of gold per ton of ore milled, the recovery for 1963 was well above the average grade of the total ore reserves.

The quantity of higher-grade ore remaining on the upper levels is limited, and since production from the orebodies on the lower levels will continue to drop, a further decline in both the tonnage milled per day and in average grade may be anticipated.

Ore Reserves

There is at present over two years' supply of material now classed as ore, but the distribution of the individual blocks of ore throughout the underground workings is such that their eventual complete extraction will be difficult to effect.

The maldistribution, which is caused by the incidence of rockbursts, prohibits the achievement of the essential balance in mining schedules. The occurrence of a burst in one part of the mine, with the consequent reduction in output from that region, makes necessary the mining of orebodies, located elsewhere, at rates faster than otherwise would have been undertaken.

This interference with the over-all balance of ore extraction could lead to a situation in which production could not be held at a rate sufficient to maintain the operation of the mine.

The average number of employees was 386: 226 underground, and 160 on surface. W. T. Robson was general manager.

Leitch Gold Mines Limited

Leitch Gold Mines Limited was incorporated in July 1935, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,912,505 shares have been issued. The directors and officers were: K. J. Springer, president and director; J. H. C. McClelland, vice-president and director; F. E. Hall, executive vice-president, secretary-treasurer, and director; S. H. Robinson and J. R. Cryderman, directors. The head office is at Suite 225, 12 Richmond Street East, Toronto 1. The mine address is Beardmore.

The property, comprising fifty-one claims, is located in Eva and Summers townships, District of Thunder Bay, about 5 miles from Beardmore by motor road.

Mining and milling continued throughout 1963.

SHAFTS, LEITCH MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1	H.F.I.	Vertical	3	Surface	3,006
No. 2	——	Vertical	3	2,870	4,612

Development work during the year consisted of 1,366 feet of drifting; 226 feet of crosscutting; and 479 feet of raising. Total development footage to 31 December 1963 was as follows: 63,511 feet of drifts; 24,365 feet of crosscuts; 29,766 feet of raises. Diamond-drilling in 1963 consisted of nine holes totalling 3,506 feet from underground, and four holes totalling 3,006 feet from surface.

Annual Report for 1963

The following is taken from the company annual report for the year ending 31 December 1963:

Ore Reserves

Ore reserves, as of 31 December 1963, are estimated at 36,964 tons, grading 1.092 ounces per ton, or a total of 40,346.63 ounces.

Hoisting

A total of 40,968 tons of ore was hoisted; 1,040 tons or 2.5 percent from drifts; 876 tons or 2.2 percent from raises; and 39,052 tons or 9.3 percent from stopes.

Waste hoisted, totalled 7,226 tons.

Milling

In all, 38,091 tons of ore was milled after sorting 9,578 tons of waste. The average milling rate was 106.3 tons a day based on 358 operating days during the year. Production for the year was 56,575.378 ounces of gold, and 2,249.07 ounces of silver. Total value of production, including premium on free market sales and premium on Canadian dollar exchange, was $2,146,068.89.

Average recovery was 1.485 ounces of gold per ton milled.

Tailing losses averaged 0.028 ounces per ton milled. Extraction was 98.1 percent.

Costs

The following table shows the operating costs for the year 1963:

	Per Ton Milled
Exploration and Development	
Crosscutting	$ 0.27
Drifting	1.47
Raising	0.35
Surface diamond-drilling	0.26
Underground diamond-drilling	0.24
	$ 2.59
Mining	$15.89
Milling	5.71
Total Operating Costs at the Mine	$24.19

The total operating cost was lower than the previous year's figure of $26.31 per ton milled, due mainly to the increase in tons milled and a higher recovery in ounces of gold per ton milled. Mining costs were lower, $15.89 per ton milled, as compared to $17.60 per ton milled; the lowering of this unit cost was due to more efficiency in the breaking and mucking cycles. Milling cost varied slightly, $5.71 per ton milled, as compared to $5.82 last year.

The trend of unit costs in the past four years are shown in the following schedule:

	1960	1961	1962	1963
Crosscutting and drifting cost per foot advance	$40.14	$41.09	$37.75	$39.74
Raising, cost per foot advance	25.15	32.82	25.34	27.00
Mining, cost per ton broken	14.65	14.93	14.37	13.09
Milling, cost per ton milled	5.86	5.78	5.82	5.71

Two unit costs were up, and two were down, as compared to last year's figures. The average unit costs over the past five years remains very close to this year's costs. Ground control at depth continues to be the main problem.

General

Ore reserves are estimated to be sufficient to maintain operations until about the end of 1964. Diamond-drilling carried on during the year failed to improve the ore picture below the 30th level.

During the year there were no compensable injuries at the mine, this indeed can be considered a highlight in the history of the mine, an achievement all can be proud of.

The average number of employees was 110: 54 underground, and 56 on surface. W. R. Sinclair was appointed manager following the accidental death of former manager and director, G. A. McKay.

Macassa Gold Mines Limited

Macassa Mines Limited was incorporated in April 1926, and Bicroft Uranium Mines Limited was incorporated in April 1955. In November 1961, the two companies were amalgamated under the name of Macassa Gold Mines Limited with an authorized capitalization of 4,000,000 shares of $1 par value of which 3,043,665 shares have been issued. The directors and officers were: J. D. Bryce, president and director; J. G. Boeckh, vice-president and director; J. C. L. Allen, P. K. Hanley, T. D. Carlson, C. C. Huston, and R. C. Stanley Jr., directors; Miss B. A. Argo, secretary-treasurer. The head office is at 112 King Street West, Toronto 1. The mine address of the Macassa Division is Box 550, Kirkland Lake. The Bicroft Division is reported on in the Uranium section of this report under Macassa Gold Mines Limited, Bicroft Division.

MACASSA DIVISION

The Macassa Division property comprises eleven claims in Teck township, Kirkland Lake area, District of Timiskaming.

Mining and milling operations continued throughout 1963.

SHAFTS, MACASSA DIVISION

	Claim No.	Inclination	Number of Compartments	Collar Depth	Depth from Surface
				feet	feet
Elliot shaft	L.1617	Vertical	2 (inactive)	Surface	523
No. 1 shaft	L.2837	Vertical	3	Surface	3,043
No. 1 winze	L.2837	Vertical	3	3,000	4,824
No. 2 shaft	L.4186	Vertical	3	Surface	4,633
No. 2 winze	L.4185	Vertical	3	4,625	6,353

Development work during the year consisted of 6,222 feet of drifting, 2,080 feet of crosscutting, and 1,113 feet of raising. Total development footage to 31 December 1963 was as follows: 151,397 feet of drifts; 50,080 feet of crosscuts; 31,967 feet of raises. Diamond-drilling in 1963 consisted of 72 holes totalling 12,987 feet from underground.

New equipment installed included the following:

1 heater, oil fired for No. 2 shaft ventilation (Howard Engineering Co.).
9 drilling machines (U & N Equipment Co.).
4 drilling machines (Canadian Ingersoll-Rand).
2 locomotives, Atlas (Bicroft Division).
2 air slushers (Gardner-Denver Co.).
1 battery charging rectifier (Northern Electric Co.).
1 compressor (Bicroft Division).

The following is taken from the company annual report for the year ending 31 December 1963:

Milling

For the year, 140,800 tons of ore was milled, giving a calendar-day average of 385.8 tons. Total recovery was 93.00 percent. These figures for 1962 were 382.5 and 93.95 percent.

Bullion recovered amounted to 63,862.362 ounces of gold and 9,513.66 ounces of silver.

From the start of milling operations in 1933, a total of 1,531,720.45 ounces of gold and 244,735.24 ounces of silver have been recovered from 3,674,824 tons of ore.

From this ore, the recovered value amounts to $55,228,442.51, excluding cost-aid, and is equivalent to $15.03 per ton.

Experimental work on the mill circuit, with the object of reducing costs, is being continued.

Ore Development Summary

For 1963, a total of 770 lineal feet of new ore, grading 0.48 ounces per ton over an average width of 7.2 feet, was developed in drifting.

Ore Reserves

The technical estimate of ore reserves, as of 31 December 1963, made using samples from drifts, raises, diamond-drilling, and the extension of known veins by stoping operations is:

Ore	Reserves	Average Grade	Value (Gold at $35 per ounce)
	tons	oz. per ton	
Unbroken	678,800	0.44	$15.51
Broken	35,009	0.36	12.81
Total and Average	713,809	0.44	$15.38

Note: Dilution factor 10 percent applied to grade only.

Unbroken ore reserves are down 50,100 tons, and the broken reserve is down 3,782 tons. Therefore, total reserves are down 53,882 tons. Average grade at $15.38 compares to $15.32 for 1962; 15,000 tons of 0.33 ounces per ton ore was removed from the unbroken ore reserves as it was considered uneconomic being tied up in sills that are endangered by caving ground.

Mining

The trend to more support in stoping operations continued. For the year, 47 percent of the ore break in stoping was obtained from filled stopes, and 29 percent from timbered stopes. Thus 76 percent of the stope break came from these two types.

Total break amounted to 130,317 tons. The waste reserve for backfill is 9,120 tons. During the year, 40,174 tons of waste was placed as backfill, which included 26,256 tons of waste from development.

Sequence mining is being practised, and experimental work on stress relieving ground has been conducted during the year. Results from this work have been incorporated into practice.

Costs

	1963		1962	
	ton	ounce	ton	ounce
Development and exploration	$ 1.916	$ 4.225	$ 1.690	$ 3.885
Mining	8.512	18.767	8.492	19.526
Milling	2.150	4.740	2.272	5.224
Undistributed mine operating charges	.578	1.274	.489	1.124
Administration and head office				
Total	$13.156	$29.006	$12.943	$29.759
Depreciation	.155	.341	.118	.272
Total	$13.311	$29.347	$13.061	$30.031

The average number of employees was 321: 229 underground, and 92 on surface. M. R. MacPherson was mine manager.

McIntyre Porcupine Mines Limited

McIntyre Porcupine Mines Limited was incorporated in March 1911; in December 1959 the authorized capitalization was increased to 3,000,000 shares without par value, of which 2,387,082 shares have been issued. The directors and

officers were: J. D. Barrington, president and managing director; W. B. Dix, vice-president, treasurer, and director; J. S. D. Tory, chairman of the board and director; M. A. Cooper, J. C. Fraser, Norman D'Arcy, and S. M. Wedd, directors; M. L. Urquhart, vice-president (operations); F. T. McKinney, secretary. The address of the head office and the mine office is Schumacher. The executive office is at Suite 1500, 25 King Street West, Toronto.

The company has numerous holdings in Ontario, the chief of which is the McIntyre mine, comprising 3,542 acres in Tisdale township, Porcupine area, District of Cochrane. In 1960, Castle-Trethewey Mines Limited was purchased by McIntyre and became the Castle Division of McIntyre, reported on in the Silver section of this report.

Mining and milling at the McIntyre mine continued throughout 1963.

SHAFTS, MCINTYRE MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1	P.13307	Vertical	3 (inactive)	Surface	307
No. 2	P.13307	Vertical	2 (inactive)	Surface	183
No. 3	P.13307	Vertical	2 (inactive)	Surface	183
No. 4	P.13307	Vertical	2 (inactive)	Surface	998
No. 5	P.13307	Vertical	2 to 1,375 ft. 4 below 1,375 ft.	Surface	2,389
No. 6	P.13710	Vertical	3 to 1,000 ft. 4 below 1,000 ft.	Surface	3,015
No. 7	P.13318	Vertical	2 3 (inactive)	Surface	989
No. 8	P.13318	Vertical	2 (inactive)	Surface	288
No. 9	P.13068	Vertical	2 (inactive)	Surface	204
No. 10	P.13068	Vertical	2 (inactive)	Surface	185
No. 11 or Main	P.13318	Vertical	5	Surface	4,131
No. 12	——	Vertical	4	3,875	7,111
No. 14	——	Vertical	4	3,750	7,336
No. 15	——	Vertical	4	6,825	8,094
No. 16	——	Vertical	4	5,500	6,848

Development for gold ore during the year consisted of 8,774 feet of drifting, 5,818 feet of crosscutting, and 87 feet of raising. Total development footage for gold ore to 31 December 1963 was as follows: 660,594 feet of drifts; 301,174 feet of crosscuts; 60,042 feet of raises. Development for copper ore in 1963 consisted of 7,191 feet of drifts and crosscuts, 2,989 feet of raises. Total development for copper ore to 31 December 1963 was: 24,976 feet of drifts and crosscuts; 11,073 feet of raises. Diamond-drilling in 1963 consisted of 969 holes, totalling 103,614 feet, from underground.

New construction in 1963 included a mill office and substore building (24 x 14 x 8 ft.), and an addition to the oil house (13 x 31 x 9 ft.).

New equipment added included the following:

2 vacuum pumps (class T-VRCP, 31 x 13 in. in mill).
1 furnace (slot type, gas-fired) in steel shop.
22 air hoists (CIR-KNNIJ double-drum, in mine).
1 slusher hoist (CIR-R222, 125 hp., in mine).
4 drills (Gardner Denver deep-hole, model SFH 99).
1 air hoist (CIR, K5MNM2J).

A total of 687,082 tons of gold ore and 156,440 tons of copper ore was hoisted and milled. The average milled per day was 1,192 tons of gold ore and 453 tons of copper ore.

The following is taken from the company annual report for the year ending 31 December 1963:

During 1963, 687,082 tons of gold ore was milled, with a recovery of 196,951 ounces of gold and 26,947 ounces of silver.

Copper production commenced early in August, and 111,440 tons of ore was milled for a recovery of 1,915,022 pounds of copper, 2,194 ounces of gold, and 13,871 ounces of silver.

Gold Development

Development work throughout the mine totalled 14,667 feet and included 8,752 feet of drifting, of which 2,326 feet, or 27 percent, was in ore averaging 0.363 ounces per ton over a width of 6.3 feet. About 30 percent of the footage in ore was above the main 3,875-foot level.

Some time ago Hollinger Consolidated Gold Mines Limited announced that they did not intend to develop below their 5,450-foot level, which is about the same elevation as McIntyre's 5,375-foot level. Accordingly, a block of ground below the 5,375-foot level and contiguous to McIntyre's west boundary was leased from Hollinger. In the leased area 2,501 feet of lateral work on five levels developed 595 feet of ore, averaging 0.359 ounces per ton over a width of 6.8 feet.

Drilling was completed on the system of 3-inch bore-holes from surface to the 3,125-foot level for delivery of hydraulic fill to both the copper and gold mining operations. Below the 3,125-foot level, 6,201 feet of drilling was done to provide hydraulic fill and drain lines for the lower levels of the gold mine. A storage stope with a capacity of 3,000 tons of fill was excavated between the 3,750- and 3,875-foot levels.

Copper Development

Development totalled 7,191 feet of lateral work and 2,989 feet of raising. Apart from 967 feet of crosscutting for access and ventilation most of this work was for stope preparation. Diamond-drilling amounted to 7,367 feet, including 538 feet for completion of the hydraulic fill-line from surface to the 3,125-foot level. Last August three stopes were brought into production at a daily rate of about 800 tons. By the year's end about 1,000 tons a day were milled.

Total expenditures to bring copper ore into production to the end of 1963 were $2,504,299. Of this sum $897,295 was spent on plant alterations and new equipment, and $1,607,004 for underground exploration and preliminary development.

Gold Ore Reserves

	1963		1962	
	tons	oz. per ton	tons	oz. per ton
Estimated in place	1,412,185	437,536	1,555,680	487,555
Broken ore	45,037	11,336	55,120	12,646
Total	1,457,222	448,872	1,610,800	500,201
Average grade per ton	———	0.308	———	0.311

Copper Ore Reserves

	Ore	Copper	Copper
	tons	tons	percent
Defined by drilling	2,908,297	30,965	1.06
Broken	64,714	711	1.10
	2,973,011	31,676	1.07
Probable	1,660,000	16,600	1.00
Total	4,633,011	48,276	1.04

The average number of employees was 1,187: 778 underground, and 409 on surface. P. B. McCrodan was mine manager.

McKenzie Red Lake Gold Mines Limited

McKenzie Red Lake Gold Mines Limited was incorporated in February 1933, with an authorized capitalization of 3,000,000 shares of $1 par value; in 1956 the capitalization was increased to 5,000,000 shares; in 1962 to 7,500,000 shares of $1 par value of which 5,400,000 shares have been issued. The directors and officers were: J. C. L. Allen, president and director; J. G. Boeckh, vice-president and director; P. K. Hanley, J. K. Lamb, and R. C. Stanley, Jr., directors; Miss B.A. Argo, secretary-treasurer. The head office is at 4th Floor, 112 King Street West, Toronto 1. The mine address is McKenzie Island.

The property consists of twelve claims at the north end of McKenzie Island in Red Lake, Dome township, District of Kenora (Patricia Portion).

Mining and milling operations continued throughout 1963.

SHAFTS, MCKENZIE RED LAKE MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth from Surface
				feet	feet	feet
No. 1 shaft	K.R.L.87	Vertical	3 (inactive)	0	——	456
No. 5 shaft	K.R.L.87	—47½°	3	0	492	2,374
No. 2 winze	——	—36°	3	250	——	1,252
No. 4 winze	——	Vertical	3	1,250	——	1,670

No. 5 shaft was sunk 492 feet slope distance in 1963, to a vertical depth of 2,374 feet below the collar. The 2,100-, 2,250-, and 2,400-foot levels were established. Development work consisted of 2,016 feet of drifting, 2,530 feet of crosscutting, and 3,452 feet of raising. Total development footage to 31 December 1963 was as follows: 98,377 feet of drifts; 31,575 feet of crosscuts; 63,712 feet of raises. Diamond-drilling in 1963 consisted of 108 holes, totalling 10,742 feet, from underground.

Major equipment installed consisted of a ball mill (Canadian Allis Chalmers, 6 x 9 feet).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

	1963	1962
Milled ..... tons	89,616	79,034
Produced ..... oz.	25,397.66	18,522.41

Operating Costs

	Per Ton Milled	
	1963	1962
Development	$ 2.52	$ 2.30
Mining	3.63	4.10
Milling	1.98	2.09
Marketing	0.09	0.08
General expenses at the property	1.43	1.38
Mine office and supervision	0.61	0.72
Administrative and corporate	0.36	0.25
Total Operating Cost	$10.62	$10.92

A total of $492,642 was paid out for wages, salaries and incentive bonuses compared to $468,076 in 1962. Cost of process supplies used during the year totalled $180,184.

Exploration

The West Mine shear was explored by drilling along a strike length of 2,200 feet and a dip length of 900 feet. Results were disappointing and no further work is planned.

The North Mine vein-dike structure was located by drilling from the new 2,400-foot level. Two flat drillholes traced the vein for 400 feet along its strike. Values were low but the vein appears to be strong.

Mining

Seventy-five percent of the ore mined and 80 percent of the gold came from the 1,800- and 1,950-foot levels in the North Mine. The average grade of this ore after sorting was 0.311 ounces per ton.

The remaining 25 percent was mined above the 1,600-foot level, and the grade was 0.248 ounces per ton after sorting. The clean-up of this section of the mine is expected to be completed in 1964.

Milling

A primary ball mill (6 x 9) was added to the grinding circuit in August. Tonnage milled in the last five months of the year averaged 275 tons per day, as compared to 224 tons per day for the first seven months and 217 tons per day for the previous year.

Ore Position

Ore remaining above the 1,950-foot level at the 1963 year's end and results of drilling from the 2,400-foot level in the North Mine indicate two years' ore.

General

Improvement is to be noted over the previous year in:

1) Tonnage milled, 89,616 tons against 79,034 tons.
2) Average value per ton milled, 0.289 oz. ($10.91 at $37.74) against 0.239 ($8.96 at $37.48).
3) Value of bullion recovered, $965,603 against $700,297.
4) Reference to operating costs will show a slight reduction, namely $10.62 against $10.92 per ton milled.
5) Operating profit of $150,810 against $26,310.

The average number of employees was 110: 71 underground, and 39 on surface. P. J. McCarthy was manager.

MacLeod-Cockshutt Gold Mines Limited

MacLeod-Cockshutt Gold Mines Limited was incorporated in September 1933, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,862,490 shares have been issued. Late in 1958, control of the company was acquired by the Little Long Lac Gold Mines Limited interests. The directors and officers were: J. C. L. Allen, president and director; J. G. Boeckh, vice-president and director; J. C. Adamson, R. C. Stanley Jr., P. K. Hanley, and S. J. Bird, directors; Miss B. A. Argo, secretary. The head office is at Suite 400, 112 King Street West, Toronto 1. The mine address is Geraldton.

The property comprising twenty-four claims is in Ashmore and Errington townships, District of Thunder Bay.

Mining and milling continued throughout 1963.

SHAFTS, MACLEOD-COCKSHUTT MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Total Depth from Surface
				feet	feet
No. 1	T.B.10040	Vertical	3	Surface	2,250
No. 2	T.B.10038	Vertical	4	Surface	1,921
No. 3	——	45°	3	1,571	2,001

Development work during the year consisted of 1,263 feet of drifting and 313 feet of crosscutting. Total development footage to 31 December 1963 was as follows: 106,711 feet of drifts; 29,168 feet of crosscuts; 34,743 feet of raises. Diamond-drilling in 1963 consisted of 17 holes, totalling 1,265 feet, from underground and 2 holes, totalling 434 feet, from surface.

New construction in 1963 consisted of an addition to a mine dwelling.

New equipment added included the following:

1 drifter (Gardner-Denver CF 93) underground.
1 slusher hoist (24 x 18 in.) underground.
1 air hoist (Scoma 4 S.M.) underground.
1 I-beam (Gantry Magic Pole) underground.
2 locomotives (Goodman, 6-ton, 30 hp.) underground.
2 transport cars (12 man cap., shop-made) underground.
2 stopers (CIR-JR 38) underground.
1 vent fan and motor (Howard Aerofoil 24-in.) underground.
1 car loader (Atlas Copco LM 56) underground.
1 machine and sprayer (Tifa) surface.
1 dump truck (International model 1700) surface.
1 vacuum pump (CIR model 255 x T 30) mill.

The following is taken from the company annual report for the year ending 31 December 1963:

During 1963 the mine produced 13,772 ounces of gold and 1,399 ounces of silver from 117,535 tons of ore, averaging 0.117 ounces of gold recovered per ton. Revenue from this production amounted to $522,064 or $4.44 per ton. Including an estimated $53,000 receivable from E.G.M.A. the total operating revenue was $575,064, or $4.89 per ton. In addition, $168,111 was received from Consolidated Mosher for the rental of equipment and use of facilities.

The mill operated at an average daily rate of 1,865 tons per calendar day, treating 322 tons per day of ore from MacLeod-Cockshutt, and 1,543 tons per day from Consolidated Mosher. Production from MacLeod in 1964 will probably average 200 tons per day.

Ore reserves within the F zone are diminishing, and with the addition of 88,000 tons from the porphyry zone, total recoverable reserves at the year's end were estimated to be 174,526 tons averaging 0.150 ounces per ton. The porphyry zone ore is being mined selectively in small shrinkage stopes on the 5th and 7th levels, which will provide a higher grade of ore, and will require higher mining costs than in recent years. It is expected that reserves within this zone will be extended, but an estimate of reserves cannot be projected much beyond mining because of the small dimensions of the ore shoots.

The average number of employees at the MacLeod and Consolidated Mosher operations was 360: 143 underground, and 217 on surface. H. E. Rudd was general manager.

Madsen Red Lake Gold Mines Limited

Madsen Red Lake Gold Mines Limited was incorporated in March 1935; in June 1940, the capitalization was reduced to 3,500,000 shares of $1 par value of which 3,499,528 shares have been issued. The directors and officers were M. K. Madsen, president and director; F. R. Marshall, vice-president and director; Miss Margaret Masterson, secretary-treasurer and director; H. H. Mackay, H. G. Young, P. H. McCloskey, and S. J. Bird, directors. The head office is at Room 1109, 55 Yonge Street, Toronto 1. The mine address is Madsen.

The company's main property comprising 58 claims, about 2,732 acres, is in Baird and Heyson townships, Red Lake area, District of Kenora (Patricia Portion). It is about 7½ miles southwest of the town of Red Lake.

Mining and milling operations continued throughout 1963.

SHAFTS, MADSEN RED LAKE GOLD MINE

Shaft	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1	K.R.L.11505	Vertical	2 (inactive)	573
No. 2	K.R.L.12528	Vertical	5	4,176

Development work in 1963 consisted of 5,245 feet of drifting, 5,231 feet of crosscutting, and 3,767 feet of raising. Total development footage to 31 December 1963 was as follows: 153,407 feet of drifts; 29,676 feet of crosscuts; 62,345 feet of raises. Diamond-drilling in 1963 consisted of 543 holes, totalling 122,181 feet, from underground.

New construction in 1963 included an addition to the electrical shop (30 x 20 ft.); a metal-sheathed frame, oil shed (24 x 12 ft.); sewage and water systems completed for trailer park No. 2.

New equipment added included the following:

1 regrind mill (5 x 7 ft.).
21 flotation cells.
1 thickener (21-ft. diam. for deslimed tailings treatment).
1 truck (Chevrolet ½-ton).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

The following figures show the production for 1963 and comparable figures for 1962 and 1961:

	1963	1962	1961
Gold.....oz.	107,130.856	100,877.831	106,096.338
Silver.....oz.	16,906.820	17,492.092	17,117.410
Gross value of bullion	$4,067,473.77	$3,794,610.80	$3,784,106.81
Average price gold per ounce	$37.75	$37.42	$35.52
Average price silver per ounce	$1.38	$1.15	$0.95

Operating Costs

	1963		1962	
	Per Ton Milled	Per Ounce	Per Ton Milled	Per Ounce
Development and exploration	$ 2.610	$ 7.462	$ 2.604	$ 8.045
Stoping and stope preparation	3.227	9.224	3.304	10.209
Mucking, tramming, hoisting, and pumping	1.541	4.405	1.738	5.371
Crushing and conveying	0.258	0.737	0.250	0.772
Milling	1.084	3.097	1.049	3.240
Mine general expense	0.957	2.736	0.784	2.422
Employee benefits	1.154	3.300	1.082	3.341
Administration expenses	0.245	0.702	0.216	0.667
Marketing charges	0.103	0.295	0.093	0.287
Total Operating Cost	$11.177	$31.958	$11.120	$34.354
Deduct estimated E.G.M.A.	1.482	4.238	2.198	6.790
Net Operating Cost	$ 9.695	$27.720	$ 8.922	$27.564

Mining

Stoping operations were carried out between the 2nd and 21st levels, with 61.8 percent of the mill feed coming from above the 2,700-foot horizon, or 17th level.

The use of tight flooring to prevent the loss of high-grade fines was introduced in cut-and-fill stopes. At year's end about 60 percent of mill feed came from stopes so equipped.

The deslimed mill tailings placed as backfill amounted to 116,567 tons for a total of 1,205,437 tons to date.

Ore Reserves

After milling 306,247 tons, the ore reserve was increased by 7,200 tons.

The estimated ore reserve for 1963 and comparable figures for 1962 are shown in the following table:

Block	31 December 1963			31 December 1962		
	Tons	Grade	Ounces	Tons	Grade	Ounces
Surface to 7th level	4,980	0.287	1,430	14,430	0.343	4,943
7th to 11th level	35,910	0.337	12,100	36,903	0.344	12,704
11th to 17th level	191,620	0.284	54,473	250,349	0.306	76,560
17th to 23rd level	591,550	0.346	204,813	481,545	0.345	166,237
Broken reserve	28,540	0.300	8,555	62,173	0.299	18,590
Total Reserves	852,600	0.330	281,370	845,400	0.330	279,034

The broken ore in cut-and-fill stopes is not included in the 1963 estimate.

Packsack and test-hole drilling of the walls of active stopes resulted in the locating and mining of 109,000 tons of additional ore in parallel lenses or extensions of known ore. Diamond-drilling extended the Nos. 3, 4, and 5 zones below the 22nd level. Additional drilling is required to estimate the tonnage and grade of ore.

Milling

The milling data for the current year, the two previous years, and the total since the commencement of milling operations, are shown in the table below:

	1963	1962	1961	11 Aug. 1938 to 31 Dec. 1963
Milled, tons	306,247	311,705	301,031	5,828,778
Operating time, percent	99.07	98.11	97.58	96.25
Milled per calendar day, tons	839.03	853.99	824.74	628.51
Average gold mill heads, oz. per ton	0.37436	0.35108	0.37746	0.31662
Average gold mill tails, oz. per ton	0.02454	0.02748	0.02502	0.01911
Recovery, percent	93.44	92.17	93.37	93.96

The average number of employees was 418: 258 underground, and 160 on surface. K. R. North was manager.

Pamour Porcupine Mines Limited

Pamour Porcupine Mines Limited was incorporated in March 1934 with an authorized capitalization of 5,000,000 shares of no par value, all shares have been issued. The directors and officers were: J. R. Bradfield, president and director R. V. Porritt, vice-president and director; J. R. Timmins, L. H. Timmins, Hon. D. R. Michener, K. C. Gray, and W. S. Row, directors; C. H. Windeler, secretary; R. G. Rudolph, treasurer; J. O. Hinds, assistant secretary; E. K. Cork, treasurer. The executive office is at 1700, Bank of Nova Scotia Building, Toronto. The head office and mine office is at Pamour.

The company's main property, totalling thirty-three claims, is in Whitney and Murphy townships, Porcupine area, District of Cochrane. It includes the former LaPalme Porcupine, Three Nations, and Porcupine Grande properties.

Mining and milling continued throughout 1963.

SHAFTS, PAMOUR MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Total Depth from Surface
				feet	feet
No. 1	P.13793	Vertical	2 (inactive)	Surface	220
No. 2	P.13793	Vertical	2 (inactive)	Surface	110
No. 3	P.13783	Vertical	5	Surface	3,144
No. 4	——	Vertical	3	600	2,437

Development work during the year consisted of 5,264 feet of drifting, 1,568 feet of crosscutting, and 5,130 feet of raising. Total development footage to 31 December 1963 was as follows: 172,749 feet of drifts; 40,527 feet of crosscuts; 115,853 feet of raises. Diamond-drilling consisted of 400 holes, totalling 62,780 feet, from underground.

New construction in 1963 consisted of a British army Romney hut (96 x 35 ft.).

The following is taken from the company annual report for the year ending 31 December 1963:

Development

Lateral development consisted of 2,870 feet in lava exploration, 640 feet in east greywacke, 1,430 feet in west greywacke, and 600 feet in conglomerate.

In the east end of the mine, 1,360 feet of drifting was in ore with an average grade of 0.209 ounces of gold per ton over drift width. In the west end of the mine, 235 feet of drifting was in ore with an average grade of 0.123 ounces of gold per ton over drift width.

Stoping

Stoping was carried on in both the east and west sections of the mine. Some 24 percent of the ore produced was from lava stopes. The east end provided 68 percent of the tonnage broken and 72 percent of the tonnage drawn from stopes. Cut-and-fill stopes provided 7 percent of the ore broken, slusher stopes 15 percent, blast-hole stopes 21 percent, and shrinkage the remainder.

Ore Reserves

	Ore	Grade
	tons	oz. per ton
BROKEN:		
East end	425,800	0.097
West End	154,400	0.096
Total	580,200	0.097
ORE IN PLACE:		
East end	782,400	0.098
West end	268,100	0.126
Total	1,050,500	0.105
Total east ore	1,208,200	0.098
Total west ore	422,500	0.115
Total	1,630,700	0.102

Allowance for normal dilution has been made in calculating the tonnage and grade of ore reserves.

After milling 628,000 tons, total ore reserves were maintained at about the same tonnage and grade as at the end of the previous year.

Mill

	1963	1962
Milled.....tons	628,000	632,700
Milled per calendar day.....tons	1,720	1,733
Average gold content.....oz. per ton	0.113	0.108
Average tailings loss.....oz. per ton	0.010	0.010
Total recovery.....percent	91.1	90.5
Total production gold.....oz.	64,870	62,140
Value of total production.....	$2,461,400	$2,335,000

The average number of employees was 356: 201 underground, and 155 on surface. W. J. Marshall was manager.

Paymaster Consolidated Mines Limited

Paymaster Consolidated Mines Limited was incorporated in February 1930, with an authorized capitalization of 9,000,000 shares of $1 par value, of which 8,629,090 shares have been issued. The directors and officers were: W. C. Ringsleben, president and managing director; H. D. Rothwell, vice-president and director; C. E. Cook, L. G. Sams, Marshal Stearns, S. A. Caldbick, and C. A. Burns, directors; A. C. Buckley, secretary-treasurer. The head office and mine office are at P.O. Box 100, South Porcupine.

The main property, comprising 751.6 acres, is in Deloro and Tisdale townships, Porcupine area, District of Cochrane.

Mining and milling continued throughout 1963.

SHAFTS, PAYMASTER MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth from Surface
				feet	feet	feet
Shaft 1	T.R.S.776	Vertical	2 (inactive)	Surface	——	80
Shaft 2	T.R.S.776	Vertical	2 (inactive)	Surface	——	814
Shaft 3	T.R.S.776	Vertical	4 (inactive)	Surface	——	400
Shaft 4	H.S.747	Vertical	2 (inactive)	Surface	——	253
Shaft 5	P.14115	Vertical	3	Surface	61	4,462
Shaft 6	P.13128	60°	2 (inactive)	Surface	——	482
Shaft 7	P.14114	Vertical	2 (filled)	Surface	——	75
Shaft 8	P.14115	Vertical	2 (filled)	Surface	——	185
Shaft 9	P.14115	Vertical	1 (inactive)	Surface	——	185
Winze 1	——	75°	2 (inactive)	1,040	——	1,202
Winze 2	——	Vertical	2 (inactive)	1,033	——	1,615
Winze 3	——	Vertical	2 (inactive)	1,023	——	2,093
Winze 4	——	Vertical	2 (inactive)	428	——	1,043
Winze 5	——	Vertical	3	2,046	——	4,202
Winze 6	——	Vertical	3	4,059	1,242	5,727

The 4,525-, 4,675-, 4,825-, 4,975-, 5,125-, 5,275-, 5,425-, 5,575-, and 5,725-foot levels were established at depths of 453, 604, 755, 906, 1,057, 1,208, 1,359, 1,510, and 1,661 feet, respectively, below the collar of No. 6 winze.

Development work during the year consisted of 3,430 feet of drifting, 323 feet of crosscutting, and 2,068 feet of raising. Total development footage to 31 December 1963, was as follows: 187,439 feet of drifts; 79,850 feet of crosscuts; 63,734 feet of raises. Diamond-drilling consisted of 156 holes from underground, totalling 15,598 feet.

A total of 174,713 tons of ore was hoisted. 175,650 tons was milled at a daily average of 481.4 tons in 1963.

The following is taken from the company annual report for the year ending 30 June 1963:

Mining

New ore developed during the year totalled 866 feet having an average width of 80 inches and an average cut grade of 0.237 ounces per ton.

Sources of ore during the year were as follows: development 4.7 percent; No. 5 winze, 45.2 percent; No. 5 shaft, 18.7 percent; and No. 6 winze, 31.4 percent.

Shaft Sinking

An extensive diamond-drilling program to explore the extension of the Nos. 36 and 37 veins at depth below the 4,375-foot level was completed in the first quarter of the fiscal year. This drilling intersected significant ore values to depth below the 6,000-foot horizon. Along a strike length of 1,600 feet, six intersections averaged 0.29 ounces uncut grade across an estimated width of 19 feet. These holes, combined with various other holes at varying depth in the same area, provided substantial evidence of new ore below the 4,375-foot level in favourable formation. The decision was therefore made to deepen No. 6 winze to the 6,025-foot horizon and establish eleven new levels below the 4,375. Preparatory work for the sinking program was commenced in September 1962.

To maintain production from the 4,225- and 4,375-foot levels while No. 6 winze was being sunk, No. 5 shaft was deepened 146 feet from its existing bottom below the 4,075-foot level. Hoisting facilities were then provided for these two levels previously serviced only by No. 6 winze. No. 6 winze sinking was commenced in March 1963 and had advanced 544 feet to a depth of 62 feet below the 4,975-foot level, at 30 June 1963.

General

Until development of the new levels at depth is well under way, the tonnage and grade of new ore can only be estimated on the limited information provided from drilling that has been done. Estimates, accordingly, provide that 5,000 tons per month or about one third of the mill feed will be mined from these new levels by January 1965, and this will increase as development progresses.

Diminishing ore reserves above the 4,375-foot level necessitated the concentration of underground development to the immediate problem of searching for extensions of known existing orebodies to the limits of the company's resources and facilities. All ore shoots that could be mined profitably were in production, and the inclusion of these is mainly responsible for the drop in ore reserve grade as compared with the previous year. Of particular favourable importance was the discovery of a new orebody along the 31 vein on the 2,825-foot level, where an estimated 175 feet grading 0.27 ounces across 9 feet was under development at the end of the fiscal year. This orebody is being explored on the levels above and below. In addition, development and exploration of the 18, 36, and 37 veins was continued.

Ore Reserves

Total (including broken ore) was 249,200 tons with an average grade of .2175 ounces.

Milling

Milled	tons	165,388
Average per day	tons	453.1
Gold produced	oz.	31,089.6
Average millhead grade	oz. per ton	0.2006
Average recovery	percent	93.72

Costs

Following is an analysis of the mine operating costs:

	Total Cost	Cost per Ton Milled
Diamond-drilling	$ 19,330.40	$ 0.11
Drifting	71,611.00	0.43
Crosscutting	7,592.53	0.05
Raising	39,118.78	0.24
Special underground exploration	36,438.16	0.22
Mining	1,047,029.56	6.33
Ore transportation	17,489.90	0.11
Crushing	42,038.74	0.25
Milling	243,068.09	1.47
General expense	150,204.51	0.91
Total	$1,673,921.67	$10.12

The average number of employees was 247: 169 underground, and 78 on surface. L. K. Walkom was general manager.

Pickle Crow Gold Mines Limited

Pickle Crow Gold Mines Limited was incorporated in January 1934; in April 1959 the capitalization was increased to 5,000,000 shares of $1 par value, of which 3,554,806 shares have been issued. The directors and officers were: N. B. Keevil, president and director; C. G. MacIntosh and J. C. Perry, vice-presidents and directors; Sir Michael Butler, secretary and director; J. H. Westell, director; D. S. Brown, treasurer. The head office is at Suite 1000, 11 Adelaide Street West, Toronto 1. The mine address is Pickle Crow.

The property consists of 110 claims in Connell and McCullagh townships, Pickle Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1963.

SHAFTS, PICKLE CROW MINE

Shaft	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth below Surface
				feet	feet
No. 1	747	Vertical	3 0–1,200 ft. 4 1,200–2,450 ft. 3 2,450–bottom	Surface	3,042
No. 3	2062	Vertical	3 0–1,554 ft. 4 1,550–2,600 ft. 3 2,600–bottom	Surface	3,025
No. 2	——	Vertical	2 (inactive)	721	1,518
No. 4	——	Vertical	3 2,900–3,707 ft. 4 3,707–bottom	2,900	4,038

The 3,500- and 3,650-foot levels were established at depths of 600 and 750 feet below the collar of No. 4 shaft.

Development work during the year consisted of 3,848 feet of drifting, 4,005 feet of crosscutting, and 1,148 feet of raising. Total development footage to 31 December 1963 was as follows: 73,639 feet of drifts; 56,690 feet of crosscuts; 43,198 feet of raises. Diamond-drilling in 1963 consisted of 160 holes, totalling 31,958 feet, from underground, and 16 holes, totalling 2,160 feet, from surface.

New construction consisted of a one-room addition to the main office (14 x 14 ft.); a boiler house (24 x 16 ft.); a cookery (80 x 42 ft.), and an oil tankhouse (13 x 13 ft.), all of wood-frame construction.

A volcano oil-fired boiler (100 hp., low pressure, automatic and portable) was located in the No. 1 shaft area on surface.

The following is taken from the company annual report for the year ending 31 December 1963:

Production

Tonnage milled totalled 100,491 tons, and bullion production amounted to $1,325,363; 34,983 ounces of gold and 3,389 ounces of silver were produced. The average value of recovery was $13.19 per ton milled. A comparison of milling results for the past two years is as follows:

	1963	1962
Milled.....tons	100,491	111,781
Gold recovered.....oz.	34,983	40,328
Silver recovered.....oz.	3,389	4,110
Gold recovered per ton.....oz.	0.3481	0.3608
Recovery.....percent	98.82	98.89

Mining

Stoping production amounted to 83,554 tons or 83.4 percent of the total tonnage mined. The remaining 16,672 tons, 16.6 percent, was won from development. Ore produced from the various veins is tabulated below.

Vein	Ore	Grade
	tons	percent
No. 1	16,005	16.0
No. 2	12,072	12.1
No. 5	32,704	32.7
No. 6	4,726	4.7
No. 7	6,140	6.1
No. 8	3,638	3.6
No. 9	24,547	24.5
No. 12	216	0.2
No. 13	111	0.1
Iron formation	67	0.0
Total and Average	100,226	100.0

Ore Reserves

Ore reserves at the year's end totalled 325,320 tons with a grade of 0.372 ounces of gold per ton. This compares with the reserves for the previous year, which totalled 303,553 tons grading 0.351 ounces per ton. These reserves are considered conservative, as at the year's end development work in the No. 4 shaft was not complete resulting in a large blank section in the No. 5 and No. 9 veins, particularly above and below the 3,500- and 3,650-foot levels.

Tonnage developed in No. 4 shaft during 1963 amounted to 78,880 tons grading 0.409 ounces of gold per ton.

	1 January 1964		1 January 1963	
	Ore Reserves	Gold at $35 per Oz.	Ore Reserves	Gold at $35 per Oz.
	tons		tons	
Broken ore	31,770	$ 9.80	51,073	$11.87
Developed ore	283,550	13.72	241,680	12.44
Probable ore	3,000	11.20	10,800	11.12
Total	325,320	$13.02	303,553	$12.30

Operating Costs

A comparative analysis of operating costs for 1962 and 1963 follows:

	Total		Per Ton Ore Treated		Per Ounce Gold Recovered	
	1963	1962	1963	1962	1963	1962
Development	$ 271,099	$ 185,411	$ 2.70	$ 1.66	$ 7.75	$ 4.60
Mining	727,923	810,171	7.24	7.24	20.81	20.09
Milling	216,552	220,369	2.15	1.97	6.19	5.46
General mine expense	264,623	222,288	2.63	1.99	7.56	5.51
Administration expense	48,013	46,640	0.48	0.42	1.37	1.16
Total	$1,528,210	$1,484,879	$15.20	$13.28	$43.68	$36.82

This analysis points out an approximate $85,000 increase in development charges, primarily due to heavier expenditures in opening up the No. 4 shaft veins; the $42,000 increase in general mine expenses was mainly the result of renovating camp facilities. Mining and milling costs were down by $86,000 due to fewer tons processed.

The average number of employees was 222: 123 underground, and 99 on surface. J. B. C. Lang was mine manager.

Preston Mines Limited

Preston East Dome Mines Limited was incorporated in January 1911, and reorganized in February 1936 and in September 1957. In August 1960, the name was changed to Preston Mines Limited, on the amalgamation of Preston East Dome Mines with Stanleigh Uranium Mining Corporation Limited, with an authorized capitalization of 10,000,000 shares of no par value, of which 6,728,000 have been issued. The company is controlled by Rio Tinto Mining Company of Canada Limited. The directors and officers were: Hon. R. H. Winters, president and director; W. B. Malone, vice-president and director; R. D. Lord, managing director; J. I. Crookston, W. H. Bouck, H. L. Roper, G. B. Langford, W. C. Pitfield, and W. P. Arnold, directors; George Baker, secretary; D. A. MacFarlane, treasurer; G. R. Devey, assistant secretary; G. A. Roy, assistant treasurer. The head office is at 335 Bay Street, Toronto. The mine address is South Porcupine.

The property comprising sixteen claims, south and east of the Dome mine, is located in Tisdale and Deloro townships, Porcupine area, District of Cochrane.

Mining and milling operations continued throughout 1963.

SHAFTS, PRESTON MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Total Depth from Surface
				feet	feet
No. 1	P.13151	63°	2 (escape)	Surface	95
No. 2	P.13151	Vertical	5	Surface	2,388
No. 3	——	Vertical	3 to 69 feet above 28th; 4 to bottom	2,166	4,170
No. 4	P.12971	Vertical	3 (inactive)	Surface	400

Development work during the year consisted of 4,734 feet of drifting, 2,912 feet of crosscutting, and 1,939 feet of raising. The total development footage to 31 December 1963 was as follows: 126,991 feet of drifts; 160,617 feet of crosscuts; 65,487 feet of raises. Diamond-drilling in 1963 consisted of 328 holes totalling 40,775 feet from underground, and two holes totalling 709 feet from surface.

The following is taken from the company annual report for the year ending 31 December 1963:

Production

Milled	tons	199,400
Average per day	tons	678
Gold produced	oz.	39,903
Silver produced	oz.	4,334
Average mill heads	oz. per ton	0.208
Average net recovery	oz. per ton	0.200
Average gold in tailings	oz. per ton	0.0083
Average recovery	percent	96

The higher percentage mined from the more refractory Midcamp ore resulted in higher tailings loss. The sulphide ore from this zone constituted 70 percent of the mill feed, compared to 48 percent the previous year.

Costs

Operating costs per ton milled before write-offs and administration were as follows:

Development and diamond-drilling	$1.74
Mining	5.93
Milling	1.26
	$8.93

The increase in operating costs of 5 cents per ton over the previous year reflects the effect of sales tax and a wage increase instituted in the second half of the year. The increasing proportion of ore obtained from areas remote from the shafts gives rise to an adverse influence on costs, which has been largely offset by a succession of improvements in methods.

Development

Early in the year a lease arrangement was made with neighbouring Dome Mines to pursue ore indications in Dome ground that are remote from the latter's mining facilities but close to those of Preston, and development has been under way in two areas of this zone.

Development ore contributed 8.6 percent of the mill feed. Broken reserves at the year's end were 17,185 tons.

Active stopes in the Midcamp zone increased from 13 to 21 as this area supplied more of the tonnage. Development in the lower levels of this zone continued throughout the year.

Ore Reserves

Calculated as at 31 December 1963, ore reserves were 396,570 tons of an average grade of 0.20 ounces. This is a decrease of 69,442 tons from the reserves of a year ago.

Reserve estimating in the Midcamp zone is difficult because of irregularity of the ore chutes. However, the extraction of ore reserves from this part of the mine is in excess of replacement by development.

General

Mill and plant performance was satisfactory, with good efficiency and no delays. Some 48,000 tons of hydraulic fill was produced and used in the mine.

The average number of employees was 303: 210 underground, and 93 on surface. G. F. Greenacre was mine manager.

Renabie Mines Limited

Renabie Mines Limited was incorporated in January 1941, with an authorized capitalization of 1,500,000 shares of $1 par value, of which 1,050,005 shares have been issued. The company is a subsidiary of Macassa Mines Limited. The officers

and directors were John D. Bryce, president and director; J. G. Boeckh, vice-president and director; Miss B. A. Argo, secretary-treasurer and director; P. K. Hanley, J. C. L. Allen, R. C. Stanley Jr., and C. C. Huston, directors. The head office is at 85 Richmond Street West, Toronto 1. The mine address is Renabie.

The property comprises thirty-three claims, about 886 acres, located in Rennie, Leeson, Brackin, and Stover townships, District of Sudbury.

Mining and milling continued throughout 1963.

SHAFTS, RENABIE MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1	S.34314 (Leeson twp.)	Vertical	3	281
No. 2	S.34317 (Leeson twp.)	Vertical	3	2,859

Development work during the year consisted of 2,686 feet of drifting, 1,456 feet of crosscutting, and 1,449 feet of raising. Total development footage to 31 December 1963 was as follows: 35,387 feet of drifts; 18,126 feet of crosscuts; 23,500 feet of raises. There was also 21,633 cubic feet of rock removed for level stations, 13,928 cubic feet for pumping stations, and 6,800 cubic feet for a loading pocket. Diamond-drilling in 1963 consisted of 95 holes, totalling 16,789 feet, from underground.

New construction in 1963 consisted of a garage addition (16 x 28.7 ft., frame); surface waste-pass housing (11 x 10.3 ft., frame); a dwelling (32 x 24 ft. frame).

Added equipment was as follows:

1 rocker shovel (Eimco model 21).
2 locomotives (Mancha type B).
4 cyclones (Krebs model D 10 B).
1 oil burner (Selby SYT, motor and controls for 150 hp. boiler).
1 dump truck (G.M.C. 3-ton).
10 handrills (Holman 33).

The following is taken from the company annual report for the year ending 31 December, 1963:

Ore Reserves

The technical position of ore reserves at the year's end, after allowing for dilution and elimination of any doubtful or marginal ore and without including any ore below the 2,175-foot level, was as follows:

	Ore	Grade	Value (Gold at $35 per ounce)
	tons	oz. per ton	
Unbroken Ore	245,380	0.213	$7.45
Broken Ore	56,552	0.223	7.80
Total	301,932	0.215	$7.52

Milling

The average tons milled per day in 1963 was 500.1 as compared to 542.5 in 1962. Bullion recovery comprised 34,413.82 ounces of gold and 9,895.63 ounces of silver.

From the commencement of milling operations (July 1947) 2,652,237 tons of ore have been milled, from which has been recovered 550,584.797 ounces of gold and 171,877.03 ounces of silver, having a gross recovered value of $19,862,531.31, equivalent to $7.49 per ton milled, exclusive of cost-aid.

As a result of extensive laboratory test work, changes in the mill circuit were instituted, resulting in better classification and finer grinds. The recovery increased from 93.9 percent in 1962 to 94.8 percent in 1963. As a result of the extensive mechanical repairs and alterations and considerable work on the tailings dam, the over-all milling costs for the year increased to $1.83 per ton from $1.59 per ton in 1962.

Operating Costs

The operating and other costs per ton and per ounce of gold recovered were as follows:

	1963		1962	
	34,413.82 Ounces Recovered from 182,552 Tons Milled		35,735.34 Ounces Recovered from 198,019 Tons Milled	
	ton	ounce	ton	ounce
Development and exploration	$2.39	$12.70	$1.50	$ 8.28
Mining	3.12	16.57	2.63	14.60
Milling	1.83	9.68	1.59	8.82
Undistributed operating charges including administration and head office	0.65	3.44	0.54	2.98
Operating Costs	$7.99	$42.39	$6.26	$34.68
Depreciation	0.56	2.96	0.52	2.87
Provision for municipal, federal and provincial taxes	0.06	0.33	0.03	0.17
Total Costs	$8.61	$45.68	$6.81	$37.72

Development and exploration costs reflect the change in the company's policy regarding the write-offs for deferred development.

The average number of employees was 191: 94 underground, and 97 on surface. W. A. Moore was mine manager.

Sapawe Gold Mines Limited

Lindsay Explorations Limited was incorporated in February 1955; in January 1963 the name was changed to Sapawe Gold Mines Limited on a one-for-two share basis. The authorized capitalization is 5,000,000 shares of $1 par value, of which 3,765,000 shares have been issued. The directors and officers were: M. H. Greenberg, president and director; T. A. Jones, vice-president and director; M. J. Plesha, secretary-treasurer and director; Glen Dix, Eric Peterson, R. B. Krize, and S. W. Erickson, directors. The head office is at 235 Bay Street, Port Arthur. The mine address is Box 759, Atikokan.

The property comprises fifty-three claims in McCaul and Hutchinson townships, Fort Frances District, located about 15 miles east of Atikokan, and connected to the Atikokan highway by road.

Operations continued from April to 15 December 1963.

The vertical, three compartment No. 1 shaft, collared in claim F.F.3417, has a total depth of 351 feet below the collar. The first and second levels were established in 1961, at vertical depths of 172 and 322 feet, respectively, below the

collar. Development footage in 1963 consisted of 250 feet of drifting and 362 feet of raising. Total development footage to 31 December 1963 consisted of 1,076 feet of drifts, 367 feet of crosscuts, and 598 feet of raises. One diamond-drill hole, 185 feet deep, was completed from underground.

New construction consisted of the following:

1 mill building (75 x 40 ft., frame with sheet metal).
1 crusher house (59 x 16 ft., frame with sheet metal).
1 assay office (25 x 14 ft., concrete-block).
1 refinery (23 x 16 ft., concrete-block).
1 garage (50 x 32 ft., frame).
1 water tank (20 x 20 ft., concrete with sheet metal).

New equipment installed included the following:

CRUSHER HOUSE

1 jaw crusher (Universal 16 x 20 in.).
1 cone crusher (Nordberg 28 in.).
1 vibrating screen (Dillon double-deck, 3 x 8 ft.).

MILL:

1 ball mill (capacity 100 t.p.d., Allis-Chalmers 5 x 7 ft.).
1 conditioner (6 x 12 ft.).
3 flotation cells (Denver 18 SPC.).
1 thickener (Dorr 7 x 14 ft.).
1 drum filter (36 x 48 in.).

1 vacuum pump (Ingersoll-Rand ERI-10 x 5 in.).
1 filtrate pump (International, 1¼ in.).
1 tailings pump (International, 1½ in.).
1 ball mill discharge pump (International, 2 in.).
1 vacuum return pump (Babcock-Wilcox 1½ in.).
1 table pump (Allis-Chalmers, SRL, 2 in.).
1 reagent pump (Clark, ¾ in.).
1 water supply pump at lake (Allis-Chalmers, CMSK, 150 gpm.).
1 air compressor (Ingersoll-Rand ERI, 18 x 7 in., 150 cfm.).
1 Wilfley table (5 x 12 ft.).
1 welder (Wilson 400 amps. dc.).
1 welder (Marquette AC gas, 200 amps.).

ASSAY OFFICE AND REFINERY:

1 tilting furnace (Wabi).
1 assay furnace (General Electric HRB—12 kw—2,000°F.).
1 assay furnace, (Walker Meyal 15 kw—2000°F.).
1 pulverizer (Braun type UA—8 in.).

A total of 2,284 tons of ore was hoisted; the mill operated from 4 to 23 December on a tune-up basis and treated 1,476 tons of ore.

R. J. Gotts, mine engineer, was in charge and ten men were employed during the period of operation.

Stairs Exploration and Mining Company Limited

Stairs Exploration and Mining Company Limited was incorporated in March 1962 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 2,000,005 shares have been issued. The directors and officers were: I. C. Stairs, president and director; G. P. Stairs, vice-president and director; E. G. Byrne and E. F. Stairs, directors; Miss M. A. Calnan, secretary-treasurer. The head office is at 21 King Street East, Toronto 1. The mine address is Matachewan, c/o General Delivery.

The property is a gold prospect consisting of 161 claims located in Midlothian, Halliday, and Montrose townships, District of Timiskaming.

Operations proceeded from 3 January to 20 December 1963.

SHAFTS, STAIRS EXPLORATION AND MINING

	Claim No.	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth below Surface
				feet	feet	
No. 1 inclined adit....	26662	—20°	1	Surface	47	100
No. 1 shaft.....	26662	Vertical	3	Surface	72	72

The inclined adit (–20°) started in 1962 was driven a further 47 feet in 1963 to a vertical depth of 100 feet. Headings west, north, and east were driven from the bottom of this adit. A flat adit located 100 feet west of the inclined adit was driven north. A vertical raise from this adit to surface was slashed out as a start on the three-compartment No. 1 shaft. The shaft is to be 700 feet deep with sinking operations planned for 1964. Total development footage to 31 December 1963 consisted of 504 feet of drifting and 493 feet of crosscutting. Some 91 diamond-drillholes, totalling 46,353 feet from surface, and 27 holes totalling 4,935 feet from underground, were completed in 1963.

New construction in 1963 included the following:

1 staff house (51 x 26 ft., wood construction).
1 bunkhouse (76 x 24 ft., "H" type, wood construction).
1 drill core house (32 x 28 ft., wood construction).
1 garage (42 x 20 ft., steel fabrication).
2 storage buildings (24 x 20 ft., steel fabrication).
1 headframe (75 ft. high, B.C. fir construction).
1 shaft service building (160 x 40 ft., steel construction).
1 hoistroom (40 x 30 ft., steel fabrication).
1 assay office, completely equipped.

Equipment added was as follows:

1 generating plant (Mirrless diesel 1,000 kva.).
1 hoist (CIR 53 x 36 in., PE-1).
1 compressor (CIR 18 x 11 x 14 in. PRE 1,020 cfm.).
1 air slusher (G.D., 15 hp.).
2 landrovers.

The average number of employees was 24: 4 underground, and 20 on surface. J. E. McKinney was mine manager.

Teck Corporation Limited (Teck-Hughes Mining Division)

Teck-Hughes Gold Mines Limited was incorporated in March 1923; in July 1963 the consolidation of Teck-Hughes Gold Mines Limited, Lamaque Gold Mines Limited, Howey Consolidated Mines Limited, and Canadian Devonian Petroleums Limited was completed. The name was changed to Teck Corporation Limited, having an authorized capitalization of 5,000,000 shares of no par value, of which 4,600,000 shares have been issued. The officers and directors were: Hon. R. Michener, chairman of the board and director; N. B. Keevil, president and director; J. C. Perry, J. A. Downing, and N. B. Keevil, Jr., vice-presidents and directors; Sir Michael Butler, secretary and director; J. H. Westell, treasurer and director; W. H. Keith, L. N. Watt, G. L. Jennison, J. D. Leishman, and D. A. Perigoe, directors; J. W. Stephenson and B. Middleton, assistant secretaries; D. S. Brown, assistant treasurer. The executive office is at Suite 1000, 11 Adelaide Street West, Toronto. The Teck-Hughes Mining Division address is Kirkland Lake.

Teck-Hughes Gold Mines Limited acquired in 1960 the adjoining Kirkland Minerals Corporation Limited property. The Teck property now comprises forty-four claims in Teck township, Kirkland Lake area, District of Timiskaming. The shafts on the former Kirkland Minerals property were shown in the 1960 report for that company. The reported total development footage completed by Kirkland Minerals up to the time of mine closure, 27 August 1960, was transferred and is now included in Teck-Hughes totals.

Mining and milling continued throughout 1963.

SHAFTS, TECK-HUGHES MINING DIVISION

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
South shaft	16625	Vertical	4	Surface	3,690
South shaft extension	16625	Vertical	4	3,639	5,553
No. 3 winze	16625	60°	3	4,887	6,148
No. 4 winze	16625	Vertical	3	3,638	4,572
Central shaft	16626	Vertical	4	Surface	3,014
10th level winze	16626	Vertical	3 (inactive)	1,098	1,985
No. 2 winze	16625 16626	60°	3 (inactive)	3,639	4,900
Central shaft extension	16626	Vertical	3 (inactive)	2,997	3,631
No. 1 shaft	1238	Vertical	2 (inactive)	Surface	490
No. 1 winze	——	Vertical	2 (inactive)	475	1,129

The south shaft extension is caved between the 33rd and 36th levels, and inactive between the 30th and 33rd levels at present. A double-drum air hoist was installed on the 36th level to service the levels to the bottom or 45th level. No. 4 winze was deepened 26.5 feet in 1963.

During the year, 1,392 feet of drifting, 574 feet of crosscutting, and 1,575 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 260,379 feet of drifts; 96,730 feet of crosscuts; 117,422 feet of raises. Some 119 diamond-drillholes, totalling 11,629 feet, were completed during 1963 from underground. A total of 126,518 tons of ore was hoisted, the mill treated 126,350 averaging 346 tons daily.

The following is taken from the company annual report for the year ending 30 September 1963:

Production

During the period, 128,715 tons of ore was milled. Recovery of bullion amounted to 25,035.633 ounces of fine gold and 3,639.92 ounces of silver, valued at $949,737.81, or $7.38 per ton. Operating costs of $1,196,615.74 or $9.30 per ton, reduced by E.G.M.A. of $254,130.13, resulted in a cost of $942,485.61, or $7.33 per ton and an operating profit of $7,252.20.

Development

Development decreased by about 7 percent as compared with last year. Diamond-drilling increased by about 13 percent.

About 51 percent of the development footage was driven in the Kirkland Minerals property on or between Teck levels 17 to 22 and 32 to 40.

The high-grade 19U vein was fully developed to its connection with the main break 50 feet above 18 level; a service raise continued to 17 level.

Exploration of the main break by raising from 22 level to 20 level, 200 feet west of the Teck boundary, with subsequent drifting on the 21 level horizon, developed an ore shoot of good grade 106 feet long and 150 feet or more in vertical extent.

The long drive west on 22 level in the footwall of the Kirkland Minerals 2,600-foot level was successful in locating a stoped area, which yielded some 22,000 tons of slough grading 0.15 ounces per ton.

The extension of the high-grade K vein around the Kirkland Minerals boundary area and below Teck 31 level was fully developed over a total length of 150 feet and was partially mined.

Development of the unmined eastern portion of the Kirkland Minerals No. 5 vein has been started on and above Teck 32 level. The limited amount of work done to date has been encouraging.

A 70-foot extension of the R vein, 36 level, was developed west of a major fault. The vertical extent appears limited.

Drifting on the Kirkland Minerals No. 3 vein, Teck 36 level, developed some 85 feet of ore grading 0.44 ounces per ton over drift width. A small stope is being started.

Operating Costs

A comparison of costs for the fiscal years 1963 and 1962 follows:

Distribution	In Full		Per Ton of Ore Treated		Per Ounce of Gold Produced	
	1963	1962	1963	1962	1963	1962
Development	$ 174,618	$ 143,597	$1.36	$1.12	$ 6.975	$ 5.984
Mining	698,948	658,687	5.43	5.13	27.918	27.448
Milling	223,458	224,181	1.74	1.74	8.926	9.342
General expense	99,592	92,913	0.77	0.72	3.978	3.872
Total	$1,196,616	$1,119,378	$9.30	$8.71	$47.797	$46.646
Tons ore treated	128,715	128,500				

Ore Reserves

Ore reserves at 30 September compare as follows:

Source	Ore Reserve		Gold Content		Average Grade	
	1963	1962	1963	1962	1963	1962
	tons	tons	ounces	ounces	oz. per ton	oz. per ton
Positive ore						
Blocked	55,273	58,190	20,389.3	22,605.0	0.369	0.388
Broken	30,266	28,732	8,718.4	8,682.5	0.288	0.302
Total	85,539	86,922	29,107.7	31,287.5	0.341	0.360
Potential ore	9,672	16,515	2,211.5	4,246.7	0.229	0.257
Grand Total	95,211	103,437	31,319.2	35,534.2	0.329	0.343

Potential ore includes proven and some probable ore in old workings which may not be recoverable. Such ore is transferred to positive or dropped altogether as changing circumstances dictate.

As in previous years a substantial percentage of the above reserve is not available at present owing to the disturbing effect its removal would have on active workings.

Branch veins produced 10.9 percent of the tonnage milled, containing 28.5 percent of the gold content, compared with 8.7 percent and 22.6 percent, respectively, the previous year.

Stoping has been continued in scattered areas between levels 14 and 40. The U, K, and R veins were especially productive on 19, 32, and 37 levels respectively.

The milling rate remained fairly constant with the help of the slough ore discovered on 22 level. Known reserves of slough are declining in grade to uneconomic limits.

The average number of employees was 200: 116 underground, and 84 on surface. G. G. Gilchrist was mine manager.

Upper Canada Mines Limited

Upper Canada Mines Limited was incorporated in April 1929, with an authorized capitalization of 3,500,000 shares of $1 par value, of which 3,499,827 shares have been issued. The directors and officers were: J. A. W. Brown, chairman of the board and director; T. J. Day, president and director; J. W. McBean, vice-president and managing director; J. H. Botsford, general manager and director; K. H. Larkin, secretary-treasurer and director; E. T. Donaldson and J. A. Dickson, directors. The head office is at Room 600, 250 University Avenue, Toronto. The mine address is Dobie.

The company's property comprising fifty-one claims is located in Gauthier township, Kirkland Lake area, District of Timiskaming.

Mining and milling continued throughout 1963.

SHAFTS, UPPER CANADA MINE

Shaft	Claim No.	Inclination	Number of Compartments	Sinking 1963	Depth from Surface
				feet	feet
No. 1	L.6314	Vertical	3 and 4 (1,760–3,625ft.)	510	5,799
No. 2	L.6321	Vertical	3	——	1,877

The 5,400, 5,500, 5,700, and 5,725 (scram) levels were established at depths of 5,389, 5,534, 5,684, and 5,715 feet, respectively, below the collar of No. 1 shaft.

During the year, 4,705 feet of drifting, 834 feet of crosscutting, and 1,462 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 143,295 feet of drifts; 33,827 feet of crosscuts; 38,024 feet of raises. Some 203 diamond-drillholes, totalling 26,497 feet, were drilled from underground. Two pumps (CIR-26T2, 50 gpm at 650-ft. head) were installed, one at the 4,950-, and one at the 5,550-foot levels, No. 1 shaft.

The following is taken from the company annual report for the year ending 31 December 1963:

Exploration and Development

Sinking No. 1 shaft to a depth of 5,799 feet below surface was completed during the year. Following installation of pumping equipment, line drives to the downward projection of the main L zone were commenced on the 5,100-, 5,400-, and 5,700-foot levels. Two short ore sections were disclosed on the 5,400- and 5,700-foot levels before the main zone was reached, and the main zone itself was encountered farther to the west and south than projected, indicating a steepening of the eastward plunge and a steepening or reversal of the normal north dip.

The 5,100- and 5,700-foot levels are now several hundred feet into the zone, and the first orebody on the 5,700-foot level grades $16.40 over drift width for a length of 110 feet. The 5,100-foot level has developed lower grade ore over most of the length exposed to date.

In view of the favourable geological and ore developments on the 5,700-foot level, No. 1 shaft will be deepened 400 feet in 1964 to the limit of the present hoisting equipment. This will enable work to proceed on permanent loading pockets, ore passes, etc.

The upward extension of the east L zone on the 3,625-foot level was explored by drifting on the 3,475-foot level, with enough ore developed to justify driving east on the 3,350-foot level. A total of 500 feet of ore was developed during the year above the 4,800-foot horizon.

Milling

Average tons per day was 556.9, recovery was 92.45 percent, and tailings loss was $0.79 per ton. The mill operated 98.8 percent of total possible running time. Extraction is down from 92.78 percent in 1962, and costs at $1.38 per ton are nine cents lower than in the previous year.

Operating Costs and Profits

Cost per ounce of gold produced, before depreciation, taxes, etc., was $34.89. Following are costs per ton milled over the last four years:

	1963	1962	1961	1960
Mine exploration and development	$1.11	$1.74	$1.69	$1.41
Mining	5.83	5.53	5.13	4.71
Milling	1.38	1.47	1.43	1.25
General expense	1.14	1.11	1.07	0.96
Total	$9.46	$9.85	$9.32	$8.33

Mine operating costs of $9.46 per ton are 39 cents lower than in the previous year, largely due to decreased development during the shaft sinking period. This reduction in costs, an increase in the price received per ounce of gold from $37.426 to $37.753, and larger Emergency Gold Mine Assistance payments offset to a considerable degree the drop in grade of 81 cents per ton. Operating profit per ton was $2.68, compared with $2.87 in the previous year, and net profit for the year totalled $307,555.81.

Outside Exploration

During the year the company entered into two joint exploration projects. On South Slate Island, in Lake Superior, this company along with Junior Frood Mines Limited and Cadamet Mines Limited, conducted a diamond-drill program on a series of narrow quartz veins showing considerable free gold. A total of 6,593 feet was drilled in 20 holes, but ore was not indicated over commercial widths.

With Hudson Bay Exploration Company, an airborne electromagnetic survey was made on an area surrounding a copper showing in MacMurchy township, Ontario. No other anomalies were discovered, and a limited drilling program is now planned on the original discovery.

The Exploration Department investigated a total of 35 other properties, none of which appeared to be of economic importance.

General

Capital expenditures totalled $51,870.00, of which the principal items were shaft power cables, pumps, and larger tramming equipment.

An investigation was made of the Lake Beaverhouse property, a former gold-copper producer located some 3 miles northeast of the Upper Canada mine. Previous operators had developed over 40,000 tons of good-grade ore to the 500-foot level, with many surface showings and diamond-drill intersections remaining to be checked. Results warrant further exploration of the property and the installation of a mining plant to resume production, using the Upper Canada mill.

The average number of employees was 280: 171 underground, and 109 on surface. J. H. Botsford was general manager.

Wright-Hargreaves Mines Limited

Wright-Hargreaves Mines Limited was incorporated in June 1916, with an authorized capitalization of 5,500,000 shares of $0.40 par value; all shares have been issued. The directors and officers were R. C. Stanley Jr., president and director; J. G. Boeckh, executive vice-president, treasurer and director; J. C. L. Allen, S. J. Bird, P. K. Hanley, and N. O. Seagram, directors; Miss B. A. Argo, secretary. The head office is at 4th Floor, 112 King Street West, Toronto 1. The mine address is Kirkland Lake.

The company's main property comprising four claims, is in Teck township, Kirkland Lake area, District of Timiskaming.

Mining operations continued throughout 1963.

SHAFTS, WRIGHT-HARGREAVES MINE

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft	L.1829	Vertical	2 to 2,000 ft. 3 to bottom (ventilation)	Surface	2,285
No. 2 shaft	L.1830	Vertical	2 (sandpass)	Surface	319
No. 3 shaft	L.1829	Vertical	3 to 1,200 ft. 4 to bottom	Surface	4,089
No. 4 shaft	L.1829	Vertical	3	Surface	4,000
No. 5 winze	L.1829	Vertical	4 to 6,450 ft. 3 to bottom	3,600	7,272
No. 6 winze	L.1829	Vertical	2	7,050	8,222

During the year a total of 87 feet of drifting, 204 feet of crosscutting, and 1,342 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 257,467 feet of drifts; 92,116 feet of crosscuts; 81,968 feet of raises.

The following is taken from the company annual report for the year ending 31 December 1963:

Production

Ore milled during the year amounted to 143,000 dry tons containing 0.425 ounces of gold per ton, from which were recovered 58,678.448 ounces of gold and 14,568 ounces of silver.

Gross value of production was $2,238,846, and total operating revenue, including $223,000 estimated receivable as cost aid, was $2,461,846 or $17.21 per ton milled.

Bullion output was sold to the Royal Canadian Mint and the average price received for gold was $37.761 (Canadian) per ounce, which was the highest yearly average price since 1950.

The improvement in grade of ore milled, and the higher price received for both gold and silver, combined to increase the value of bullion output in 1963 to the highest level since 1959.

Mining

Mining was again conducted on 38 of the 51 main levels down to and including the 7,200-foot level, and on all six of the deeper levels served by No. 6 winze.

Of the total ore milled, 35,494 tons or 24.8 percent of the total (25.1 percent in 1962) was obtained from mining and a small amount of routine development work on the six bottom levels. Towards the end of the year, with completion of an ore-pass between 8,100- and 7,950-foot levels, production from these deepest levels increased to about 31 percent of the total ore hoisted.

The average gold content of ore milled in the year was 0.4253 ounces per ton, a substantial improvement over the average of 0.3604 in 1962 and 0.385 in 1961. The reason for this improvement was the fortuitous finding of better than expected values in several stopes on the deeper levels, and in part to limited mining in some high-grade remnants adjacent to No. 4 shaft.

The broken-ore reserve was reduced by 2,518 tons to a total of 29,345 tons at the end of the year.

The following table shows the origin of ore hoisted in 1963.

	From Stopes	From Development	Hoisting Stages
	tons	tons	
Surface to 3,900-foot level	57,138	1,017	1
4,050-foot level to 7,200-foot level	48,261	1,090	2
7,350-foot level to 8,100-foot level	34,374	1,120	3
Total	139,773	3,227	——

Milling

Wright-Hargreaves ore continued to be treated in the Lake Shore mill under the joint milling agreement arranged in 1957.

Average daily milling rate was 391.8 tons, compared to 409.3 in 1962 and 435.8 tons in 1961.

Mill recovery of gold was 96.5 percent of the contained metal, compared to 96.1 percent in 1962.

Ore Reserves

After milling 143,000 tons of ore in the year, the developed available broken and unbroken ore reserve was reduced by 23,148 tons to a total, on 1 January 1964, of 116,315 tons estimated to contain 0.40 ounces of gold per ton.

New ore added to the reserve by development amounted to 3,600 tons, and 83,252 tons was won by mining beyond previously established ore limits, principally in stopes on the deep levels. These additions, together with a transfer of 33,000 tons from the probable and unavailable classifications, account for the relatively small reduction in the developed available ore reserve.

Further additions to the reserve by mining beyond presently established ore limits will be small, since mining in the ore blocks on the bottom levels has advanced to the stage where accurate estimates of remaining ore can and have been made. For this reason, it is likely the ore reserve will be exhausted by the end of 1964.

The upward revision in the grade of the reserve reflects the better than anticipated value of some ore blocks, largely on the lower levels.

Operating Costs

	1963	1962
Milled.....tons	143,000	149,384
Gold recovered.....oz.	58,678.448	51,720.149

	1963		1962	
	Cost Per Ton Milled	Cost Per Ounce Gold Recovered	Cost Per Ton Milled	Cost Per Ounce Gold Recovered
Mine development	$ 0.31	$ 0.76	$ 0.32	$ 0.92
Mining	8.09	19.72	8.03	23.19
Milling	1.78	4.34	1.83	5.28
Marketing expense	0.12	0.29	0.10	0.30
General expense at property	1.79	4.37	1.78	5.15
Mine office and supervision	0.69	1.67	0.75	2.18
Administration and corp. expense	0.53	1.29	0.52	1.49
Mining taxes	0.28	0.68	0.15	0.43
Total Operating Expense	$13.59	$33.12	$13.48	$38.94

Plant Safety

Again it is a pleasure to pay tribute to all supervisors and employees for their continued and aggressive effort in the prevention of accidents.

There were only 4 compensable injuries in the year, compared to 15 in 1962; the frequency rate, or number of compensable accidents per million man-hours worked, was 5.9, which compares with the average frequency rate of 26.3 for the 26 gold mines of Ontario. Only one of these mines had a better record in 1963 than the Wright-Hargreaves mine.

The average number of employees was 338; 249 underground, and 89 on surface. Frank Buckle was general manager.

IRON ORE AND IRON

Shipments of ore from iron mines in Ontario in 1963 increased 5.21 percent in quantity, from 6,414,936 tons in 1962 to 6,749,617 tons in 1963; the value of shipments increased 8.61 percent, from $64,479,510 in 1962 to $70,033,690 in 1963. The production, value and general statistics for iron ore production by the nickel-copper mines are shown under Nickel-Copper.

The industry paid $3,744,125 to 476 salaried employees, and $9,568,401 to 1,633 wage earners; fuel and electricity cost $2,419,154, and process supplies cost $6,656,961.

The Algoma Steel Corporation Limited

In October 1960, Algoma Ore Properties Limited, Algoma Steel Corporation Limited, and Canadian Furnace Company Limited, were amalgamated under the name of The Algoma Steel Corporation Limited. The authorized capitalization is 15,099,880 shares of no par value, of which 5,786,192 shares have been issued. The directors and officers were: D. S. Holbrook, president, chairman, and director; Douglas Joyce, vice-president (operations) and director; J. B. Barber, vice-president (finance) and director; W. R. Binch, Hon. T. A. Crerar, Sir Philip Dunn, H. S. Hamilton, W. H. Howard, G. W. Humphrey, T. R. McLagan, W. E. McLaughlin, E. G. McMillan, J. S. D. Tory, Hon. R. H. Winters, and Wilhelm Zangen, directors; C. C. Weeks, vice-president (sales); D. A. Machum, secretary and assistant vice-president (sales); C. E. McClurg, treasurer. The head office is at 503 Queen Street East, Sault Ste. Marie.

ALGOMA ORE PROPERTIES DIVISION

The Algoma Ore Properties Division holds various iron properties in the Algoma district, including the formerly operated Helen mine, the George W. MacLeod mine and the Sir James mine, three miles east of the Helen, and the Goudreau Pyrite property. The mines (excluding the Goudreau Pyrite property) and the sintering plant, are at Wawa.

GEORGE W. MacLEOD MINE

This property consists of fourteen claims in ranges 23 and 24, Township 29, District of Algoma. Mining operations continued from 1 January to 31 December 1963.

SHAFTS, GEORGE W. MACLEOD MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 4 (below 2nd level)	D.J.22	Vertical	2 (inactive)	1,778
No. 5	D.J.24	Vertical	3	2,066
Ropeway	D.J.24, 25, 30, 31	—22°	1	1,827

During 1963, a total of 17,016 feet of drifting, 5,271 feet of crosscutting, and 6,629 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 82,659 feet of drifts; 25,489 feet of crosscuts; 34,064 feet of raises. Some 110 diamond-drillholes totalling 20,189 feet were completed in 1963 from underground.

New construction in 1963 included the following:

2 extensions to mine compressor house (15 x 30 ft. and 12 x 13 ft., steel and asbestos tile).
1 explosive magazine (37 x 21 ft., frame).
1 extension to plant compressor building (28 x 17 ft., steel).
2 extensions to warehouse office building (15 x 45 ft. and 8 x 9 ft., steel).
1 boiler house extension (16 x 33 ft., steel).
1 septic tank (20 x 10 ft., concrete).
1 yard fence (chain link, 1,500 ft.).
1 road paving (asphalt, 4-in., HL 4).

New equipment added in the locations indicated was as follows:

2 locomotives (Clayton 8½ ton) underground.
22 mine cars (Dorr-Oliver-Long, Granby 100 cu. ft.) underground.
1 slusher hoist (Joy R-223, 125 hp., 15,000 lbs. rope pull) underground.
2 mucking machines (Eimco 24B) underground.
1 pump (Pulsometer centrifugal 11 stages, 750 gpm. at 2,000 ft. head) underground.
2 electric motors (English Electric, AD-683, 250 hp.) underground.
1 dust collector (Rabson bag-type, 30,000 cfm.) underground.
1 dust collector (Wheelabrator bag-type, 13,000 cfm.) underground.
1 dust collector (Canadian Blower & Forge, exhaust system, repair shop).
1 tractor (International Harvester TD-20, sinter plant).
1 boiler (Ray Scott, LSD 250, sinter plant).
1 car shakeout (Hewitt Robins, sinter plant).
1 crusher and pulverizer (Denver Equipment Co., laboratory).

A total of 1,965,119 tons of ore was hoisted and conveyed.

SIR JAMES MINE

This property consists of two claims and two mining locations in range 24, Township 29, District of Algoma. The Sir James mine commenced production of ore in 1958. A spur railway line was built from the Helen mine to provide service to the operation and for the transportation of ore to the treatment plant. A conveyor tunnel, 610 feet long, was driven at an angle of 14.5 degrees to house the conveyor carrying ore from the underground crusher to the railway loading point. The crusher room was cut at a point 124 feet vertically below surface.

Mining operations continued from 1 January to 31 December 1963.

A total of 683,837 tons of ore was hoisted and conveyed.

GOUDREAU PYRITE

The property consists of ten claims, located in Township 27, range 26, in the Sault Ste. Marie mining division and includes the Rand No. 1 and Bear A and C groups of claims.

The pyrite is used primarily as fuel in the sintering process.

A total of 91,938 tons of pyrite was shipped from stockpile.

The total ore production from the George W. MacLeod, Sir James mines, and Goudreau Pyrite property was 2,740,894 tons.

The average number of employees at the mines was 703; 281 underground, and 422 on surface. C. M. Beck was general manager; J. E. Worley was general superintendent.

STEELWORKS DIVISION

The blast furnace section of the Division is located at Sault Ste. Marie. Operations continued throughout 1963. No. 1 blast furnace has been dismantled; No.2 furnace was idle.

The sintering plant of the Division, located at Wawa, operated a total of 350 days during 1963, producing 602,000 tons of sinter.

PRODUCTION OF IRON, STEELWORKS DIVISION

Furnace	1963		1962	
	Days of Operation	Production	Days of Operation	Production
		tons		tons
No. 3	340	257,600	315	225,503
No. 4	363	241,700	363	203,714
No. 5	364	726,700	364	684,079
No. 6	330	697,400	312	545,979
Total	——	1,923,400	——	1,659,275

The average number of employees in the blast furnace section and sintering plant was 783. W. P. Dowhaniuk was superintendent.

CANADIAN FURNACE DIVISION

The Canadian Furnace Division, comprising a blast furnace and the accessory equipment necessary to produce pig iron, is located at Port Colborne.

Total pig iron production was increased in 1963 by about 30 percent over 1962. The sinter plant was dismantled in September, subsequent ore in the furnace burden will be pellets, sized ore, and sinter from the Sault Ste. Marie operation.

The blast furnace operated from 8 January to 5 September 1963, a total of 239 days and produced 152,991 tons of pig iron.

The average number of employees was 131. Thomas C. Cordner was general superintendent.

The following is taken from the corporation annual report for the year ending 31 December 1963:

An increase of 223,000 net tons or 17 percent in shipments of steel products, particularly in flat rolled form, was the prime reason for increased sales in 1963. Shipments of pig iron declined slightly, and shipments of Algoma sinter to outside customers were considerably lower.

Greater usage of Algoma sinter in the corporation's blast furnaces more than offset the decline in shipments to outside customers. Total shipments were 1,699,000 gross tons compared to 1,561,000 gross tons in 1962.

Domestic pig iron increased slightly, but this was more than offset by a decline in export sales. Total pig iron shipments in 1963 were 359,000 net tons compared to 388,000 net tons in 1962. Ample supplies and increased use of low priced scrap continued to depress the export market for pig iron, but dependence of earnings on sales of pig iron from the steelworks is diminishing as greater amounts are needed for steelmaking to support the steel product diversification program.

Demand for Algoma's steel products reached a high level early in 1963 and continued to be strong throughout the year. Shipments were 1,520,000 net tons compared to 1,297,000 net tons the year before.

There were no general price revisions in Canada, and the average price realized on steel products at Sault Ste. Marie was $114.31 per ton compared to $112.24 in 1962. The increase is attributable to the sale of a greater proportion of higher priced finished products.

The supply of uniform-size Algoma sinter from the sinter screening plant installed in Novembert 1962 at the Algoma Ore Properties Division played a significant role in iron production. Blast furnace performance at the steelworks improved substantially, and iron production increased as a result of greater coke oven gas injection, installation of equipment permitting higher top gas pressure operation on the two largest blast furnaces, and better preparation of charge materials. The quantity of coke required to make a ton of iron was the lowest ever achieved. While one of the smaller blast furnaces was out of service for relining, rehabilitation, and enlargement, it was equipped for higher top gas pressure operation and fuel injection. The other small blast furnace will be similarly equipped in 1964. Use of this equipment in the operation of all four blast furnaces will permit production of the additional tonnage of iron required for increased steelmaking capacity.

Operations at the Canadian Furnace Division were again intermittent. However, use of more beneficiated iron-bearing materials appreciably increased blast furnace performance.

Production of Algoma sinter at the Algoma Ore Properties Division was 1,618,000 gross tons, with practically all of the sinter being sized in the new sinter screening plant, compared to 1,460,000 gross tons in 1962, of which only 44 percent was sized on temporary facilities. Through use of improved methods, including more efficient ignition practices, operating speeds on the sintering machines were considerably increased. Approximately 26 percent of the raw ore sintered was from the Sir James open pit mine and 74 percent from the George W. MacLeod underground mine; these proportions are identical to those in 1962.

At the Algoma Ore Properties Division, no major capital expenditures were made in 1963. In 1964, projects contemplated include installation of equipment to permit use of lower cost fuel oil in the sintering operation, and replacement of pallets on the sintering machines. Studies are being made of the economics of replacing three small sintering machines installed in 1939 with one large machine.

Algoma's participation in the Blast Furnace Research Inc. project with other Canadian and United States steel companies continued throughout 1963, and comprehensive progress reports were received on the results obtained from tests in the experimental blast furnace.

Extensive metallurgical tests were made on the concentrating and pelletizing of low-grade magnetite iron ore from deposits owned and leased by the Corporation about 60 miles north of Sault Ste. Marie. The economics of development and mining of these deposits are being actively studied.

Caland Ore Company Limited

Caland Ore Company Limited was incorporated in November 1957, with an authorized capitalization of 100,000 shares of $50 par value, all of which have been issued. It is a wholly-owned subsidiary of the Inland Steel Company of Chicago. The directors and officers were: P. D. Block Jr., chairman and director; C. B. Jacobs, president and director; R. D. Satterley and H. M. Graff, vice-presidents and directors; W. H. Lowe, assistant treasurer, assistant secretary, and director; J. L. Block, L. B. Hunter, J. F. Smith Jr., F. G. Jaicks, and G. A. Ranney Jr., directors; P. P. Ribotto, vice-president; W. B. Cummings, treasurer and assistant secretary; J. C. Carter, secretary. The head office is at 30 West Monroe Street, Chicago 3, Illinois. The mine address is Atikokan.

The property consists of 48 claims, in Schwenger and Freeborn townships, District of Rainy River, of which 31 are held on a 99-year lease from Steep Rock Iron Mines Limited. The lease covers a section of the C orebody at the east end of Steeprock Lake.

Operations continued throughout 1963.

The Falls Point mine is serviced by the vertical, eight-compartment shaft, 1,333 feet deep, located on claim F.F. 3513.

All underground work was suspended in December 1961. The total development footage at that time was as follows: 205 feet of drifts; 5,171 feet of crosscuts; 976 feet of raises on the 800-, 1,000-, and 1,200-foot levels. Eight diamond-drillholes totalling 2,899 feet were drilled from surface in 1963.

Major equipment, added in 1963, consisted of two D8 caterpillar tractors and one rotary drill (Reich, C 750).

All production in 1963 was from the open pit and consisted of 1,914,105 tons; 2,002,917 tons was shipped to Inland Steel Company of Chicago.

Caland proposes to award contracts for the construction of a $15,000,000 pellet plant at the property. In addition to 1,000,000 tons of pellets, Caland will also produce up to 1,500,000 tons of high-grade direct-shipping ores especially tailored to meet Inland's blast furnace requirements. The plant is scheduled to commence operating late in 1965.

In announcing plans for this major development, in November 1963, Caland pointed out that the high iron and low silica content of the ore would enable this to be the first plant in the world to pelletize iron ore directly from its natural state without preparatory concentration.

The average number of employees was 222: 71 in the open pit, and 151 on surface. P. P. Ribotto, vice-president, was in charge at the property.

Dominion Foundries and Steel Limited

Dominion Foundries and Steel Limited was incorporated in May 1917. The authorized capitalization was 5,000,000 shares of no par value, of which 3,828,215 shares have been issued. The officers were: F. A. Sherman, chairman; A. G. Wright, vice-chairman (finance); F. A. Loosley, vice-chairman (research and development); F. H. Sherman, president and general manager; D. F. Hassel, vice-president; R. R. Craig, vice-president (marketing); D. O. Davis, vice-president (engineering); D. A. Lindsey, vice-president (purchasing); J. G. Sheppard, secretary and comptroller. The head office and plant address is Hamilton, P.O. Box 460.

PRODUCTION OF IRON, DOMINION FOUNDRIES AND STEEL LIMITED

Furnace	1962		1963	
	Operated	Production	Operated	Production
	days	tons	days	tons
No. 1	224	301,964	365	——
No. 2	151	197,871	208	——
No. 3	365	617,794	364	——
Total	——	1,117,629	——	1,201,782

The blast furnaces treated 1,832,656 tons of ore, averaging 5,021 tons per operating day, to produce 1,201,782 net tons of pig iron.

The No. 2 blast furnace, which had been previously relined, was blown-in during the month of June. The three furnaces were on blast thereafter and achieved the scheduled increase in pig iron production using the Bunker-C heavy fuel injection method that efficiently speeds the reduction of ore to iron. The ore deck and high line was extended 300 feet into Hamilton Harbour to provide for additional storage for the blast furnace division.

Slag removal from the pits using a power shovel was revised during 1963. Special ladles receive the molten slag from the blast furnace runners for transfer to new adjacent pits, where water sprays, located at the bottom, expand the slag into a foam which is processed into a light-weight aggregate.

The results obtained in the pilot fluid-bed briquetting plant were encouraging, and studies confirm the feasibility of a full-scale production unit to briquette flue dust from the blast furnace and slag fines from the oxygen furnace for blast furnace feed.

A new maintenance and Bay Front store building (200 x 70 ft.) was constructed in 1963.

The average number of employees in the blast furnace division was 165. H. C. Taylor was general superintendent; Lloyd Thomas was assistant superintendent.

Jones and Laughlin Steel Corporation

Jones and Laughlin Steel Corporation was incorporated in December 1922, with an authorized capitalization of 293,568 preferred shares of $100 par value and 10,000,000 common shares of $10 par value; all preferred shares and 7,879,974 common shares have been issued. The officers of the company were: C. M. Beeghly, chairman of the board; W. J. Stephens, president; H. J. Haughton, treasurer; W. R. Compton, secretary. The head office is at 3 Gateway Center, Pittsburgh, Pennsylvania 15230, U.S.A. The address of the Adams mine is Box 547, Kirkland Lake.

The property, known as the Adams mine, comprises 119 claims in Boston township, District of Timiskaming. It is about 6 miles southeast of Kirkland Lake; the distance by road is approximately 15 miles. The ore is a banded magnetic iron formation containing an average of 25 percent iron. It will be mined in open pits, crushed, ground, and concentrated magnetically. The concentrate will be pelletized and loaded in railroad cars for direct year-round shipment to Jones and Laughlin plants.

The construction of the crushing and screening plant, concentrator, and pelletizer was started. The plant is designed to handle 10,000 tons of crude ore per day and to produce 1,000,000 tons of iron pellets annually. Pellet production is scheduled to begin in the fall of 1964.

New equipment added included the following:

4 electric shovels (P & H-No. 1600, 6 cu. yd.).
1 diesel shovel (Bucyrus-Erie 71B-3½ cu. yd.).
10 trucks (Euclid, 45 ton).
3 tractors (Hough No. 120).
2 tractors (Euclid C-6).
2 graders (Adams Letourneau Westinghouse).
3 crawler drills (CIR-6½ inch).
1 air compressor (portable 600 cfm. & CIR 2¾ in. crawl drill).
20 trucks (miscellaneous ½–3 ton).
1 crane (B.E. 30 ton).
1 air compressor (CP 315 cfm.).

During 1963 some 46,400 tons of crude ore and 1,685,000 tons of waste rock were removed from the south and central pits. The crude ore was stockpiled for future processing. Some 39 diamond-drillholes, totalling 21,468 feet, were completed from surface.

The average number of employees was 61: R. E. Durocher was division superintendent for the Adams mine. The contractors employed about 350 additional construction workers.

Lowphos Ore Limited
(Moose Mountain Mine)

Lowphos Ore Limited, incorporated in July 1941, is a subsidiary of National Steel Corporation and operates under the direction of the Hanna Iron Ore Division of the corporation. The directors and officers were: W. A. Marting, president and director; R. W. Whitney, and R. E. Anderson, vice-presidents and directors; G. W. Humphrey, director; R. H. Bartholomew, vice-president; S. L. Engel, secretary; R. E. Beal, treasurer; F. W. Bennett, assistant secretary; F. C. Teske, assistant treasurer. The head office is The Hanna Mining Company, 1300 Leader Building, Cleveland 14, Ohio, U.S.A. The mine address is Box 310, Capreol.

Lowphos Ore Limited has a lease on the Moose Mountain iron property, approximately 6,064 acres, about 35 miles north of Sudbury, in Hutton township, District of Sudbury. No. 2 open pit produced a daily average of 4,000 tons of magnetite ore for the concentrator. The new pelletizing plant started operations in July, and pelletized concentrate is shipped by rail from the property to Depot Harbour, District of Parry Sound, where it is transferred to cargo ships.

The open pit and mill were inoperative from 25 January to 10 June 1963.

Some 42 diamond-drillholes, totalling 13,040 feet, were drilled from surface. A pelletizing plant of steel construction, (197 x 88 ft), having a capacity of 1,800 tons of pellets daily, and consisting of two shaft pellet furnaces, two filters, two balling drums, pumps, feeders, conveyors, etc., was completed and commenced operating in July. An electric shovel (Bucyrus Erie, model 150-B, 4½ yd. capacity) was purchased.

A total of 873,489 tons of ore was mined in the open pit; 876,180 tons was milled producing 368,819 tons of magnetite concentrate.

The average number of employees was 175: 62 in the open pit, and 113 on surface. F. F. Rahne was superintendent.

Marmoraton Mining Company Limited

Marmoraton Mining Company Limited is a wholly-owned subsidiary of Bethlehem Steel Corporation. It was incorporated in the State of Delaware in November 1950. The authorized capitalization is 205,000 shares of $100 each, of which 200,500 have been issued. The directors and officers were: P. B. Entrekin, president and director; W. H. Johnstone, vice-president and director; A. M. Reed, comptroller and director; R. D. Broeker, secretary and director; I. D. Sims, director; C. A. Lorenson, vice-president and general superintendent; L. W. Foy, A. M. Rupkey, S. J. Shale, and I. D. Sims, vice-presidents; J. Bernhardt, manager; E. W. Morris, treasurer. The head office and mine offices are at Marmora. The executive office is at Wilmington, Delaware, U.S.A.

The company owns an iron property in Marmora and Rawdon townships, County of Hastings, a short distance east of Marmora.

Early in 1963 a start on a ten-year program was made to expand the size of the pit. The present size will be increased in length from 2,600 to 2,800 feet and in width from 1,200 to 1,500 feet. Originally the pit was to bottom at 475 feet below datum, which is the floor of the primary crusher. The new layout will extend the depth of the pit an additional 270 feet or to 745 feet below datum.

The orebody of 33 percent magnetic iron was capped with an average of 8 feet of overburden and 130 feet of limestone. The expansion necessitates the removal of an additional 37,900,000 tons of waste material. More equipment will be required to handle this waste in addition to the daily production of some 4,000 tons. The first two of a fleet of eight 55-ton trucks were delivered in December. An additional electric (6 cu. yd.) shovel will also be required.

Added equipment in 1963 consisted of two trucks (Dart 55-ton).

A total of 1,282,630 tons was mined in the open pit; the mill treated 898,655 tons of ore, averaging 2,723 tons per working day, and produced 514,543 tons of pellets.

The average number of employees was 316: 78 in the open pit, and 238 on surface. C. A. Lorenson, vice-president and general superintendent, was in charge.

Oglebay Norton Company (Canadian Charleston Mine)

Canadian Charleston Limited was incorporated in April 1955. In 1962 the name was changed to Oglebay Norton Company, Canadian Charleston Mine. The authorized capitalization is 3,000,000 shares of $1 par value, of which 1,019,951 shares have been issued. The officers were: E. W. Sloan, Jr., president; J. J. Dwyer, secretary; F. R. White, Jr., treasurer. The head office is at 1200 Hanna Building (P.O. Box 6508) Cleveland 1, Ohio, U.S.A. The mine address is Box 1510, Atikokan.

The company holds a lease on about 1,000 acres in Freeborn and Schwenger townships, Steeprock Lake area, District of Rainy River. The property, which includes the Mathieu and Pattison groups of claims, is situated between Atikokan and the Steep Rock Iron mines.

The concentrator did not operate during 1963, but 19,178 tons of stockpiled ore was shipped.

C. F. Bauers was manager, and there was one other employee.

The Steel Company of Canada Limited

The Steel Company of Canada Limited was incorporated in June 1910. The authorized capitalization was increased in 1953, and in 1962 to 28,000,000 shares of no par value, of which 20,377,595 shares have been issued. The directors and officers were: H. G. Hilton, chairman and chief executive officer; V. W. T. Scully, president and director; L. T. Craig and H. M. Griffith, vice-presidents and directors; Allan Graydon, G. A. R. Hart, Frederick Johnson, R. A. Laidlaw, L. L. Lang, J. R. Gordon, H. Greville Smith, D. R. McMaster, L. G. Rolland, and H. G. Welsford, directors; R. B. Taylor, vice-president and treasurer; N. J. Brown, vice-president and comptroller; H. J. Clawson, vice-president; W. C. Chick, secretary and assistant treasurer; J. W. Younger, assistant secretary; B. M. Kinnear, assistant treasurer; R. E. Karr, assistant comptroller. The head office and blast furnace division is at Wilcox Street, Hamilton.

PRODUCTION, THE STEEL COMPANY OF CANADA, 1962 AND 1963

Furnace	1962		1963	
	Operated	Pig Iron Produced	Operated	Pig Iron Produced
	days	tons	days	tons
A	365	111,928	364	119,425
B	364	376,933	360	368,619
C	365	482,358	319	519,484
D	364	736,377	359	810,560
Total	——	1,707,596	——	1,818,088

The blast furnaces treated 2,926,136 tons of ore, averaging 8,348 tons per working day, to produce 1,818,088 net tons of pig iron.

The sinter plant operated at capacity during 1963. The test results of producing sized sinter from minus one-inch to plus ¼-inch for the blast furnaces are being scrutinized.

Except for the short period when No. 3 blast furnace was being relined, the four furnaces were on blast throughout 1963 and established another record year in pig iron production. Natural gas injection supplemented coke as a fuel in all the blast furnaces. Late 1963, Bunker-C heavy fuel oil injection was instituted in No. 3 furnace as a partial substitute for coke and a source of hydrogen to help supply reducing gas. The replacement ratio value as compared with coke will be determined.

Efforts were directed toward acquiring more and better sized beneficiated materials in the blast furnace burden, an improved quality of coke, and making use of the maximum hot blast available from the stoves. During the No. 3 furnace reline, one of the stoves was rebuilt with an external combustion chamber that nearly doubled the heat area. This trend will be pursued as other stoves are rebuilt in conjunction with the insulation of the stainless steel blow pipes that permit effective use of the hot blast.

The average number of employees was 473. C. M. Birkett was works manager; J. A. Peart was superintendent in the blast furnace division. J. G. Sibakin was manager, research and development.

Steep Rock Iron Mines Limited

Steep Rock Iron Mines Limited was incorporated in February 1939. Early in 1955 the authorized capitalization of 30,000 shares of preferred stock of $100 par value and 10,000,000 shares of common stock of $1 par value was changed to 10,000 shares of preferred stock of $100 par value and 10,666,666 shares of common stock of $1 par value. The 20,000 previously issued shares of preferred stock were converted into 666,666 shares of common. The number of shares issued at 31 December 1963 was: common 8,058,872; preferred, none. The directors and officers were: Cyrus S. Eaton, chairman of the board and director; M. S. Fotheringham, president, general manager, and director; Neil Edmonstone, vice-president, secretary-treasurer, and director; W. R. Daley, J. G. Cross, G. E. Allen, Mark McKee, John Paterson, F. H. Black, D. D. Hogarth, and Hon. C. J. Burchell, directors. The head office and mine offices are at Steep Rock Lake.

The company holds about 7,000 acres in Freeborn and Schwenger townships, Steeprock Lake area, District of Rainy River.

Operations continued throughout 1963. The amount of ore mined during the year is shown in the following table:

	Tons
B orebody (Errington underground)	184,818
G orebody (Roberts open pit)	880,098
	1,064,916

A total of 1,033,315 tons of ore was sold in 1963, an increase over the 962,885 tons sold in 1962.

A (HOGARTH) OREBODY

Open-pit mining was completed on 16 March 1962. Preparations for underground mining of the Hogarth orebody had continued to 31 August 1961.

SHAFTS, A (HOGARTH) OREBODY

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. A-1	F.F.3183	Vertical	3 (inactive)	845
No. A-2	F.F.3660	Vertical	4	1,480

Total development footage when underground operations were discontinued was as follows: drifts, 1,477 feet; crosscuts, 5,169 feet; raises, 1,040 feet.

The mine was inactive during 1963.

B (ERRINGTON) OREBODY

Underground mining on the B (Errington) orebody continued throughout 1963.

SHAFTS, B (ERRINGTON) OREBODY

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. B1 Errington (Float Ore Island) shaft	G.629	Vertical	3	1,263
Mosher Point (Drainage Tunnel) shaft	F.F.3664	Vertical	2	283

Development footage in 1963 consisted of 634 feet of raising. Total development footage to 31 December 1963 was as follows: 42,516 feet of drifts; 13,311 feet of crosscuts; 9,711 feet of raises. Diamond-drilling in 1963 consisted of 36 holes, totalling 5,210 feet from underground. A total of 184,818 tons of ore was hoisted.

ROBERTS OPEN-PIT MINE

The dredging of the G ore zone was completed at the end of 1961. A total of 1,768,448 cubic yards of material was removed from this portion of the G ore zone, which is called the Roberts mine, in 1962.

Operations in the open pit continued throughout 1963. The Roberts conveyor system, designed to crush, convey, and stockpile 1,800 long tons of raw ore per hour, and to reclaim and load crushed ore at a rate of 1,000 long tons per hour, was completed.

A total of 880,098 tons of ore was mined in the open pit in 1963.

The following is taken from the company annual report for the year ending 31 December 1963:

> Combined output of 3,036,232 tons from the Steep Rock Range was approximately the same as 1962; Steep Rock sold 1,033,315 tons from its own operations, and Caland shipped 2,002,917 tons from the leased C ore zone to meet the requirements of its parent, Inland Steel Company of Chicago.
>
> The new Roberts ore zone has large open-pit reserves, in addition to tonnages of underground ore, sufficient to sustain volume output for decades. Stripping and development work on this mine has advanced to the stage where it can be called upon for substantially larger tonnage than it produced in 1963. Further market demands would be met from developed reserves in the Hogarth and Errington underground mines.
>
> The large scale experimental operations, which have been conducted on the Errington underground mine, are approaching a successful conclusion; costs and profits, comparable to deep open-pit operations projected for the new Roberts mine, are now indicated.

The Hogarth underground mine is already provided with a fully equipped plant and shaft designed for an annual output of 2,500,000 tons. It can be brought into production within 30 months from the date of a decision to activate it, and can be developed to accommodate increasing market requirements.

Exploration Program

An exploration program carried on again in 1963 has located two properties, one a sizeable copper prospect in Northwestern Ontario, the other is an interesting molybdenite prospect in British Columbia. Agreements have been negotiated with two major mining companies to explore the properties in detail and, if warranted, to bring them into production.

These activities will involve no further expenditures by Steep Rock, but the company would have a substantial share in the profits from operations, which might materialize.

The Iron and Steel Industry

Because of existing long-term contracts in the Canadian iron ore and steel industry in 1945 when the property was brought into production, the major market for its ore was developed in the United States. At that time, and until fairly recently, the American iron ore and steel industry was operating largely on direct-shipping iron ore.

Recent far-reaching technological advances in steel making require that iron ores be upgraded substantially to accommodate new blast furnace practices. Accompanying this change, increasingly large tonnages of high-grade direct shipping ore have come into the American market from outside the continent. At the same time, the steel industry operated below the 100 million ton level during the five years prior to 1963, contrary to earlier predictions that production would be rising steadily to 140 million tons annually by the mid 1960s, with concurrent consumption of correspondingly large quantities of iron ore. The steel industry showed marked improvement in 1963 with production reaching 109.4 million ingot tons. Competent industry authorities forecast further improvement in 1964.

Steep Rock deposits are high grade, with structural characteristics readily amenable to the up-grading requirements of the steel industry. The company expects to press for establishment of fully competitive transportation rates, so that Steep Rock may enjoy the same advantages of the other iron ore deposits with which it shares the geographical benefit of access to Great Lakes steel centres through location in the Lake Superior district.

The average number of employees was 414: 159 underground, and 255 on surface. M. S. Fotheringham president and general manager, was in charge of operations at the property.

Strategic-Udy Metallurgy Limited

Strategic-Udy Metallurgical and Chemical Processes Limited, a subsidiary of Strategic Materials Corporation, was incorporated in October 1955. In December 1960, the name was changed to Strategic-Udy Metallurgy Limited. The authorized capitalization was 1,000 shares of no par value, all of which have been issued. The directors and officers were: George M. Walker, president and director; R. O. Denman, vice-president and director; W. H. Dalman, treasurer and director; W. F. McCutcheon, assistant treasurer and director; Harold Kahen secretary and director; R. D. Weldon, assistant secretary. The head office and plant is at 3527 Stanley Avenue, Niagara Falls.

The plant of Strategic-Udy Metallurgy Limited consists of four separate operational departments:

1) A crushing plant capable of handling 50 tons per hour.
2) A concentration mill, equipped with wet and dry magnetic separators, capable of handling up to 10 tons of ore per hour.
3) A prototype smelting plant equipped with one 5½- by 80-foot rotary kiln, three 1,000-kva smelting furnaces and one 3-ton steel refining furnace.
4) A commercial smelting division, consisting of one 8- by 150-foot rotary kiln and one 10,000-kva smelting furnace of the Strategic-Udy design.

The 10,000-kva plant was inoperative during the year as a result of the depressed condition of the ferrochrome market. The prototype smelting plant was operated for 17 days in December, treating 345 tons of ore to produce 179 net tons of pig iron.

The average number of employees was 34; R. O. Denman vice-president was in charge.

LEAD AND ZINC

The production and value of both lead and zinc in Ontario in 1963 was increased over 1962 figures. Lead increased 3.46 percent in quantity, from 2,287,087 pounds in 1962 to 3,077,814 pounds in 1963, and 4.92 percent in value from $226,879 in 1962 to $338,560 in 1963; zinc increased 5.29 percent in quantity from 126,264,684 pounds in 1962 to 132,939,970 in 1963, and 11.20 percent in value from $15,278,027 in 1962 to $16,989,728 in 1963. There was no lead recovered in 1963 from the silver-cobalt ores of the Cobalt-Gowganda area; all the lead and zinc production came from the Manitouwadge area.

The mines of the Manitouwadge area paid $1,009,377 to 196 salaried employees, and $3,568,239 to 659 wage-earners; fuel and electricity cost $514,540, and process supplies cost $3,229,488.

The operations report for the Manitouwadge mines appears under Nickel and Copper.

MAGNESIUM AND CALCIUM

These metals are produced in the Renfrew area of Ontario by Dominion Magnesium Limited. The production of magnesium increased 1.02 percent in quantity, from 17,631,310 pounds in 1962 to 17,810,348 in 1963; the value of production increased 11.11 percent, from $4,821,823 in 1962 to $5,357,816 in 1963. The production of calcium decreased 20.11 percent in quantity, from 123,511 pounds in 1962 to 98,673 pounds in 1963; the value of production decreased 5.76 percent, from $124,412 in 1962 to $117,247 in 1963.

Dominion Magnesium Limited

Dominion Magnesium Limited was incorporated in February 1941, with an authorized capitalization of 500,000 shares of no par value, of which 476,270 shares have been issued. The directors and officers were: R. J. Jowsey, president and director; John Thomson, vice-president, general manager and director; J. G. Weir, L. M. Pidgeon, F. H. Jowsey, G. T. N. Woodrooffe, and J. M. Mortimer, directors; H. B. Clearihue, secretary-treasurer. The head office is at 7 King Street East, Toronto 1. The plant address is Haley.

Dominion Magnesium Limited holds exclusive patent rights to the Pidgeon magnesium production process. Operations continued throughout 1963 at the company's quarry and plant about 3 miles from Haley, comprising 383 acres in concessions V and VI, Ross township, Renfrew county.

A white Grenville dolomite is quarried near the plant. This high purity rock contains about 21 percent magnesium carbonate and 31 percent calcium carbonate. The rock is crushed and calcined prior to mixing with ferrosilicon and a small

amount of fluorspar. The fluorspar acts as a catalyst; the ferrosilicon is the reducing agent for the production of magnesium. Aluminum powder is used as the reducing agent for the production of calcium. The mixtures are briquetted and bagged before being placed in the reduction furnaces. The magnesium or calcium crowns are moved from this section to the melt plant for further purification. Mixes are also made with other metals such as, aluminum, thorium, zirconium, barium, strontium, and lithium, to make up different alloys.

New construction in 1963 consisted of a melt plant extension (20 x 12 ft.), a rock-drying building (46 x 40 ft.), a bagging building (62 x 29 ft.).

New equipment added included three storage bins for rock, eight vibrating screens, a dryer, and a shovel (Dominion 1¼-yd.).

A total of 138,794 tons of rock was quarried and milled at an average of 485 tons per working day.

Production of metals for 1962 and 1963 was as follows:

	1962	1963
	pounds	pounds
Calcium crowns	123,654	126,350
Magnesium, pure metal	15,241,159	20,000,637
Thorium pellets	12,758	6,487
Titanium powder	6,660	8,543
Barium	23	503
Strontium	92	77
Zirconium pellets	23,395	29,555

The following is taken from the company annual report for the year ending 31 December 1963:

Production of magnesium crowns was an all-time record. Two of the electrically heated reduction furnaces were shut down for repairs at the end of January 1963 and because of lack of orders were not placed in production until June 1963.

Titanium and zirconium were produced in the Research Centre. The zirconium produced was used mainly in company production of alloys. Ferrosilicon costs were lowered at the Beauharnois smelter.

Capital expenditures for the year amounted to $463,044, mainly to cover the cost at Haley of an addition to the melt plant, integration of a drying, screening and bagging unit with the crushing plant, and, at the Beauharnois smelter, additional fume stacks and a change house. The addition to the melt plant was necessary to improve ingot handling and shipping facilities. The addition to the crushing plant will improve the quality of the kiln feed product by removal of fines, and the separated fines can be marketed profitably.

Research work concentrated on condensation, process efficiency, product improvement, and die casting alloys.

The average number of employees at the plant and quarry was 463. D. J. McPhail was plant manager.

NICKEL AND COPPER

The production of nickel in Ontario in 1963 decreased 10.50 percent in quantity, from 333,163,344 pounds in 1962 to 298,178,570 pounds in 1963; the value of production decreased 10.20 percent, from $274,219,955 in 1962 to $246,252,488 in 1963. The mines with predominant nickel production include The International Nickel Company of Canada Limited, and Falconbridge Nickel Mines Limited in the Sudbury area; the Gordon Lake Division of Metal Mines Limited in the Werner Lake area of Kenora District.

Statistical Synopsis of the Nickel-Copper Mines in Ontario

Year	Number of Producing Companies	Dividends Paid	Number of Plants in Ontario	Salaried Employees		Wage-Earners		Selling Value of Products	
				Number	Salaries	Number	Wages	Kind	Value
1959	3	$48,267,656	16 mines[1]	975	7,146,760	9,220	45,601,540	Nickel in matte	$ 85,970,920
			4 smelters	1,108	7,112,238	6,308	29,320,254	Metallic nickel	138,036,499
			2 refineries	374	2,476,620	2,538	11,219,286	Nickel oxide and salts	15,912,284
								Copper in matte	9,804,234
								Converter copper	82,322,026
								Gold	1,427,027
								Silver	1,215,071
								Platinum metals	16,932,178
								Selenium and tellurium	724,635
								Cobalt	4,451,593
								Pyrrhotite	632,140
								Sulphur	1,041,857
Total		$48,267,656		2,457	$16,735,618	18,066	$86,141,080		$358,470,464
1960	3	$50,158,396	19 mines[1]	1,093	8,071,601	10,209	$51,784,392	Nickel in matte	$101,799,347
			4 smelters	1,151	7,562,771	6,523	31,341,853	Metallic nickel	153,956,279
			2 refineries	409	2,786,892	2,710	12,512,226	Nickel oxide and salts	22,038,141
								Copper in matte	11,043,287
								Converter copper	91,738,960
								Gold	1,923,777
								Silver	1,480,631
								Platinum metals	28,871,955
								Selenium and tellurium	1,037,575
								Cobalt	5,696,208
								Pyrrhotite	762,661
								Sulphur	985,717
Total		$50,158,396		2,653	$18,421,264	19,442	$95,638,471		$421,334,538
1961	3	$56,430,569	18 mines[1]	1,124	8,454,795	10,473	54,191,874	Nickel in matte	$126,507,279
			4 smelters	1,182	7,830,457	6,334	31,302,063	Metallic nickel	145,861,044
			2 refineries	418	2,950,140	2,613	12,410,680	Nickel oxide and salts	22,991,719
								Copper in matte	9,967,622
								Converter copper	89,604,061
								Gold	2,083,948
								Silver	1,683,147
								Platinum metals	24,534,349

								Cobalt	4,147,340
								Iron ore	3,281,209
								Sulphur	833,706
Total.	.....	$56,430,569	.....	2,724	$19,235,392	19,420	$97,904,617	.....	$432,605,667
1962.....	4.....	$70,979,901	18 mines[1]	1,105	$ 8,573,659	9,904	$52,125,497	Nickel in matte	$122,084,245
			4 smelters	1,199	8,213,374	5,773	28,209,681	Metallic nickel	134,169,676
			2 refineries	429	3,047,569	2,355	11,223,002	Nickel oxide and salts	17,955,541
								Copper in matte	9,455,058
								Converter copper	76,285,695
								Gold	2,092,042
								Silver	2,047,893
								Platinum metals	28,848,262
								Selenium and tellurium	883,827
								Cobalt	4,707,066
								Iron ore	4,505,093
								Sulphur	952,877
Total..	.....	$70,979,901	.....	2,733	$19,834,602	18,032	$91,558,180	.....	$403,987,275
1963.....	3.....	$79,057,256	15 mines[1]					Nickel in matte	$121,838,817
			4 smelters	2,680	$19,497,580	16,798	$85,300,244	Metallic nickel	96,777,996
			2 refineries					Nickel oxide and salts	27,635,675
								Copper in matte	8,842,887
								Converter copper	68,689,585
								Gold	1,801,670
								Silver	1,900,662
								Platinum metals	22,585,055
								Selenium and tellurium	511,317
								Cobalt	4,295,732
								Iron Ore	7,982,796
								Sulphur	1,397,959
Total..	.....	$79,057,256	.....	2,680	$19,497,580	16,798	$85,300,244	.....	$364,260,151

[1]The figures for "mines" include the following that were active but non-producing:
1958—Crean Hill (International Nickel), Boundary and Onaping (Falconbridge).
1959—Crean Hill, Victor (International Nickel), Boundary (Falconbridge).
1960—Clarabelle, Copper Cliff North, Crean Hill (International Nickel), Boundary, Strathcona (Falconbridge).
1961—Crean Hill, Copper Cliff North (International Nickel), Strathcona (Falconbridge), and Nickel Mining and Smelting Corporation.
1962—Copper Cliff North, Crean Hill (International Nickel), Strathcona (Falconbridge).
1963—Copper Cliff North, Coleman (International Nickel), Strathcona (Falconbridge).

The production of copper in Ontario in 1963 decreased 5.31 percent in quantity, from 377,990,690 pounds in 1962 to 357,919,536 pounds in 1963; the value of production decreased 3.70 percent, from $116,347,723 in 1962 to $112,-048,454 in 1963. The mines with predominant copper production include Kam-Kotia, McIntyre, North Coldstream, Rio Algom (Pater Division), and Temagami Mining. The Manitouwadge area mines, Geco and Willroy, are important producers of copper, lead, zinc, gold, and silver.

The nickel-copper mines in the Sudbury area milled 13,560,139 tons, or 81.2 percent of the total of 16,699,767 tons of nickel-copper ores milled. In addition to the significant production of nickel and copper, they account for the province's entire production of platinum metals, selenium, and tellurium; the major portion of the cobalt production; also significant production of gold, silver, iron, and sulphur. The statistical synopsis of the nickel-copper mines, which follows, includes the production of Metal Mines Limited with the two large producers of the Sudbury area: The International Nickel and Falconbridge Nickel mines.

NICKEL AND COPPER MINING AND SMELTING

	1959	1960	1961	1962	1963
	tons	tons	tons	tons	tons
Ore treated	16,554,454	19,002,040	18,896,447	15,724,683	16,699,767
Copper in blister produced in Ontario	170,116	186,046	192,624	172,407	164,834
Nickel produced in Ontario	110,282	126,243	111,174	91,222	134,963
Matte exported	107,131	125,333	136,405	121,901	118,372
Nickel content of matte exported	63,682	75,407	85,478	77,227	75,271
Copper content of matte exported	18,156	20,226	19,022	16,678	14,126

PRECIOUS METALS RECOVERED

	1959	1960	1961	1962	1963
Platinum metals oz.	329,081	483,585	418,278	470,782	357,649
$	16,932,178	28,871,955	24,534,349	28,848,262	22,585,055
Gold oz.	42,509	56,665	58,769	55,922	52,557
$	1,427,027	1,923,777	2,083,948	2,092,042	1,983,946
Silver oz.	1,384,223	1,665,314	1,785,643	1,757,848	1,373,044
$	1,215,071	1,480,631	1,683,147	2,047,893	1,900,662
Total $	19,574,276	32,276,363	28,301,444	32,988,197	26,469,663

Falconbridge Nickel Mines Limited

Falconbridge Nickel Mines Limited was incorporated in August 1928, with an authorized capitalization of 5,000,000 shares of no par value, of which 4,852,260 shares have been issued. The directors and officers were: H. J. Fraser, president and managing director; R. Campbell, executive vice-president and director; C. F. H. Carson, O. D. Cowan, W. F. James, Thayer Lindsley, J. D. Barrington, James Stewart, L. J. McGowan, S. M. Wedd and R. B. West, directors; R. C.

Mott, vice-president (operations); G. S. Jewett, vice-president (sales); G. T. N. Woodrooffe, vice-president (finance) and secretary; G. P. Mitchell, director of exploration and geology; F. R. Archibald, director of metallurgy and research; A. W. Coome, controller; J. T. McWhirter, treasurer; J. L. Matthews, assistant secretary; R. M. Oliver, general manager (nickel division); H. S. McGowan, general manager (minerals division); E. L. Healy, manager (nickel division, Sudbury operations); J. H. Fraser, general superintendent (Falconbridge area); G. A. Allen, general superintendent (Onaping area). The head office is at 7 King Street East, Toronto 1.

The company has numerous interests and holdings, principally in mining companies, through a merger with Ventures Limited in 1962. The nickel-copper mines, concentrating and smelting operations in the Sudbury area, research laboratories at Richvale, and Lakefield, and refinery at Kristiansand, Norway, are operations principally connected with nickel production.

FALCONBRIDGE MINE

The Falconbridge property comprises twenty-four claims in Falconbridge township, Sudbury District. The mine address is Falconbridge.

Operations progressed from 1 January to 31 December 1963.

A total of 8,599 feet of drifting, 2,023 feet of crosscutting, and 754 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 207,568 feet of drifts; 46,059 feet of crosscuts; 105,907 feet of raises. A total of 531 diamond-drillholes, totalling 43,210 feet, was completed from underground in 1963.

New equipment added was as follows:

3 diamond-drills (CP 65, Canadian Pneumatic Tool Co. Ltd.).
1 diamond-drill (BBS—35 AUG, Boyles Bros. Drilling Co. Ltd.).
1 mine cage (steel, single-deck, for 4.5 x 5 ft. compartment, Wabi Iron Works).

A total of 666,917 tons of ore was hoisted and milled. The average number of employees was 819: 650 underground, and 169 on surface. R. R. Holmes was mine superintendent.

EAST MINE

The property comprises twelve claims in Falconbridge township, Sudbury District. The mine address is Falconbridge.

Operations progressed from 1 January to 8 November 1963.

During the year, 1,400 feet of drifting, 271 feet of crosscutting, and 770 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 39,284 feet of drifts; 7,279 feet of crosscuts; 15,713 feet of raises. Some 233 diamond-drillholes, totalling 11,077 feet, were drilled from underground in 1963.

New equipment added consisted of: 1 timber car (Zimmerman, 16 feet long, Dorr-Oliver-Long Ltd.).

A total of 217,350 tons of ore was hoisted and milled.

The average number of employees was 148: 135 underground, and 13 on surface. M. J. Chesser was mine superintendent.

HARDY MINE

The property comprises two claims in Levack township, Sudbury District. The mine address is Onaping.

Operations progressed from 1 January to 31 December 1963.

There was no development work during 1963. Total development footage to 31 December 1963 was as follows: 14,893 feet of drifts; 17,952 feet of crosscuts; 12,912 feet of raises. Diamond-drilling in 1963 consisted of two holes, totalling 221 feet, from underground.

New construction consisted of a tool room extension (42 x 16 x 11 ft., concrete foundation, concrete block walls, concrete roof slab).

A total of 134,180 tons of ore was hoisted and milled.

The average number of employees was 194: 87 underground, and 107 on surface. J. Bardswich was mine superintendent.

SHAFTS, FALCONBRIDGE NICKEL COMPANY'S MINES IN THE SUDBURY AREA

	Claim No.	Inclination	Number of Compartments	Collar Depth	Sinking in 1963	Vertical Depth from Surface
				feet	feet	feet
FALCONBRIDGE						
No. 1 shaft...	3035 SES.	Vertical	3	Surface	——	2,848
No. 5 shaft...	3040 SES.	Vertical	6	Surface	——	4,347
No. 7 shaft...	3040 SES.	Vertical	3	2,631	——	4,323
No. 9 shaft...	3040 SES.	Vertical	6	4,023	——	6,562
EAST MINE						
No. 1 shaft...	3036 SES.	Vertical	3	Surface	——	3,942
No. 2 shaft...	———	Vertical	3	4,025	341	4,366
MCKIM (inactive)						
No. 1 shaft...	3773 SES.	Vertical	3	Surface	——	1,421
No. 2 shaft...	———	Vertical	3	989	——	2,426
MOUNT NICKEL (inactive)						
Mount Nickel shaft.....	———	Vertical	3	——	——	327
HARDY						
Hardy shaft..	5822	Vertical	3	Surface	——	1,427
1125 Incline (inactive).	———	36½°	1 (Not oper.)	986	——	1,138
BOUNDARY						
Boundary shaft	5821	Vertical	3	Hardy 10,000 ft. level	——	1,951
ONAPING						
No. 1 shaft...	SE.¼,S.½, lot 8, con. 1, Levack twp.	Vertical	5	Surface	——	3,148
FECUNIS LAKE						
No. 1 shaft...	NW.¼,N.½, lot 5, con. 2, Levack twp.	Vertical	6	Surface	——	4,183
No. 2 shaft...	NW.¼,N.½, lot 5, con. 2, Levack twp.	Vertical	4	Surface	——	3,243
STRATHCONA						
No. 1 shaft...	S.½, lot 4, con. 4, Levack twp.	Vertical	4	Surface	——	3,205

BOUNDARY MINE

The property comprises one claim in Levack township, Sudbury District. The mine address is Onaping. The Boundary and Onaping mines are, respectively, the upper and lower portions of the same orebody. The Boundary mine has been developed from an internal shaft of the Hardy mine; the Onaping shaft collared on surface is 3,148 feet deep.

Operations progressed from 1 January to 31 December 1963.

During the year, 637 feet of drifting, 371 feet of crosscutting, and 483 feet of raising were completed. Total development footage to 31 December 1963 was as follows: 11,197 feet of drifts; 3,450 feet of crosscuts; 2,257 feet of raises. Some 85 diamond-drillholes, totalling 12,834 feet, were completed from underground.

A total of 204,741 tons of ore was hoisted and milled.

The average number of employees was 89, all underground. J. Bardswich was mine superintendent.

ONAPING MINE

The property comprises 1.5 claims in Levack township, Sudbury District. The mine address is Onaping.

Operations progressed from 1 January to 31 December 1963.

During the year, 10 feet of drifting, 694 feet of crosscutting, and 427 feet of raising were completed. Total development footage to 31 December 1963 was as follows: 7,310 feet of drifts; 9,603 feet of crosscuts; 5,508 feet of raises. Some 34 diamond-drillholes, totalling 16,793 feet, were completed in 1963 from underground.

New equipment added consisted of 25 rocker dump mine cars (44 cu. ft. capacity, Wabi Iron Works Ltd.).

A total of 157,464 tons of ore was hoisted and milled.

The average number of employees was 90: 68 underground, and 22 on surface. J. Bardswich was mine superintendent.

FECUNIS LAKE MINE

The property comprises two claims in Levack township, Sudbury District. The mine address is Onaping.

Operations progressed from 1 January to 31 December 1963.

During the year, 44 feet of drifting, 64 feet of crosscutting, and 353 feet of raising were completed. Total development footage to 31 December 1963 was as follows: 17,199 feet of drifts; 13,608 feet of crosscuts; 13,317 feet of raises. Some 39 diamond-drillholes, totalling 10,812 feet, were drilled from underground in 1963.

New underground equipment included the following:

19 rock drills (JR 300, Canadian Ingersoll-Rand Co. Ltd.).
8 scrapers (Simplex 36 in., Mine Equipment Co. Ltd.).
8 slusher hoists (H5NN1J, Canadian Ingersoll-Rand Co. Ltd.).

A total of 674,834 tons of ore was hoisted and milled.

The International Nickel Company of Canada Limited mines the Fecunis ore, and delivers it underground to the Fecunis shaft for hoisting and subsequent treatment.

The average number of employees at the Fecunis mine and concentrator was 134: 23 underground, and 111 on surface. E. N. Gilje was mine superintendent.

STRATHCONA MINE

The property comprises five claims located in Levack township, Sudbury District. The mine address is Onaping.

Operations proceeded from 1 January to 31 December 1963.

The vertical, four-compartment No. 1 shaft, located in the south half of lot 4, concession IV, Levack township has a total depth of 3,205 feet below surface. Development work consisted of 18,002 feet of drifting, 4,694 feet of crosscutting, and 661 feet of raising. Total development footage to 31 December 1963 was as follows: 18,112 feet of drifts; 8,033 feet of crosscuts; 661 feet of raises. Diamond-drilling consisted of 776 holes, totalling 225,554 feet, from underground.

New construction consisted of a 12,500-kva sub-station with concrete piers and superstructure 59 feet high; an insulated instrument building (Armco steel 12 x 12 x 10 ft.)

New equipment installed included the following:

1 mine pump motor (700 hp., English Electric Co. Ltd.).
2 mine pumps (centrifugal, 10 stage, 1,000 gpm. at 1,750 ft. head, Harland Engineering Co. of Canada Ltd.).
12 mine cars (70 cu. ft. arc gate, Dorr-Oliver-Long Ltd.).
8 axial fans (19 in. double-stage, Howard Engineering Sales Co. Ltd.).
1 electrical equipment for 12,500-kva., 115/44-kv. sub-station (Joice Sweaner Electric Ltd.).

A total of 17,190 tons of ore was hoisted.

The average number of employees was 56: 32 underground, and 24 on surface. G. M. Proudfoot, mine project superintendent, was in charge.

FALCONBRIDGE ROCKHOUSE AND CONCENTRATOR

The plant address is Falconbridge.

Operations continued from 1 January to 31 December 1963.

Equipment installed included the following:

1 polarograph (sargent model XV, Care and Co. Ltd.).
1 magnetic separator drum (Jeffrey Manufacturing Co. Ltd.).
1 vacuum pump (single-stage, 75 hp., CIR 26 x 11 in.).

During the year a total of 841,413 tons of ore was milled, at an average of 2,730 tons daily, producing 123,384 tons of concentrate.

H. T. Berry was plant superintendent; W. R. Lyford was mill superintendent.

HARDY ROCKHOUSE AND CONCENTRATOR

The plant address is Onaping.

Operations proceeded from 2 January to 30 December 1963.

Added equipment was as follows:

1 dust collector (Microdyne 8,500 cfm. with 25 hp. axial fan, Joy Manufacturing Co. Ltd.).
3 cyclones (Krebs 10 in., Techniquip Co. Ltd.).
2 cyclones (Krebs model D-20B, Techniquip Co. Ltd.).
1 mixer (Greey Lightning 40 hp., Greey Mixing Equipment Ltd.).
1 pump (SRL 8 x 6 in., Canadian Allis-Chalmers Ltd.).
1 feeder (electric vibratory, Jeffrey Manufacturing Co. Ltd.).

During the year a total of 462,350 tons of ore was milled, at an average of 1,550 tons daily, and 100,347 tons of concentrate was produced.

The average number of employees was 60. Stan McQuitty was mill superintendent.

FECUNIS CONCENTRATOR

The plant address is Onaping.

Operations progressed from 2 January to 30 December 1963.

New construction consisted of a dust collector house (14 x 18 x 26 ft., concrete slab foundation, steel frame, 1⅛ in. Transitop sheathing, insulated roof deck, bonded roof).

New equipment installed was as follows:

1 dust collector (No. 10 model 126 D, Wheelabrator Corp. of Canada Ltd.).
1 pump (SRL, 8 x 6 in., Canadian Allis-Chalmers Ltd.).
1 cyclone (Krebs 20 in., Techniquip Co. Ltd.).

During the year a total of 761,496 tons of ore was milled, at a daily average of 2,470 tons, producing 124,025 tons of concentrate.

The average number of employees was 50. K. C. Mott was mill superintendent.

FALCONBRIDGE SMELTER AND PLANTS

The smelter and plants address is Falconbridge.

Operations proceeded from 1 January to 31 December 1963.

New construction in 1963 involved the conveying system at the pyrrhotite sinter plant and included an 80-foot conveyor tunnel (8 x 8 feet); 234-foot conveyor gallery and towers (steel frame, asbestos siding and roofing, wood floors, concrete foundations); an Armco building (28 x 40 x 12 ft. concrete slab foundation, steel frame, metal siding and roofing).

New equipment added included the following:

PYRRHOTITE PLANT
2 transformer rectifiers (50 kv. 300 Ma, Joy Manufacturing Co. Ltd.).
2 switchboards (25 kva., 550/50 precipitation, Joy Manufacturing Co. Ltd.).

CONVEYOR TO SINTER PLANT
2 conveyors (30 in. wide, 160 ft. long, idlers drives etc., United Steel Corp. Ltd.).
2 belts for conveyors (Dunlop Canada Ltd.).

CONVEYING SYSTEM—SINTER FINES TO PELLETIZING PLANT
1 vacuum pump (Nash, The Arthur S. Leitch Co. Ltd.).
1 screw feeder (inclined, 9-in. diam., 9 ft. 11 in. long, United Steel Corp. Ltd.).
2 gate locks (Dracco, Fuller Co. Ltd.).
1 Airveyor filter (Fuller Co. Ltd.).
1 conveyor (Redler 9 in., 31 ft. 3 in. long, horizontal and inclined, Stephen Adamson Mfg. Co. Ltd.).
1 elevator (Redler 9 in., type L, 27 ft. 3 in. long, Stephen Adamson Mfg. Co. Ltd.).
1 Rotoclone (4,500 cfm., American Air Filter of Canada Ltd.).
1 vacuum pump (14 x 21 in. horizontal, Fuller Co. Ltd.).
1 discharge scrubber (Burgess Manning 36 x 142 in., Fuller Co. Ltd.).

GENERAL
1 carry lift (Pettibone Mulliken Super 10, M. J. Poupore Lumber Co. Ltd.).
1 metal-cutting power saw (The Do-All Company of Canada Ltd.).
1 replacement hood for blast furnace (Procor Ltd.).

The smelter treated concentrates from the Falconbridge, Hardy, and Fecunis concentrators, and ore, totalling 432,675 tons, at an average of 1,243 tons for 348 working days, and produced 124,042,234 pounds of nickel-copper matte. The pyrrhotite plant produced 78,744 tons of iron ore.

The average number of employees was 1,061 in the concentrator, smelter, and pyrrhotite plant. H. T. Berry was area superintendent of plants; H. F. C. Taylor was smelter superintendent; R. Horne was pyrrhotite plant superintendent.

The following is taken from the company annual report for the year ending 31 December 1963:

Metal Deliveries and Prices

Commercial deliveries of nickel increased from 44,861,000 pounds in 1962 to 53,245,000 pounds in 1963, but because of the termination of United States Government stockpile deliveries in August 1962, total deliveries in 1962 exceeded those of 1963 by 7,816,000 pounds. There was a substantial improvement in deliveries in the fourth quarter over the average of the first three quarters, which improvement has continued to date in 1964. The 1963 deliveries of nickel shown above do not include deliveries of nickel in intermediate forms nor the loss at sea of a shipment of matte (fully insured) enroute to the refinery, amounting in all to 1,375,000 pounds of nickel with accompanying copper and cobalt. Copper deliveries, which are more dependent upon production rather than market conditions, amounted to 28,690,000 pounds, a reduction of 5,141,000 pounds from the previous year. A lower copper content relative to nickel in the ores and concentrates treated contributed to the decrease in deliveries. Deliveries of cobalt increased slightly to 1,262,000 pounds from 1,226,000 pounds in 1962. Sales of precious metals were moderately higher. Iron ore concentrate was in continuous production by the pyrrhotite plant, and sales and shipments were made throughout the year.

The prices of nickel, copper, and cobalt remained steady throughout the year.

Ore production during the first half of the year continued at the high level established in 1962. A two-weeks vacation shut-down in July, which permitted maintenance work to be carried out, and the cut-back in production in October resulted in ore production for the full year being 12 percent below that of 1962.

Development and preproduction work consisted chiefly of lateral development and diamond-drilling in the Strathcona mine, developing new levels below the 4,025-foot level in the Falconbridge mine, and completing lateral development above this level in the East mine. An underground shaft below the 4,025-foot level was also commenced in this mine.

The company's treatment plants, consisting of three mills, a pyrrhotite plant and a smelter, treated the ores produced from the company's mines and the concentrate purchased from Marbridge. The smelter operated with two furnaces until the October reduction in production, following which a single furnace was operated. A significant improvement in nickel recovery was achieved in the pyrrhotite plant.

For several years a metallurgical program of upgrading the smelter feed by removing more waste in the concentrating process has been in progress. Over the past ten years the number of tons smelted to tons of ore feed has decreased from about fifty percent to twenty percent. This has had an important beneficial effect on treatment costs.

Mines

	1963	1962
Ore delivered to treatment plants from company mines.....tons	2,116,000	2,408,000
Development advances.....feet	42,000	38,000
Diamond-drilling.....feet	344,000	202,000

Treatment Plants

	1963	1962
	tons	tons
Ore and concentrates delivered to treatment plants from all sources.	2,146,000	2,462,000
Ore milled to produce concentrates.....	2,116,000	2,354,000
Ore and concentrates smelted.....	433,000	488,000

Ore Reserves

SUMMARY OF ORE RESERVES AT THE YEAR'S END

	Ore	Nickel	Copper
	tons	percent	percent
Developed ore: Falconbridge, East, Hardy, Fecunis, Onaping and Strathcona.....	27,014,000	1.60	0.85
Indicated ore: Sudbury district.....	24,308,000	1.22	0.72
Total.....	51,322,000	1.42	0.79

The ore reserves reached a record high at the end of the year of 51,322,000 tons, an increase of 3,059,000 tons in the year, although the grade of the reserves decreased slightly. Due mainly to the very large drilling and development program at the Strathcona mine, it was possible to transfer nearly 6,000,000 tons to the developed category.

Research

Official opening in October of the expanded laboratories at Richvale, Ontario, marked a turn to broader and more intensified activities in research, process and product development and technical services. Research at the operations in the Sudbury District included a continuation of projects in the mines started the previous year, and a number of studies on metallurgical problems in the plants. Pilot plant development on a process for recovering nickel from lateritic ores was continued in the Dominican Republic. Process development of new refining techniques was pilot plant tested at the refinery. The facilities at Lakefield Research Limited, a wholly-owned subsidiary, were expanded during the year. Increasing attention is being given to improving technology and co-ordinating research activities by the associated companies.

Geco Mines Limited

Geco Mines Limited was incorporated in October 1953, with an authorized capitalization of 3,000,000 shares of $1 par value, all shares have been issued. The directors and officers were: J. A. H. Paterson, president and director; R. V. Porritt, vice-president and director; P. D. P. Hamilton, R. T. Birks, J. R. Bradfield, R. M. P. Hamilton, J. D. Perrin, N. C. Urquhart, and W. S. Row, directors; William Harrison, secretary; D. A. Foster, treasurer. The head office is at 44 King Street West, suite 1715, Toronto. The mine address is Manitouwadge.

The property comprises seventy-four claims in the Manitouwadge Lake area, Port Arthur Mining Division, District of Thunder Bay.

Mining and milling continued throughout 1963.

SHAFTS, GECO MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth from Surface
				feet	feet	feet
No. 1	T.B.46849	Vertical	5	Surface	——	2,459
No. 2	T.B.46849	Vertical	3 (inactive)	Surface	——	455
No. 3	——	Vertical	3	1,250	——	2,565
No. 4	T.B.46847	Vertical	7	Surface	276	276

No. 4 shaft was collared and sunk 276 feet below the collar in 1963. The shaft is circular, 21.5 feet in diameter, concrete lined with a depth objective of 4,050 feet. The 100-foot level was established at a depth of 225 feet below the collar.

The following development work was done during the year: drifting and crosscutting, 18,625 feet; raising 7,316 feet. The total development footage to 31 December 1963 was as follows: 175,368 feet of drifts and crosscuts; 57,791 feet of raises. Diamond-drilling consisted of 270 holes from underground, totalling 69,133 feet.

New construction in 1963 included the following:

1 headframe tower (51 x 41 x 176 ft. reinforced concrete).
1 sinking hoist and compressor building (100 x 36 x 24 ft., steel frame, metal clad).
1 service building (144 x 80 x 32 ft., concrete block).
1 ventilation and heating building (49 x 27 x 28 ft., concrete block).
1 portal entrance building (24 x 23 x 21 ft., reinforced concrete).

New equipment added was as follows:

1 filter tank (VFL-180, B.I.F. Industries (1961) Ltd.).
4 cyclones (Krebs model D10B, Technequip Co. Ltd.).
2 pinions for friction hoist (40 teeth, Canadian Ingersoll-Rand Co. Ltd.).
1 outdoor transformer (10,000 kva., Canadian General Electric Co. Ltd.).
1 compressor (31.5 x 19 x 14.5 in. with C.G.E. 600 hp. motor, Canadian Ingersoll-Rand Co. Ltd.).
1 slusher hoist (30 MNM-30, Canadian Ingersoll-Rand Co. Ltd.).
1 skip dump chute (complete with liner plates, Brayshaws Steel Limited).
1 sinking hoist (double-drum, 10 ft. x 78 in., John Bertram & Sons).
2 heaters (Olson direct-fired, model C-4000, 40,000 cfm., Rio Algom Mines Ltd.).
2 slusher hoists (CIR-30 MNM3F, Rio Algom Mines Ltd.).
1 sub-station, unit (1000-kva., Canadian General Electric Co. Ltd.).
2 fuel oil storage tanks (15,000 gal. underground, O'Connor Tanks Limited).
2 overhead travelling cranes (Morris 20-ton hand operated, Herbert Morris Crane & Hoist Co. Ltd.).
1 fan (L-type aerofoil, 48TWE, 48 in., Howard Engineering Co. Ltd.).
1 mobile gester (Wright Anderson 30 in., U & N Equipment Ltd.).
1 switchgear unit (5 kv. outdoor, Northern Electric Co. Ltd.).
1 travelling crane (50-ton electric overhead, John T. Hepburn Co. Ltd.).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

		1963	1962
ORE MILLED	dry tons	1,281,165	1,282,414
Calculated Grade: Copper	percent	1.88	1.81
Zinc	percent	5.72	4.68
Silver	oz. per ton	2.44	2.14
Gold	oz. per ton	trace	trace
COPPER CONCENTRATE PRODUCED	dry tons	87,449	82,058
Grade: Copper	percent	26.12	26.70
Silver	oz. per ton	25.96	24.33
Gold	oz. per ton	0.051	0.057
ZINC CONCENTRATE PRODUCED	dry tons	110,040	91,641
Grade: Zinc	percent	54.10	53.86
LEAD CONCENTRATE PRODUCED	dry tons	3,553	2,218
Grade: Lead	percent	44.19	44.27
Silver	oz. per ton	46.92	49.81
Copper	percent	3.24	3.35
REVENUE METALS CONTAINED IN ABOVE CONCENTRATES:			
Copper	lb.	45,905,359	43,968,322
Zinc	lb.	119,058,623	98,714,406
Lead	lb.	3,140,052	1,963,783
Silver	oz.	2,437,039	2,106,694
Gold	oz.	4,499	4,776

Copper concentrates continued to be shipped to the Noranda smelter. Zinc concentrates were shipped to six different destinations, including treatment plants in the United States, Europe Japan, and Valleyfield, Quebec. Shipment of lead concentrates continued to the smelter in the western United States.

Mining

Considerations of topography at the optimum location of the new No. 4 shaft dictated that it be developed from surface by means of a main adit from the valley bottom, and headworks on the hillside above. Excavation of the adit complex was completed early in the year. This shaft is a concrete-lined, circular opening, 21 feet 6 inches in finished diameter, to be equipped with steel sets and guides throughout.

Airways for both fresh air and return air ventilation were completed to the bottom level of the mine.

Stope preparation accounted for 77 percent of all heading advance in the mine for the year. This work was carried out on all levels and sub-levels east of the shaft from the 450 to the 2,050. Some stope preparation was also under way west of No. 1 shaft and west of the B block recovery section.

Ore production was again 91 percent from blast-hole mining and about 1.3 percent from cut-and-fill stoping. Stope preparation accounted for the remainder. The largest proportion of mill feed was from the C zone east of the shaft, but remnants were also recovered from the original A zone section, as well as from the B block.

During the year, 466,000 tons of backfill of all types were placed in the mine. Of this total, quarry rock accounted for 223,000 tons, and mill tailings sands for 187,000 tons.

Milling

The mill operated 95.32 percent of the possible time during the year and averaged 3,510 tons per day, as compared to 3,513 tons per day in 1962.

No serious problems were encountered anywhere in the crushing and milling operations. The capacity of the tailings sand recovery plant was doubled, and provided mine backfill on a continuous basis from September on.

Research into the application of various mill reagents continued. Economies in the use of liquid reagents became evident, and facilities for storage and metering of these liquids are undergoing installation. Automatic alkalinity control is also in operation.

Metal recoveries for the year averaged:

	Percent
Copper	95.07
Silver	77.93
Zinc	81.26

Ore Reserves

	Total Ore	Averages		
		Copper	Zinc	Silver
	tons	percent	percent	ounces
1963	22,858,000	2.06	4.62	2.25
1962	22,046,000	2.00	4.67	2.29

Grades and tonnages quoted include an allowance for dilution of 10 percent. The prices for metals used to evaluate for ore reserve purposes were:

		Canadian Funds
Copper	per lb.	$ 0.30
Zinc	per lb.	0.11
Silver	per oz.	1.00
Gold	per oz.	35.00

The average number of employees was 563: 205 underground and 358 on surface. J. A. Graham was mine manager.

The International Nickel Company of Canada Limited

The International Nickel Company of Canada Limited was incorporated in July 1916 under Dominion of Canada charter; in 1957 all issued preferred shares of stock were redeemed for cash, and all authorized but unissued preferred shares were cancelled; in April 1960, the authorized capitalization was increased to 36,000,000 shares of no par value, of which 29,488,462 shares have been issued.

The officers of the company in 1963 were as follows: H. S. Wingate, chairman and chief officer; J. R. Gordon, president; J. C. Parlee, vice-president; T. M. Gaetz, general manager (Ontario Division); W. A. McCadden, comptroller; W. F. Kennedy, secretary; F. M. A. Noblet, treasurer; J. A. Piggott, assistant general manager (Ontario Division); Alex Godfrey, G. A. Harcourt, and G. O. Machum, assistants to general manager (Ontario Division); J. McCreedy, manager of mines; R. R. Saddington, manager of reduction plants; W. R. Koth, manager (copper refining division, Sudbury); J. H. Tuck, manager (nickel refining division, Port Colborne); E. G. Stoneman, manager (iron ore recovery plant, Copper Cliff).

The executive office is at 67 Wall Street, New York 5, N.Y., U.S.A., and the general offices are at Copper Cliff. The Toronto office is at 55 Yonge Street, Toronto 1.

The company and its subsidiary companies operate: hydro-electric plants; nickel-copper mines in the Sudbury district; a smelter, refinery, and iron ore recovery plant at Copper Cliff; a refinery at Port Colborne. Operations outside the province include refineries at Acton, England, and Clydach, Wales; rolling mills at Birmingham, England; Huntington, West Virginia, U.S.A.; and Glasgow, Scotland; and a foundry at Bayonne, New Jersey, U.S.A. In 1961, the company's new nickel mining, smelting, and refining project at Thompson, Manitoba, was completed and brought into full operation, thereby increasing the nickel production capacity to 400,000,000 pounds per year.

SHAFTS, INTERNATIONAL NICKEL COMPANY'S MINES, SUDBURY AREA

	Inclination	Number of Compartments	Collar Depth	Sinking in 1963	Vertical Depth from Surface
			feet	feet	feet
CREAN HILL					
No. 1	57° to 305 ft. 71° to bottom	3	Surface	—	797
No. 2	Vertical	5	Surface	—	2,115
CREIGHTON					
No. 2	65°	2 (inactive)	Surface	—	314
No. 3	55°	5	Surface	—	1,946
No. 4	50°	5 (inactive)	1,477	—	2,702
No. 5	Vertical	6	Surface	—	4,074
No. 6	Vertical	5	3,822	—	5,562
No. 7	Vertical	3	Surface	—	2,056
No. 65 winze	65°	3 (inactive)	3,819	—	4,320
No. 8	Vertical	3	5,017	—	6,746
FROOD-STOBIE					
No. 1	77° to 1,300 ft. 61° to bottom	2 (inactive)	Surface	—	3,097
No. 3	Vertical	6	Surface	—	3,042
No. 4	Vertical	3 (active 2,783 to bottom)	Surface	—	3,928
No. 6	Vertical	4	2,782	—	3,391
No. 7	Vertical	5	Surface	—	3,105
No. 8	Vertical	3	Surface	—	2,624
GARSON					
No. 1	Vertical	3 (inactive)	Surface	—	1,457
No. 2	Vertical	5	Surface	—	4,242
No. 3	Vertical	2	4,000	—	5,126
LEVACK					
No. 1	65°	3 (inactive)	Surface	—	983
No. 2	Vertical	6 to 2,910 ft. 5 to 2,973 ft. 4 to bottom	Surface	—	3,915
No. 3	Vertical	3	1,594	—	3,716
MURRAY					
No. 1	36°	3 (inactive)	Surface	—	593
No. 1 winze	36°	1 (inactive)	470	—	775
No. 2	Vertical	5	Surface	—	3,298
No. 3	Vertical	2	2,994	459	3,889
VICTOR					
No. 1	Vertical	3	Surface	—	362
COPPER CLIFF NORTH					
No. 1	Vertical	5	Surface	2,029	4,134

CREIGHTON MINE

Operations continued throughout the year.

Development work consisted of 18,091 feet of drifting and crosscutting; 2,893 feet of raising. Total development footage to 31 December 1963 was as follows: 447,723 feet of drifts and crosscuts; 212,003 feet of raises. A total of 363 diamond-drillholes, totalling 118,821 feet, was completed in 1963 from underground.

New equipment included the following:

1 locomotive (8-ton, type 158-B-24-60F, Goodman Mfg. Co., Chicago).
2 locomotives (4-ton, type 75D-24-44B, Goodman Mfg. Co., Chicago).
3 batteries (66 D8 cells, Amalgamated Electric Corp. Toronto).
1 mobile gester (2 seater, U & N Equipment Ltd., Toronto).
1 rectifier (Powertronic silicon, 6900v, 3 phase 60 cycle, Canadian General Electric, Toronto).
3 turbine pumps (Mather and Platt, 180 U.S. gpm., Mine Equipment Co. Ltd., Montreal).
1 motor (100 hp., 3600 rpm., 3/60/550v, K455 US, Canadian General Electric, Toronto).
10 mine cars (110 cu. ft. Granby type, Dorr-Oliver-Long, Orillia).
1 diamond-drill (BBU with 6 in. BVRG vane motor, Boyles Bros. Drilling Co., Weston).

A total of 3,258,362 tons of ore, averaging 12,735 tons daily, was hoisted and shipped for treatment.

The average number of employees was 1,727: 1,355 underground, and 372 on surface. E. E. Mumford was superintendent.

FROOD-STOBIE MINE

Operations continued throughout the year.

Development work consisted of 13,418 feet of drifting and crosscutting; 7,136 feet of raising. Total development footage to 31 December 1963 was as follows: 533,024 feet of drifts and crosscuts; 211,588 feet of raises. Some 47 diamond-drillholes, totalling 4,690 feet, were drilled from underground in 1963.

New equipment added included an electric heavy-duty hoist (1½-ton capacity, Provincial Engineering Co. Ltd., Niagara Falls).

A total of 3,681,361 tons of ore at a daily average of 14,355 tons was hoisted and shipped for further treatment.

The average number of employees was 2,354: 1,813 underground and 541 on surface. S. J. Sheehan was superintendent.

GARSON MINE

Operations continued throughout the year.

Development work during the year consisted of: 7,014 feet of drifting and crosscutting; 2,416 feet of raising. Total development footage to 31 December 1963 was as follows: 228,899 feet of drifts and crosscuts; 100,251 feet of raises. Some 98 diamond-drillholes, totalling 34,751 feet, were drilled from underground.

New equipment added was as follows:

1 battery (66A 10 cells, The Electric Storage Battery Co. (Canada) Ltd., Toronto).
1 pump (Moyno ER 2610 type CSQ, 75US6PM, Robbins & Myers Co., Brantford).
1 hot water tank (12 ft. long, 5 ft. diam., 1295 gals., Ferro Metals Ltd., Toronto).

A total of 921,997 tons of ore, at a daily average of 3,609 tons, was hoisted and shipped for further treatment.

The average number of employees was 896: 730 underground, and 166 on surface. B. T. King was superintendent.

LEVACK MINE

Operations continued throughout the year.

Development work in 1963 consisted of: 696 feet of drifting and crosscutting; 1,441 feet of raising. Total development footage to 31 December 1963 was as follows: 252,358 feet of drifts and crosscuts; 81,401 feet of raises. Some 62 diamond-drillholes, totalling 48,179 feet, were drilled from underground in 1963.

New equipment consisted of a battery (66 D8 cells, Amalgamated Electric Corp. Ltd., Toronto).

A total of 1,372,694 tons of ore was hoisted and 1,409,135 tons was shipped at an average of 5,515 tons per working day.

The average number of employees was 1,634: 1,338 underground, and 296 on surface. V. H. Ritzel was superintendent.

MURRAY MINE

Operations continued throughout the year.

The vertical, two-compartment No. 3 winze, collared at 2,994 feet, was sunk 459 feet to a depth of 3,889 feet below surface. The 3,600- and 3,800-foot levels were established at depths of 630 and 830 feet, respectively, below the winze collar.

Development work in 1963 included: 213 feet of drifting and crosscutting; 59 feet of raising. Total development footage to 31 December 1963 was as follows: 171,779 feet of drifts and crosscuts; 38,761 feet of raises.

Added equipment included one skip (100 cu. ft. Kimberly, Dorr-Oliver-Long, Orillia).

A total of 848,912 tons of ore at a daily average of 3,342 tons, was hoisted and shipped for further treatment.

The average number of employees was 197: 122 underground, and 75 on surface. H. W. Smith was superintendent.

CLARABELLE OPEN PIT

Operations at the Clarabelle open pit, located between Copper Cliff and the Murray mine, continued throughout 1963.

New added equipment included the following:

2 rotary blast-hole drills (Bucyrus Erie 40 L, Ontario Equipment and Supply, Toronto).
1 pump (Milton Roy simplex, model 7GMD1-41-745, Consolidated Engines & Machinery Co. Ltd., New Toronto).
1 transformer (1500-kva. class H dry-type, Acme Electric Co. Ltd., Toronto).

Some 980 churn-drillholes totalling 47,525 feet, and 456 rotary-drillholes totalling 26,180 feet, were drilled for production purposes. A total of 2,022,644 tons of ore was mined and trucked to the rockhouse at an average of 7,948 tons daily during the year.

The average number of employees was 304: 140 in the pit, and 164 on surface. N. A. Creet was superintendent.

COLEMAN MINE

Falconbridge Nickel Mines Limited did 161 feet of drifting and crosscutting from the 2,500-foot level; 195 feet of drifting and crosscutting from the 2,750-foot level of the Strathcona mine for the Coleman mine of International Nickel. The operation progressed from 25 November to 31 December, and J. McCreedy, manager of mines for International Nickel was in charge.

COPPER CLIFF NORTH MINE

The sinking of the vertical, five-compartment, No. 1 shaft was commenced on contract, and 50 feet had been completed in 1960. The surface plant, commenced in 1961, was completed in 1962 and the shaft was sunk 2,055 feet; in 1963 it was sunk 2,029 feet to a depth of 4,134 feet below the collar. The shaft dimensions, inside the concrete lining, were 18 by 14.5 feet. The 2,200-, 2,400-, 2,600-, 2,800-, 3,000-, 3,200-, 3,400-, 3,600-, 3,800-, and 4,000-foot levels were established at depths of 2,204, 2,404, 2,603, 2,803, 3,002, 3,202, 3,401, 3,601, 3,800, and 4,000 feet respectively below the collar.

Total development footage consisted of: 327 feet of drifting and crosscutting, and 96 feet of raising. Total development footage to 31 December 1963 was as follows: 570 feet of drifts and crosscuts; 270 feet of raises. One diamond-drillhole, totalling 1,666 feet, was completed from underground.

The average number of employees by the shaft contractor, Dravo of Canada Limited, was 40: 24 underground, and 16 on surface. H. J. MacIsaac was general superintendent.

LAWSON QUARRY

The quarry is operated to supply quartzite rock used as a flux in Sudbury smelting operations. The quarry address is Willisville.

Some 93 churn-drillholes, totalling 6,650 feet, were drilled for quartzite production in 1963.

A total of 321,980 tons of quartzite was mined and delivered to the rockhouse; 319,680 tons were shipped at a daily average of 1,264 tons.

The average number of employees was 20. W. G. Tilston was superintendent.

CREIGHTON MILL CONCENTRATOR

The Creighton mill treated 3,043,433 tons of ore, averaging 9,058 tons per working day, to produce concentrates, which were pumped to the Copper Cliff smelter.

The average number of employees was 91. E. McMullen was superintendent.

COPPER CLIFF CONCENTRATOR

The Copper Cliff concentrator treated 7,020,853 tons of ore, averaging 19,235 tons daily, to produce concentrates.

New equipment installed included the following:

2 separators (Eriez wet drum Memco, Eriez of Canada Ltd., Downsview).
1 rectifier (silicon type 26OR, 15-kw., Northern Electric Co. Ltd., Toronto).
2 automatic samplers, (Hardinge Company Inc. Toronto).
2 separator drums (Eriez of Canada Ltd., Downsview).

J. Lee was superintendent.

LEVACK MILL

A total of 1,379,853 tons of ore was milled at an average of 4,466 tons per working day.

The average number of employees was 70. G. H. Morrison was superintendent.

CONISTON SMELTER

The Coniston smelter treated 299,735 tons of concentrate, averaging 821 tons per working day, and produced 24,382 tons of bessemer matte.

The average number of employees was 361. R. L. Snitch was superintendent.

COPPER CLIFF SMELTER

The smelter treated 374,765 tons of concentrate, averaging 1,027 tons per working day, and produced 141,865 tons of nickel matte, 19,859 tons of nickel oxide sinter, and 120,375 tons of converter copper.

New equipment installed was as follows:

1 strapping machine (model F7B5, Acme Steel Co. of Canada Ltd., Toronto).
5 scales (4 automatic E50, 1 Richardson duplex E50, Canadian Fairbanks Morse Co. Ltd., Toronto).
2 reducers (1 speed 171CT, 1 speed No. 107, Hamilton Gear & Machine Co. Ltd., Toronto).
5 samplers (2 Galigher 24-in., 3 Galigher 18-in., Canadian Locomotive Co. Ltd., Kingston).
2 conveyors (Roller Flight, Jervis B. Webb Co. Ltd., Hamilton).
1 unloading crane (Jervis B. Webb Co. Ltd., Hamilton).
1 conveyor, Redlar (Stephens Adamson Mfg. Co. Ltd., Belleville).
2 jacks (Hawk hydraulic, 50-ton, S-180 black, H. C. Burton Co. Ltd., Hamilton).

The average number of employees at the Copper Cliff concentrator and smelter was 4,619. J. N. Lilley, superintendent of smelters, was in charge.

IRON ORE RECOVERY PLANT

The iron ore recovery plant produced 504,242 gross tons of iron ore and 1,831 net tons of nickel oxide.

Major construction buildings commenced in 1961 and 1962 were completed in 1963.

Major equipment installed included the following:

1 scale (2 sections, 150-ton capacity, Gurney Scale Co. Limited, Hamilton).
1 gas booster (350 hp., 317 SS, The Spencer Turbine Co., Hartford Conn., U.S.A.).
2 fans (No. 66 CW-NED type ME, American Standard Products (Canada) Ltd.).
1 radial drilling machine (Asquith 32 in. type ASR, A. C. Wickman Ltd., Toronto).
1 indirect-heat rotary decomposer (40 ft. long x 54 in. diam., Bartlett Show Pacific Inc., Cleveland, U.S.A.).
1 feedwater heater plus 1 A.S. exchanger (103 sq. ft., Foster Wheeler Co. Ltd., St. Catharines).
1 pulverizer (Massco McCool, Williams and Wilson Ltd., Toronto).
1 utility hoist (K4UL, Canadian Ingersoll-Rand Co. Ltd., Montreal).
2 pumps (Goulds, size 6 x 12.16, MLW Services Ltd., Montreal).
22 pumps (18 Wilfley, 4 in. model 4K16, 4 Wilfley, 6 in. model 6K18, Canadian Vickers Ltd., Montreal).
1 pump (3 x 3 type SRL-V, Canadian Allis-Chalmers Ltd., Montreal).
2 pumps (Hazleton model 16 in. B 3,000 U.S. gpm., Hydro Dynamics Limited, Montreal).
1 turbine generator condensing plant plus auxiliaries (Canadian General Electric Ltd., Toronto).
6 thickener tanks (2—26 ft. O.D. x 12 ft.; 1—25 ft. O.D. x 10 ft.; 2—35 ft. O.D. x 12 ft.; 1—45 ft. O.D. x 20 ft. high, Proctor Limited, Toronto).
3 roto clones (1 size 2½ type N; 1 size 4 type N; 1 size 8 type H, American Air Filter of Canada, Montreal).
3 industrial exhausters (1 size 11 MH; 1 size 13 MH; 1 size 19 MH, American Air Filter of Canada, Montreal).
2 belt conveyors (8 centres 36 in. hor., troughed 32 ft. long, Stephen Adamson Mfg. Co. Ltd., Belleville).
4 cyclones (type 430, 48 in. I.D. x 16.75 ft. long, Plate & Structural Steel Ltd., Toronto).
1 lathe (Dean Smith 20 x 120 in., A. C. Wickman Ltd., Toronto).
16 fans (14—42 in. type 74; 2—30 in. type 74, Sheldon Engineering Ltd., Galt).
1 punching machine (single and Pedd model 225, Upton, Bradeen & James, Toronto).
5 samplers (2 Galigher 30 in.; 2 Galigher 18 in.; 1 Galigher 36 in., Canadian Locomotive Company, Kingston).
2 pump control-panels (Farval; Peacock Bros. Ltd.).
2 breakers (type 50 HS, 3 pile 600-v, Railway & Power Engineering Ltd., Toronto).
1 fork lift truck (automatic electric driven, propane powered, H. C. Burton Co. Ltd., Hamilton).
1 scrub brush (Clarke-A-Matic PS-20-BP, G. H. Woods & Co. Ltd., Toronto).
1 floor polisher (model G-15, Taylor-Atlas Products, Downsview).
1 marine engine (40 hp., Industrial Materials Supply Co., Montreal).
1 work boat (Rockiron Co. Ltd., Sudbury).
1 bucket elevator (Rex Chainbelt (Canada) Ltd., Willowdale).

1 vacuum cleaning unit (portable, No. 75 Hoffman Industries of Canada, Toronto).
1 belt feeder (United Steel Corp. Ltd., Toronto).
2 wing door heaters (size 38HV 735,000 btu, Michael Stuart Co. Ltd., Toronto).
1 superheater (separately fired, Babcock-Wilcox Goldie & McCulloch, Toronto).
4 chain hoists (2—8 ton; 2—16 ton, Provincial Engineering Ltd., Niagara Falls).
2 motors (1—100 hp. 1,800 rpm.; 1—125 hp. 3,600 rpm., Canadian General Electric, Toronto).
2 controllers (300 hp. BOL 6017T-601-DRA-NNW, Railway & Power Engineering, Toronto).
1 motor (75 hp. 1800/3/60/550 KG 445 US, Canadian General Electric, Toronto).
2 motors (100 hp. 1200/3/60/550 FR644E, Canadian Iron Foundries Ltd., Montreal).
6 refrigerators (4 type A; 2 type B, Acme Refrigeration, Sudbury).

The average number of employees was 732. E. G. Stoneman was manager.

COPPER CLIFF REFINERY

The Copper Cliff refinery produces copper cathodes and shapes, nickel sulphate, gold, silver, tellurium, selenium, and semi-refined platinum metals.

A total of 120,345 tons of converter copper and 593 tons of scrap and secondary copper was refined at an average of 331 tons per working day, to produce 116,706 tons of refined copper. No. 1 furnace was in operation for 232 days, No. 2 furnace for 287 days.

New equipment added included:

2 scales (Printomatic 20 tons, serial Nos. E41361, E41362, Robt. Morse Mfg. Co., Toronto).
1 portable steel dump for vertical cast wire bars (made by copper refining division).
38 deposition tanks (made by copper refining division).
1 cast lead evaporator (made by copper refining division).

The average number of employees was 729. W. R. Koth was manager.

PORT COLBORNE REFINERY

The Port Colborne refinery produces nickel metal and cobalt metal.

The average number of employees was 1,473. J. H. Tuck was manager.

The following is taken from the company annual report for the year ending 31 December 1963:

Total ore production from Ontario and Manitoba mines during 1963 amounted to 13,566,000 short tons. This compares with 13,794,000 short tons in 1962.

The mines and plants in Ontario operated during 1963 at the lower level adopted in October 1962. A lowering of electrolytic nickel production in October 1963, consistent with decreased demand for this form of nickel, resulted in a work force reduction at the Port Colborne refinery. However, due to increased demand for nickel in other forms equally suitable for direct use in industry, the level of over-all production remained unchanged.

In February 1964, the level of operations at the mines and plants in Ontario was raised. This action resulted in an increase of 1,850 men in the work force at the mines and plants in the Sudbury District and at the Port Colborne refinery; and it will bring about an increase in the supplies of copper and platinum-group metals as well as of nickel.

At the Clarabelle open-pit mine the acquisition of two rotary drills to replace churn drills has resulted in an appreciable reduction in drilling costs. At the Copper Cliff North mine, the sinking of the No. 1 shaft was completed to its planned depth of 4,134 feet, and development of this mine for future production is proceeding. Development was continued at the Creighton, Garson, and Murray mines to provide access to lower horizons preparatory to deep level exploration.

The wide use of cemented sand fill throughout the underground mines resulted in substantial economies in timber requirements, decreased dilution of ore, and greater flexibility of mining methods. Coupled with special mining techniques, it has permitted mining by the cut-and-fill method to much greater depths than heretofore.

Ore Reserves

The proven ore reserves of the Sudbury district and Manitoba mines stood at 301,620,000 short tons at 31 December 1963, with a nickel-copper content of 9,093,500 short tons. At the end of 1962, the proven ore reserves stood at 299,416,000 short tons, with a nickel-copper content of 9,006,300 short tons.

Plant and Process Improvements

The extension to the iron ore recovery plant at Copper Cliff was completed during the year. Four new roaster-kiln units were installed and the expanded leaching, recovery and pelletizing facilities were completed. With increased amounts of pyrrhotite by-passing the Copper Cliff smelter for direct conversion to iron ore, the company achieved the significant economy of being able to reduce nickel reverberatory operations from five to four furnaces, with no decrease in over-all nickel production. Additional equipment was installed by Canadian Industries Limited, permitting the doubling of its output of sulphuric acid produced from iron ore recovery plant roaster gas.

At the Creighton mill, experimental work on improved nickel recovery continued throughout 1963. Work was started at the Levack mill on pyrrhotite concentration facilities to provide additional feed for the iron ore recovery plant. At the Copper Cliff mill, the improvements to the flotation section, and the provisions for increased pyrrhotite recovery, were completed.

At all of the nickel refineries, as well as at the copper refinery, investigations were carried forward leading to increased process efficiency and product improvement.

The company continued to operate its two research stations at Port Colborne. In one, research was advanced in the treatment of intermediate products to provide refined nickel and associated refined by-product metals in anticipation of the metallurgical needs of the future. The second station continued research on the treatment of nickel ores.

As a part of its continuing research activities, designed to develop specialized nickel products for particular applications, the company was successful during the year in producing and introducing on a commercial basis three new or improved nickel products. One is a special grade of sulphur containing electrolytic nickel, marketed as "SD" nickel in North America and "S" nickel in Europe, for which the demand has been increasingly strong in the electroplating industry. Another is a new high-purity carbonyl nickel powder for use in the field of powder metallurgy. The third is an improved soluble nickel oxide, which has found a ready market in the chemical, ceramic, and electronic industries for use in the production of nickel chemicals, catalysts, enameling frits, and ferrites.

Kam-Kotia Porcupine Mines Limited

Kam-Kotia Porcupine Mines Limited was incorporated in August 1932, with an authorized capitalization of 4,000,000 shares of no par value, of which 800,000 shares have been issued. The directors and officers were: A. W. White, president and director; E. D. Scott, vice-president and director; D. F. Burt and A. W. McDonald, directors, H. R. Heard, secretary-treasurer. The head office is at Suite 416, 25 Adelaide Street West, Toronto 1. The mine address is P.O. Box 290, Timmins.

The property consists of ten claims located in Robb township, Porcupine area, District of Cochrane, about 12 miles northwest of Timmins.

Open-pit mining and milling continued throughout 1963.

The vertical, four-compartment No. 1 shaft collared on claim P.12341, was sunk 822 feet in 1963, to a depth of 864 feet below the collar. The 9,900-, 9,750-, 9,600-, 9,400-, and 9,250-foot levels were established at 150, 300, 450, and 800 feet, respectively, below the collar. Diamond-drilling consisted of 34 surface holes, totalling 11,567 feet.

Major equipment installed was as follows:

1 filter (Dorr-Oliver-Long, 60-in., disc-type) in mill.
1 thickener (Denver 22-ft. diameter) in mill.
20 flotation cells (Wemco, 66-in.) in mill.
10 flotation cells (Denver 24, sub A) in mill.
1 rod mill (Allis-Chalmers 9.5 x 12 ft. with 500 hp. motor) in mill.
1 conditioner tank (Denver 8 x 12 ft.) in mill.
1 transformer (General Electric, 3,000-kva, 27,600–2,300 v.) in sub station.
1 pump (950 gpm. at 280 ft. head, 100 hp.) in main pumping station.
1 conveyor (90 ft. long, 24 in. wide) at crushing plant.
1 mine hoist (Nordberg, single-drum, 10 ft. diam., 6,000 hp. motor) in hoistroom.
1 dump truck (Ford 35,000 G.V.W. gasoline powered) on surface.
1 truck (Ford, 20,000 G.V.W. gasoline powered) on surface.

New construction in 1963 included the following:

1 oil house (10 x 12 ft., concrete block).
1 power house extension (24 x 24 ft., concrete block).
1 mine air heating plant (20 x 24 ft., concrete block).
1 surface dry and carpenter shop (100 x 30 ft., prefabricated steel, Butler type).
1 mill building (40 x 70 ft., steel frame, plywood and aluminum sheathing).
1 hoist house (50 x 120 ft., concrete block and steel).
1 headframe, shaft house, and bin house (130 x 40 x 160 ft., steel frame, plywood and and aluminum sheathing).

The following is taken from the company annual report for the year ending 31 December 1963:

Milling was carried out continuously throughout the year except for a planned shutdown of five days in October, to revise the grinding circuit to effect an increase of about 50 percent in milling capacity. Revisions to the balance of the mill, plus installations of additional equipment including a zinc circuit were made with only minor down-time during the year. Mill operating time was 93.93 percent of total available time.

Production

Milled	tons	400,091
Average milled per calendar day	tons	1,096.1
Average milled per net operating day	tons	1,167.0
Average mill-head grade copper	percent	2.00
Average mill-head grade zinc	percent	0.86
Copper concentrate produced	dry tons	34,035.3
Average grade of copper concentrates	percent	19.90
Returnable copper produced	lb.	12,868,499
Average copper recovery in milling	percent	84.7
Smelter settlements outstanding—as at 31 December 1963—returnable copper	lb.	3,976,471.5

Mill heads ranged between 1.5 percent and 2.5 copper with minor tonnages of lower and higher grade material being treated. Recoveries ranged between 76 percent and 92.4 percent.

A small tonnage of zinc concentrates was produced in November and purchased by British Metal Corporation under contract. This shipment amounted to 44.5 tons grading 51.6 percent zinc.

A total of 8,509.7 ounces of silver was also produced and paid for in the copper concentrates.

Grinding steel consumption (balls and rods)—3.50 pounds per ton milled.

Reagent consumption was as follows:

	Pounds per Ton Milled
Soda ash	0.41
Hydrated lime	3.89
Amyl xanthate	0.58
Sodium cyanide	0.027
Dow froth	0.023
Zinc sulphate	0.013

Operating Costs, 1963

	Per Ton Milled	
Smelting, refining, assaying, and representation	$2.076	
Trucking and rail freight	0.410	$2.486
Mining	1.203	
Milling	1.401	
Administration and general expense	0.632	$3.236
		$5.722

Above costs do not include bank or debenture interest or provincial mining taxes.

Mining costs shown include the cost of mining, hauling, and stockpiling the following tonnages, additional to the tonnage mined for milling:

	Tons
Ore stockpiled	105,264
Waste rock	368,487
Total tonnage	473,751

Ore Reserves

Ore reserves as of 1 January 1964, adjusted for tonnage mined and additional information gained during the year, are shown here:

Source	Copper Ore	Average Copper Content
	tons	percent
Open-pit ore plus high-grade stockpile	125,168	1.557
B zone	1,170,528	2.174
C zone	406,495	1.986
M-60 zone	146,584	1.197
North zone	90,983	1.548
Low-grade sulphide ore[1]	250,792	0.772
Low-grade greenstone ore[2]	269,200	0.808
Total	2,459,750	1.733

[1]Low-grade sulphide ore has been mined and is stockpiled. A small tonnage may be milled in the future.
[2]Low-grade greenstone ore, mined in 1964 and partially milled in 1964, will supplement underground production until the mine can supply total mill feed.

Despite the milling of 400,091 tons, grading 2.00 percent copper in 1963, ore reserves were slightly increased during the year. A dilution factor of 5 percent has been used in computing tonnage and grades.

Source	Zinc Ore	Average Zinc Content
	tons	percent
Zinc ore stockpiled	17,700	3.11
Tonnage in A zone (outside open-pit limits)	387,275	4.283
B zone (included in copper tonnage)	286,199	2.88
C zone (included in copper tonnage)	406,495	1.710
Total	1,097,669	2.944

Of this total, the B and C zones are included in copper ore reserve tonnage at copper grades shown.

The A zone zinc tonnage contains some copper, but, an average copper grade cannot be set due to insufficient data. Available copper assays from drill cores in this zone suggest a copper grade of from 0.50 to 0.70 percent copper.

The average number of employees was 127: 25 in the open pit, and 102 on surface. G. W. Walkey was mine manager.

Lun-Echo Gold Mines Limited

Lun-Echo Gold Mines Limited was incorporated in May 1950 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 4,750,000 shares have been issued. The directors and officers were, J. G. Boeckh, president and director; P. K. Hanley, vice-president and director; S. J. Bird, J. C. L. Allen, and R. C. Stanley, directors; Miss B. A. Argo, secretary. The company is controlled by the Little Long Lac organization through Consolidated Mosher Mines Limited. The head office is at 112 King Street West, Toronto 1. The mine address is Manitouwadge.

The property, consisting of fifty claims in Mapledoram township, Manitouwadge area, District of Thunder Bay, is about three miles north of the Willroy mine. In 1963 the company optioned the property to Willroy Mines Limited, who started a development program on the base metal prospect.

A vertical, three-compartment shaft was collared on claim TB.47378, and was sunk 243 feet below the collar in 1963. Some 41 diamond-drillholes, totalling 29,207 feet, were completed from surface.

New construction consisted of a headframe, 112 feet high to the sheave timbers, and a Butler type building (144 x 36 feet), for use as office, change house, warehouse, hoistroom, and compressor room. A 3-mile road was built from the Willroy mine to the Lun-Echo shaft site.

Major equipment installed included a hoist (Canadian Ingersoll-Rand PE-1, 72 x 54 in., 1,300 fpm.), and a compressor (CIR XVHE 2, 23 x 14.5 x 12 in., 1,500 cfm.).

R. S. Haflidson, general manager of Willroy was in charge; V. Wilson was mine superintendent. The labour force was also supplied by Willroy Mines Limited.

Metal Mines Limited (Gordon Lake Division)

Eastern Mining and Smelting Corporation Limited was incorporated in December 1955 on amalgamation of Eastern Smelting and Refining Company Limited and Quebec Nickel Corporation Limited; the name was later changed to Nickel Mining and Smelting Corporation; in December 1963 the name was again changed to Metal Mines Limited to include Faraday Uranium Mines Limited and Nickel Mining and Smelting Corporation. The authorized capitalization is 8,500,000 shares of $1 par value, of which 7,215,700 shares have been issued. The directors and officers were: A. W. Johnston, president and director; H. B. Hicks, vice-president, general manager, and director; Wm. McKee, secretary and director; W. C. Campbell, Eliot Janeway, L. E. Wetmore, and A. B. Whitelaw, directors; W. M. O'Shaughnessy, treasurer and assistant secretary. The head office is at Suite 914, 1155 Dorchester Blvd. West, Montreal 2, Quebec. The executive office is at Suite 1600, 100 Adelaide Street West, Toronto 1. The mine address of Metal Mines Limited, Bancroft Division (formerly Faraday Uranium Mines Limited) is R.R. No. 3, Bancroft; the information is given in the uranium section of this report. The mine address of Metal Mines Limited, Gordon Lake Division (formerly Nickel Mining and Smelting Corporation) is Box 700, Lac du Bonnet, Manitoba.

The Gordon Lake Division property comprises 128 claims in the Werner Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1963.

SHAFTS, GORDON LAKE DIVISION MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1	K.R.L.19096	Vertical	3	Surface	360
No. 2	K.R.L.31831	Vertical	3	Surface	1,817
No. 3	——	Vertical	2	1,204	1,687

Development footage in 1963 consisted of: 657 feet of drifting; 354 feet of crosscutting; and 3,673 feet of raising. Total footage to 31 December 1963 was as follows: 19,400 feet of drifts: 9,658 feet of crosscuts; 10,308 feet of raises. Diamond-

drilling in 1963 consisted of 244 holes, totalling 15,539 feet from underground and 8 holes, totalling 2,538 feet, from surface.

Construction in 1963 included a new pumphouse.

Major equipment added was as follows:

MILL:

8 flotation cells (Denver No. 24, Denver Equipment Company).
1 supercharger (Denver Equipment Company).
1 flotation machine (8 cells, Denver Equipment Company).
1 pump (Sherman, 1-B-10-5, 20 hp. motor, Faraday).
1 Dorrclone (Type FR-12 in., Faraday).
1 magnetic separator (type XW 4, 30 x 18 in., J. F. Comer Ltd.).

SURFACE:

1 resuscitator (dual cylinders, Safety Supply Co.).
8 house trailers (47 x 10 ft., Nelson Machinery Ltd.).
1 station wagon (Ford, 1964 Meteor).
1 water tank (wood stave, 16 x 16.9 ft., Pacific Coast Pipe Co. Ltd.).

UNDERGROUND:

2 pumps (1—40 hp., 1 size 3, Canadian Ingersoll-Rand).
8 mine cars (40 c.f. side dump, Nelson Machinery Ltd.).
2 slushers (Pikrose Rotair, size 1, Peacock Bros. Ltd.).
4 drills (Silver 33, Holman Bros. Ltd.)
1 scraper (Pacific model 3B, 42 in., Nelson Machinery Ltd.).
1 slusher (Sala electric, 2 drums, Rio Algom Mines Ltd.).
35 miners lamps (Wheat, National Mine Service).
10 anoloders (Canadian Industries Ltd.).
2 exploders (Beethoven, Canadian Industries Ltd.).
1 scraper (Pacific 3 D, 48 in., Lecky Machinery Ltd.).
1 slusher (Sala, 3-drum, used, D-2-47-SL, 25 hp., Preston Mines).
1 electric peak-load controller (Sangamo Co. Ltd.).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

Metal production totalled 2,753,459 pounds of nickel, 1,216,015 pounds of copper, 754 ounces of platinum, and 5,042 ounces of palladium. All concentrates are sold under contract to The International Nickel Company of Canada Limited, and are delivered to its plant near Sudbury.

Milling

Mill operation was, in general, satisfactory. Some difficulty was experienced in the early part of the year in achieving satisfactory metal recoveries, but this has now been overcome, and recoveries of both nickel and copper are exceeding preproduction estimates.

The following table summarizes results:

Milled	tons	136,970
Milled per day	tons	375
HEADS: Nickel	percent	1.37
Copper	percent	0.56
CONCENTRATES: Nickel	percent	10.80
Copper	percent	4.78
TAILS: Nickel	percent	0.26
Copper	percent	0.06
RECOVERY: Nickel	percent	82.8
Copper	percent	90.0

Development

There was virtually no exploratory development work carried out. However, a fairly heavy program was required to complete development of the various orebodies for mining, and, toward the end of the year, in establishing a new ore-pass system.

Ore Reserves

Ore reserves as at 31 December 1963 were as follows:

	Ore	Nickel	Copper
	tons	percent	percent
Proven	439,112	1.39	0.52
Probable	728,549	1.56	0.58
Indicated	64,212	1.76	0.60
Total Reserve	1,231,873	1.51	0.56

Some minor additions were made to ore reserves in the course of stope preparation. The lack of exploratory development, however, precluded any significant increases. Experience has shown that a dilution factor higher than that used in the past should be applied to the ore reserves: thus, the figures above show a higher tonnage but correspondingly lower grade than those published in the past.

Costs

Due to the fact that many underground working places were in the course of preparation for mining during the year and that tonnage milled was considerably below capacity, operating costs are not typical. Marked improvement is anticipated. A breakdown of the past year's figures follows:

Operating Costs, 1963

	Per Ton Milled
Development	$ 1.47
Mining	7.45
Milling	2.43
Marketing	1.58
Total	$12.93

The average number of employees was 139: 84 underground, and 55 on surface. G. R. Hjorleifson was mine manager.

North Coldstream Mines Limited

Coldstream Copper Mines Limited was incorporated in November 1951; in April 1955 the number of shares was increased to 6,000,000, and in April 1957, to 7,000,000; and in November 1957, to 8,000,000. In August 1959, the name was changed to North Coldstream Mines Limited on a one-for-four-share basis; the authorized capitalization is 5,000,000 shares of no par value, of which 4,438,696 shares had been issued. The directors and officers were: W. S. Row, president and director; K. C. Gray, vice-president and director; E. T. Donaldson, L. J. Moreaux, R. V. Porritt, and N. C. Urquhart, directors; R. D. Stewart, secretary; B. C. Bone, treasurer. The head office is at Suite 1600, 44 King Street West, Toronto. The mine address is Burchell Lake.

The property, comprising 106 claims, includes the old Tip Top mine. It is located in the area east of Moss township and south of Ames township, District of Thunder Bay, about 90 miles west of Fort William, and about 8½ miles by road south of Kashabowie Station on the Canadian National railway.

Mining and milling operations continued throughout 1963.

Development footage in 1963 consisted of: 1,298 feet of drifting, 990 feet of crosscutting, and 1,980 feet of raising. Total development footage to 31 December 1963 was as follows: 16,432 feet of drifts, 9,825 feet of crosscuts; 15,467 feet of raises. Diamond-drilling in 1963 consisted of 69 holes totalling 13,733 feet from underground, and 10 holes totalling 3,851 feet from surface.

SHAFTS, NORTH COLDSTREAM MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1	K.65	80°	2 (inactive)	200
No. 2	K.65	Vertical	1 (inactive)	50
No. 3	K.65	Vertical	1 (inactive)	20
No. 4	K.65	Vertical	3	1,596

New equipment added included a loader (Gardner Denver LM 56), and a locomotive (Atlas type Q).

The following is taken from the company annual report for the year ending 31 December 1963:

Summary of Production

	1963	1962
Milled ..... tons	367,677	364,348
Average milled daily ..... tons	1,007	998
Average grade, copper ..... percent	2.01	2.01
Copper recovery ..... percent	95.18	94.89
Operating time ..... percent	92.31	91.71
CONCENTRATE GRADE:		
Copper ..... percent	26.62	27.82
Gold ..... oz. per ton	0.134	0.127
Silver ..... oz. per ton	2.30	2.65
Concentrate shipped ..... tons	26,430.33	24,872.39
CONTENT OF CONCENTRATE:		
Copper ..... lb.	14,109,735	13,835,131
Gold ..... oz.	3,607.41	3,137.28
Silver ..... oz.	58,898	63,628

Development and Mining

Development and stope preparation carried out during 1963 consisted of 2,295 feet of drifts and crosscuts, 2,947 feet of raises and boxholes, 1,357 feet of sub-drifting, and 70,920 cubic feet of slashing. During the latter part of the year the development was begun of the ore purchased from the Shield Development Company Limited. Production from this area will commence early in 1964.

Ore broken in development, stope preparation, and stoping totalled 342,370 tons, and 368,050 tons of ore were trammed. About 46 percent of the ore broken was by blast-hole stoping, 50 percent by shrinkage stoping, and the remainder by development and stope preparation.

Exploration

The exploration drift to the west on the 950-foot level was driven to a point about 1,200 feet west of the shaft. At this point it entered the main rhyolites, which are not known to contain ore. Diamond-drilling from this drift did not intersect any ore or chert. Chert is the host rock for most of the known ore in this area.

On the 1,400-foot level the drilling below the level east of the shaft did not disclose anything of economic significance. A drift is now being driven on this level to permit exploration west of the shaft. At the year's end this drift had reached a point 500 feet west of the shaft. Diamond-drilling to the south and below the level from this point failed to intersect ore or chert. The drift will be extended a further 300 feet to the west to permit additional diamond-drilling.

The surface exploration program consisting of scouting, property examination, and geophysical reconnaissance in the local area was expanded. Five areas were examined, including one optioned property that was later dropped. Fifty-one claims were staked in geologically favourable areas, 21.5 miles of line cutting and 40 line miles of geophysical surveying were carried out. One strong anomalous area was outlined, and diamond-drilling of this conductor was started in the latter part of the year. Nothing of economic interest has been intersected to date.

Ore Reserves

Ore reserves at 31 December 1963, after allowing for dilution, and including ore purchased from Shield, were estimated to be 1,028,000 tons, having an average grade of 2.17 percent copper.

The average number of employees was 196: 93 underground, and 103 on surface. G. H. Montgomery was manager.

Rio Algom Mines Limited (Pronto Division, Pater Mine)

In June 1960, Pronto Uranium Mines Limited, which comprised the Pater mine, was amalgamated under the name of Rio Algom Mines Limited. Further details are given in the Uranium section of this report under Rio Algom Mine Limited.

PATER MINE

The company's main property consists of 22 claims, and 10 lots known as the McFadden Option, in Spragge township, District of Algoma. The mine address is Algoma Mills. The No. 1 vertical shaft, located on the southeast quarter of section 29, Spragge township, was sunk a further 676 feet in 1963 to a total depth of 3,005 feet below the collar. There are three compartments from the collar to a depth of 1,024 feet, and four compartments from this point to the bottom. The 13, 14, 15, and 16 levels were established at depths of 2,308, 2,508, 2,708, and 2,908 feet, respectively, below the collar.

Development work in 1963 consisted of: 3,132 feet of drifting, 1,173 feet of crosscutting, and 4,155 feet of raising. Total development footage to 31 December 1963 was as follows: 22,299 feet of drifts; 4,362 feet of crosscuts; 27,500 feet of raises. Diamond-drilling in 1963 consisted of 44 holes, totalling 6,929 feet, from underground, and seven holes from surface totalling 4,591 feet.

New construction included a core shack (14 x 30 ft., frame and corrugated sheet) and a pump house (12 x 20 ft., frame). Added equipment comprised two flotation cells.

The following, pertaining to the Pater operation, was taken from the Rio Algom annual report for the year ending 31 December 1963:

The operating results for the year were considerably better than forecast due to better grade experience in the mine. Mill heads averaged 1.96 percent copper, or 15 percent higher than projected for the year. Operating costs were as expected, and copper prices remained steady.

Production

The mill treated 258,499 tons for the year, and concentrates produced had a copper content of 9,708,367 pounds, an increase of 18 percent over the previous year. Concentrate is loaded on rail cars on the mine property and shipped to the International Nickel Company smelter at Copper Cliff, Ontario, under contract with metal merchants.

Ore Reserves

Shaft sinking was in progress for most of the year, and during this time no depth information on the orebody was obtained. Hence, the reserves shown are the estimate of 12 months ago less the ore milled during the year. Ore reserves as at 31 December 1963, stood as follows:

	Total	Copper
	tons	percent
Proven ore	279,782	2.14
Probable ore as disclosed by underground development	nil	nil
Probable ore as disclosed by diamond-drilling	483,920	2.05

After allowing 15 percent increase for dilution at 0.25 percent copper, the proven and probable reserves become 878,257 tons grading 1.86 percent copper, between the 6th and 16th levels.

Depth drilling has begun, and ore has been intersected 700 feet below the 16th level. However, the program has not advanced sufficiently to add any further tonnage to the reserves.

In addition to development of the known ore zone, a program was carried out that included detailed geological study, lateral work, and surface and underground diamond-drilling in the vicinity. Results were negative, and the existence of a second orebody within reach of the present underground facilities is now considered unlikely. However, the work revealed, in shallow diamond-drilling, copper mineralization on the company's property some two miles west of the main ore zone. It is proposed to investigate this further.

Mining

The tendency of the orebody to thicken and shorten with depth led to greater stoping widths. These averaged 11.2 feet, compared to 8.6 feet the previous year. This lessened the ratio of dilution, which was further decreased by the practice adopted of using raises for ore passes rather than completed stopes.

The usage of ammonium nitrate explosive was increased to 90 percent of total requirements.

Milling

A minor plant addition of two flotation cells resulted in an improvement in both recovery and concentrate grades. Recovery is now 96.2 percent and concentrate averages 27.1 percent copper.

Summary

The mine continued to improve on its commendable safety record, low figures for frequency and severity of injuries being maintained in 1963. The mine was recently awarded the C. S. Gibson Safety Trophy for the best record of mines in the area.

Plans for deepening of the mine and further operational improvements await results of current drilling work. Hydraulic fill will be used for efficient extraction of the orebody at depth, and the use of pebble grinding is expected to lower mill costs.

The average number of employees was 159: 102 underground, and 57 on surface. R. D. Lord was general manager, P. E. Young was mine manager.

St. Lucie Exploration Company Limited

St. Lucie Exploration Company Limited was incorporated in July 1962 with an authorized capitalization of 3,000,000 shares of $1 par value; 1,000,007 shares have been issued. The directors and officers were: J. P. Sheridan, president and director; Maxwell Juby and Miss Judith Bruce, directors; G. H. Duff, secretary. The head office is at 121 Richmond Street West, Toronto 1. The mine address is Elk Lake.

The St. Lucie syndicate took a three-year lease on the Ethel Copper property consisting of twelve claims located in James and Tudhope townships, District of Timiskaming, near Elk Lake. The syndicate in turn assigned the lease to St. Lucie Exploration Company Limited.

An inclined adit in claim No. 10316 had been driven at —20 degrees for a length of about 350 feet. A 25-foot crosscut had been driven south from the bottom of the adit, to intersect the vein, from which drifts were driven east and west. Some 500 feet of drifting and 25 feet of crosscutting had been completed on the 125-foot level when operations were suspended.

Mining and milling operations proceeded from 1 to 10 January 1963.

A total of 237 tons of ore was mined and hoisted from the bottom of the inclined adit; 437 tons was milled and about 1,000 tons of broken copper ore was reported remaining. A fire in January destroyed the compressor, and operations were stopped for the remainder of the year.

John Lill was manager, and twenty men were employed during the period of operation.

Sherbrooke Metallurgical Company Limited

Sherbrooke Metallurgical Company Limited was incorporated in May 1959, with an authorized capitalization of 200,000 shares of no par value, all of which have been issued. The officers were: H. D. Carus, president; C. R. MacBrayne, vice-president; L. C. Pejeau, secretary-treasurer; R. K. Thoman, assistant treasurer and assistant secretary; Laura E. Hughett, assistant secretary. The head office and plant are at Port Maitland, P.O. Box 220, Dunnville.

Roasting of zinc sulphide concentrates by the pelletized fluid hearth process continued throughout 1963; the amount treated was increased by about 12 percent over 1962. Calcined pellets are shipped and processed at the Meadowbrook smelter of Matthiessen and Hegeler Zinc Company, the parent company at La Salle, Illinois, U.S.A.

A new dust collecting system consisting of a Dustkop dust collector (model 90N70) with motor was installed in the pellet plant. Ore pads for concentrate storage were replaced and completed over the marshy ground. Steady progress was achieved in eliminating idiosyncrasies within the plant, and results generally have been encouraging.

Sulphur dioxide gas from the roasters is converted to sulphuric acid in the acid plant.

A total of 61,664.94 tons of zinc sulphide concentrate was treated, at a daily average of 168.9 tons, to produce 96,408,540 pounds of zinc oxide (calcine) in 1963.

The average number of employees was 65: R. K. Thoman was works manager.

The Shield Development Company Limited

The Shield Development Company Limited was incorporated in March 1926, with an authorized capitalization of 5,000,000 shares of no par value, of which 3,296,081 shares have been issued. The directors and officers were: W. S. Row, president and director; K. C. Gray, vice-president and director; R. V. Porritt, N. C. Urquhart, and Hon. Alistair Fraser, directors; C. H. Windeler, secretary; E. K. Cork, treasurer; J. O. Hinds, assistant secretary. The head office is at Suite 1700, 44 King Street West, Toronto 1. The mine address is Burchell Lake.

The property comprises a 2,631 acre copper prospect east of Moss and south of Ames townships, in the Kashabowie area, District of Thunder Bay. A part of the property, about 300 acres, is completely surrounded by the North Coldstream mine.

The exploration program was continued in 1963 from the 800-, 1,100-, and 1,400-foot levels of the North Coldstream mine; it was carried out by employees of that company.

A total of 967 feet of drifting, 286 feet of crosscutting, and 67 feet of raising was completed. Total development footage to 31 December 1963 was as follows: 4,040 feet of drifts; 1,313 feet of crosscuts; 88 feet of raises. Some 62 diamond-drillholes, totalling 24,494 feet, were completed in 1963 from underground.

G. H. Montgomery was manager.

Temagami Mining Company Limited

Temagami Mining Company Limited was incorporated in August 1954; it was an amalgamation of Temagami Mining Company and Derosier Nickel and Copper Mines. The authorized capitalization is 5,000,000 shares of $1 par value; 2,992,267 shares have been issued. The directors and officers were: N. B. Keevil, president and director; Hon. D. R. Michener, W. H. Keith, C. G. MacIntosh, and J. C. Perry, directors; J. L. C. Jenner, secretary; D. S. Brown, treasurer; R. A. Cranston, assistant secretary. The head office is at Suite 1000, 11 Adelaide Street West, Toronto 1. The mine address is Timagami.

The company's holdings, comprising about 7,152 acres, consist of a mineral lease on part of Timagami Island, leases on 11 other islands and 185 claims in Phyllis, Briggs, Joan, Yates, and Scholes townships, Timagami area, District of Nipissing.

Mining and milling operations continued throughout 1963.

The vertical four-compartment No. 1 shaft located in Phyllis township on mining lease No. 11446 was sunk 15 feet in 1963 to a total depth of 1,205 feet below the collar.

Development footage in 1963 consisted of: 4,592 feet of drifting, 197 feet of crosscutting, and 717 feet of raising. Total development footage to 31 December 1963 was as follows: 20,653 feet of drifts; 3,574 feet of crosscuts; 5,710 feet of raises. Diamond-drilling in 1963 consisted of 397 holes totalling 51,893 feet from underground, and 52 holes totalling 14,769 feet from surface.

New construction in 1963 included the following:

Bunkhouse (66 x 24 ft. frame construction, Asbestolux siding).
Assay office (30 x 22 ft., concrete block construction).
Pumphouse (8 x 6 ft., frame with Asbestolux siding, camp area).
Core rack (40 x 10 ft., open sided with frame roof).
Boiler house addition (16 x 16 ft., frame, galvanized covering).
Manager's residence addition (18 x 8 ft., frame).

Added equipment included the following:

1 equipment for 12.5 transformer station (Ontario Hydro).
12 mine cars (30 cu ft., Wabi Iron Works, New Liskeard).
12 mine cars (30 cu ft., used, Acme Equipment, Noranda).
1 tailings line (3,900 ft. 3-in. plastic pipe).
4 rock drills (2–22 BBC, 2–23 BBC, Atlas Copco).
1 stoper drill (CR 38, Canadian Ingersoll-Rand).
1 dump truck (3 ton 1964, General Motors).
1 boiler (Orr & Sembower Powermaster 100 hp., Bacon Engineering, Toronto).
13 heater units (Trane) installed in mine area buildings.
1 shaft signal sets and underground electrics for 175-, 975-, and 1,125-foot levels.

A total of 55,122 tons of ore was hoisted; the mill treated 55,009 tons, averaging 150.7 tons daily.

The following is taken from the company annual report for the year ending 30 June 1963:

Mining

Stoping was carried out in No. 3, No. 4, No. 6, No. 6A, No. 10, No. 12, No. 17, and No. 18 orebodies. A total of 48,353 tons of ore was broken.

Milling

The mill treated 53,600 tons of ore grading 7.24 percent copper, 98.84 percent of the copper was recovered.

Metals contained in 12,435.95 tons of concentrates shipped were:

Copper	lb.	7,668.415
Gold	oz.	910.765
Silver	oz.	23,247.73

COPPER CONCENTRATE SHIPMENTS

	Dry tons	Copper	Gold	Silver
		percent	oz. per ton	oz. per ton
Year ending 30 June 1963	12,436	30.83	0.073	1.87
Total to date	47,560	28.86	0.083	1.76

Exploration

Surface drilling from Phillips Bay indicated a new ore discovery west of No. 14 zone and above the 542 zone. Also, ore was intersected by two holes west of 6A orebody, above the 400-foot level.

Underground, No. 5A orebody was discovered, east of No. 5 orebody, just above the 400-foot level. No. 6W orebody was indicated, west of No. 6 orebody, above and below the 400-foot level. Ore was intersected by drillholes on the 975- and 1,125-foot levels in the shaft area, a part of the mine that has been unproductive. No. 19 orebody was indicated in a sub-level, below and east of No. 2 pit.

ORE RESERVES AS OF 30 JUNE 1963

Orebody	Ore in Place	Grade Copper	Ore Broken	Grade Copper
	tons	percent	tons	percent
No. 3	3,000	12.0	———	———
No. 4	3,500	8.5	———	———
No. 5A	3,500	7.0	———	———
No. 6	———	———	10,000	7.0
No. 6A	9,000	7.0	3,600	7.0
No. 6E	25,000	7.0	———	———
No. 6W	5,000	7.5	———	———
No. 10	2,000	10.0	6,580	7.5
No. 12	5,000	7.0	———	———
No. 15	10,000	7.0	———	———
No. 16	1,000	7.0	218	5.0
No. 17	5,000	6.0	6,055	5.0
No. 18	———	———	4,111	3.5
No. 19	1,000	8.0	———	———
Total	73,000	7.3	30,564	6.2

Total ore reserves 103,564 tons of 7.0 percent copper. An additional 25,000 tons of inferred ore, grading 5 percent copper, remains unchanged from the previous year.

The average number of employees was 118: 52 underground, and 66 on surface. M. F. Leavens was mine manager.

Tribag Mining Company Limited

Tribag Mining Company Limited was incorporated in December 1926 with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,752,000 shares have been issued. The directors and officers were: C. H. Franklin, president and director; E. R. Heald, director; Miss E. H. Linton, secretary-treasurer. The head office is at Suite 2014, 44 King Street West, Toronto 1. The mine address is Batchawana Bay.

The property, a copper prospect, comprises 135 claims in townships 27 and 28, range 13, District of Algoma, in the Batchawana area, about 50 miles north of Sault Ste. Marie.

A three-compartment vertical shaft, located on claim SSM.35137, was collared to a depth of 50 feet in 1963. Some 76 diamond-drillholes, totalling 50,542 feet, were completed from surface.

New construction completed in 1963 was as follows:

2 bunkhouses (32 x 48 ft., joined by a section 20 x 36 ft., Quonset).
1 cookery (32 x 60 ft., Quonset).
1 office and warehouse (32 x 60 ft., Quonset).
1 mine dry (32 x 48 ft., Quonset).
1 machine shop and power house (32 x 48 ft., Quonset).
1 oil house (12 x 14 ft., Quonset).
1 headframe (75 ft. high, timber construction).

New equipment installed in 1963 included the following:

1 hoist (60 x 36 in. P.E-1 with 150 hp. General Electric motor, Canadian Ingersoll-Rand).
1 generating set (175 kw., 600 volts, Cummins Diesel).
1 generating set (12.5 kva. with 3-cylinder diesel 32 hp., 1,500 rpm. Sheppard).
1 compressor (model AR4, 800 cfm., 100 psi., driven by Cat. model 342 diesel, Atlas Copco).
1 compressor (model AR3, 550 cfm., 100 psi., with 100 hp. Westinghouse motor, Atlas Copco).
1 compressor (T6OR, 520 cfm., 100 psi., with 100 hp. Westinghouse motor, Holman).

Munex Limited, a contracting firm did work on the property employing about 80 men under H. G. Donaghue during the period of operation. A. J. Walker was exploration manager for Tribag which employed an average of seven men.

Willroy Mines Limited

Willroy Mines Limited was incorporated in January 1954, with an authorized capitalization of 4,000,000 shares of $1 par value of which 3,999,905 shares have been issued. The directors and officers were: H. W. Knight, president and director; R. T. Birks, vice-president and director; R. M. P. Hamilton, P. D. P. Hamilton, G. W. Gooderham, J. C. Perry, and H. D. Carus, directors; B. E. Martin, secretary-treasurer. The head office is at Suite 407, 25 Adelaide Street West, Toronto 1 The mine address is Manitouwadge.

The property consists of thirty claims in Gemmell and Mapledoram townships, Manitouwadge Lake area, District of Thunder Bay, in the Port Arthur Mining Division adjoining the west boundary of the Geco property.

Operations continued throughout 1963.

SHAFTS, WILLROY MINE

Shaft	Claim No.	Inclination	Number of Compartments	Sinking 1963	Vertical Depth from Surface
					feet
No. 1.....	T.B.46933	Vertical	4	407	2,855
No. 2.....	T.B.46938	Vertical	2	——	530

No. 1 shaft was sunk 407 feet to a total depth of 2,855 feet below surface; the 1,600-foot level was established at a vertical depth of 2,508 feet below the collar.

The following development work was done during the year: drifting, 3,391 feet; crosscutting, 1,569 feet; raising, 4,282 feet. The total development footage

to 31 December 1963 was as follows: 29,651 feet of drifts; 12,946 feet of crosscuts; 23,218 feet of raises. Diamond-drilling consisted of 443 holes, totalling 44,448 feet, from underground.

A total of 482,728 tons of ore was hoisted, 483,827 tons was milled; the mill treated an average of 1,326 tons daily.

The following is taken from the company annual report for the year ending 31 December 1963:

Costs

Over-all operating costs were reduced during the year, with mining costs slightly higher and both milling and development lower. A comparison with performance in 1962 follows:

	Cost Per Ton Milled	
	1963	1962
Exploration and Development	$0.20	$0.24
Mining	2.18	2.08
Milling	1.18	1.36
Administration and General	0.85	0.83
Total	$4.41	$4.51

Ore Reserves

As of 1 January 1964 the total of broken, proved, and indicated reserves at the Willroy mine stood at 1,572,300 tons, distributed as follows:

Zone	Total Ore	Copper	Zinc	Lead	Silver
	tons	percent	percent	percent	percent
1	460,803	1.39	0.45	trace	0.42
2	79,148	0.02	5.33	trace	0.34
3	703,495	1.52	4.26	0.06	1.10
4	90,872	0.03	6.58	1.03	4.14
5	72,095	0.03	6.75	0.19	1.89
6	165,887	2.50	1.25	trace	0.89
Total and Average	1,572,300	1.36	3.13	0.09	1.05

Exploration and Development

LUN-ECHO PROPERTY

Following an option agreement made with Lun-Echo Gold Mines Limited in April 1963, four diamond-drillholes were laid out at 200-foot intervals down the estimated centre line of plunge of the Lun-Echo No. 3 orebody to substantiate previous drilling. Results were so encouraging that additional drilling was undertaken further down the plunge. At the year's end Nos. 3B and C orebodies had been extended over 3,500 feet down plunge from surface to indicate over 2,000,000 tons of ore.

In the light of the above results, a decision was made to install a mining plant and develop the known ore zones from underground. A gravel road, 3 miles long, from the Willroy plant, was constructed along with a 25,000 volt power line. A headframe, 1,000-ton ore bin, 250-ton waste bin, service building, and sub-station were erected and equipped. Hoisting, pumping, and compressed air facilities were installed. Shaft sinking started in November, and at the year's end the shaft bottom was 243 feet below collar; at which time advances to Lun-Echo amounted to $993,-857.41.

NAMA CREEK PROPERTY

Following an option agreement with Nama Creek Mines Limited signed in July of 1963 the company undertook to complete a comprehensive exploration program covering the whole property. A baseline and 25 miles of line were cut, and magnetometer and electromagnetic surveys completed which disclosed several new conductors. A diamond-drilling program, requiring a minimum of twelve holes, was laid out to test these anomalies; by the year's end one hole had been completed to indicate a narrow band of iron sulphides.

In addition, a series of short holes was drilled in the known ore zone in order to substantiate previous estimates of tonnage and grade.

Mining

Mining methods remained unchanged during the year, despite considerable hanging-wall weakness in the No. 3 zone, below 10th level. However, as main mining areas became narrower in width, it became necessary to step up stope preparation footages in order to maintain production. This had an adverse effect on mining costs.

Milling

During 1963, copper and silver metallurgy were improved, whereas zinc metallurgy declined. Copper recovery rose from 89.0 percent to 93.4 percent; silver recovery from 63.2 percent to 78.5 percent; and zinc recovery from 81.8 percent to a reduced figure of 77.0 percent. A comparison of results during the two years is shown in the accompanying table:

AVERAGE MILLING RESULTS, 1963
(Average daily tonnage—1,326 tons; mill running time 95.40 percent)

	Assays			Recoveries		
	Ag	Cu	Zn	Ag	Cu	Zn
Heads	1.14	2.02	3.32	100.0	100.0	100.0
Cu Concentrate	11.31	23.74	3.57	78.5	93.4	8.5
Zn Concentrate	0.98	0.71	54.29	4.0	1.7	77.0
Tails	0.24	0.12	0.56	17.5	4.9	14.5
Payable Recoveries				78.5	93.4	77.0

AVERAGE MILLING RESULTS, 1962
(Average daily tonnage—1,356 tons; mill running time 95.42 percent)

	Assays				Recoveries			
	Ag	Cu	Zn	Pb	Ag	Cu	Zn	Pb
Heads	1.43	1.70	5.56	0.14	100.0	100.0	100.0	100.0
Cu Concentrate	12.41	23.40	6.11	0.76	55.8	88.3	7.1	25.7
Pb Concentrate	80.44	9.55	4.67	40.84	7.4	0.7	0.1	67.1
Zn Concentrate	1.43	0.74	54.16	0.03	8.4	3.7	81.8	2.1
Tails	0.48	0.14	0.72	0.01	28.4	7.3	11.0	5.1
Payable Recoveries					63.2	89.0	81.8	67.1

General

Copper concentrates made during the year were shipped to Noranda and zinc concentrates to Port Maitland. Lead content in the ore did not warrant making lead concentrates.

The average number of employees was 263: 140 underground, and 123 on surface. R. S. Haflidson was general manager.

PLATINUM METALS—*see* NICKEL AND COPPER

SELENIUM—*see*—NICKEL AND COPPER

SILVER AND COBALT

In 1963 the mines of the Cobalt and Gowganda area shipped 5,389 tons of concentrates to Noranda Mines Limited; 1,347 tons to the Cobalt Refinery Limited, and 735 tons to refineries in foreign countries. From the total of 7,471 tons of concentrates and 6.6 tons of bullion shipments 5,053,534 ounces of silver was recovered. The refining of concentrates from the various groups of mines resulted in the following silver recovery: from the base metal mines, 2,882,443 ounces; from the nickel-copper mines, 1,320,777 ounces; from the gold mines, 344,867 ounces. The total silver production of 9,601,621 ounces in 1963 resulted in an increase in quantity of 2.32 percent over 1962 production of 9,383,445 ounces; the value of production increased 21.56 percent from $10,931,713 in 1962 to $13,288,643 in 1963. The average price of silver in 1962 was 116.47 cents per ounce; in 1963 it was 138.43 cents per ounce.

The mines of the Cobalt and Gowganda area reported the recovery of 55,652 pounds of cobalt from ores and concentrates shipped; the refining of nickel-copper ores produced 2,101,080 pounds of cobalt. The total of 2,156,732 pounds of cobalt shows a decrease of 18.58 percent from 1962 production of 2,649,193 pounds; the value of production decreased 7.48 percent from $4,765,808 in 1962 to $4,409,262 in 1963.

The mines of the Cobalt and Gowganda area paid $479,424 to 91 salaried employees, and $1,747,914 to 424 wage-earners. Fuel and electricity cost $265,748, and process supplies cost $545,694.

Accra Explorations Limited

Accra Explorations Limited was incorporated in April 1935 with an authorized capitalization of 3,500,000 shares of $1 par value, of which 1,750,000 shares have been issued. The directors and officers were: C. M. Cook, president and director; Martin Winter, vice-president and director; Robert Brown, secretary-treasurer and director; Henry Petroff and H. L. Pountney, directors. The head office and mine address is at suite 305, 100 Adelaide Street West, Toronto 1.

The company optioned fifteen claims and four mining leases in Robb and Willet townships; the Robb property is in the District of Cochrane; the Willet property, which included the former Barnet Silver property, is in the District of Timiskaming.

Operations progressed from 1 January to 31 December 1963.

The Barnet shaft, about 80 feet deep, was dewatered. A sampling and diamond-drilling program was carried out on the 70-foot level, on which former operators had completed approximately 350 feet of drifting and crosscutting. Six diamond-drillholes totalling 929 feet from the Barnet underground, and three holes totalling 1,832 feet from surface on the Robb property, were completed.

J. P. Jewell, mining geologist, was in charge, and three men were employed during the period of operation.

Agnico Mines Limited

Cobalt Consolidated Mining Corporation Limited was incorporated in January 1953; in October 1957 the company was reorganized, and the name changed to Agnico Mines Limited. The capitalization was increased to 5,000,000

Silver Production

Source		1959	1960	1961	1962	1963
Sales of bullion by the reduction companies, smelters, and mines.	oz.	6,657,162	7,155,909	4,680,763	4,707,590	5,053,534
	$	5,843,657	6,362,319	4,412,087	5,484,342	6,994,091
Contained in silver-cobalt concentrates exported from Canada.						
Estimated as recovered from concentrates treated in other provinces.						
In crude gold bullion	oz.	408,114	442,629	404,693	397,200	344,867
	$	358,242	393,541	381,463	462,738	477,296
Recovery for nickel-copper refineries	oz.	1,384,223	1,665,314	1,785,643	1,757,848	1,320,777
	$	1,215,071	1,480,631	1,683,147	2,047,893	1,827,955
Base metal mines	oz.	2,091,357	1,956,971	1,999,303	2,520,807	2,882,443
	$	1,835,793	1,739,943	1,884,543	2,936,740	3,989,301
Total Production	oz.	10,540,856	11,220,823	8,870,402	9,383,445	9,601,621
Total Value	$	9,252,763	9,976,434	8,361,240	10,931,713	13,288,643

shares of $1 par value, of which 2,834,327 shares have been issued. The directors and officers were: N. B. Sheriff, president and director; G. McLaughlin, secretary-treasurer and director; J. E. Armstrong, C. M. Hames, P. Penna, M. Klyman, and J. Vorback, directors. The head office is at Suite 711, 62 Richmond Street West, Toronto 1. The mine address is Box 140, Cobalt.

The company acquired properties formerly held by Silanco Mining and Refining Company Limited; Cobalt Lode Silver Mines Limited; Penn-Cobalt Silver Mines Limited; Gilgreer Mines Limited; Keylode Cobalt Silver Mines Limited; Hellens Mining and Reduction Company Limited; and others in the Cobalt, South Lorrain, and Gowganda areas, District of Timiskaming. A group of mines in Coleman township, including the Beaver and Temiskaming mines, was acquired in 1955, and the O'Brien mine in 1958. The company also owns, or has an interest in, a number of claims in the Blind River area, District of Algoma, and in Strathcona township, Timagami area, District of Nipissing.

All mining operations in 1963 were confined to the company's properties in the Cobalt areas.

BRADY LAKE PROPERTY

The Brady Lake property, which has also been called the Silver-Miller mine, is in lots 2 and 3, concession III, Coleman township. It includes six claims comprising the old Lumsden, Rochester, Gillies, Cobalt Central, and Coleman Development (Pan Silver) mines.

The property, which adjoins the Christopher property on the north, was leased from Silver-Miller and a development program was commenced.

Operations continued intermittently from January to November 1963.

SHAFTS, BRADY LAKE PROPERTY

	Location	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft (Lumsden)....	Claim No. 367	Vertical	2	Surface	400
No. 2 shaft (Rochester)...	Claim No. 119	Vertical	2	Surface	75
No. 3 shaft (Rochester)...	Claim No. 119	Vertical	2	Surface	75
No. 4 shaft (Pan Silver)...	SW.¼, N.½, lot 2, con. III, Coleman twp.	Vertical	2	Surface	632
No. 1 winze (Pan Silver)..	———	Vertical	2	285	447
No. 3 winze (Pan Silver)..	———	Vertical	2	610	746
No. 4 winze (Lumsden)...	———	Vertical	2	200	270

There was no development work or mining carried out in 1963. The accumulated development footages were recorded by level in the annual report for 1962.

Three concrete bulkheads were installed in 1963 on the 500-, 600-, and 740-foot levels between the Brady Lake and Christopher mines of Agnico Mines Limited. Six diamond-drillholes, totalling 2,054 feet, were completed from underground.

LODE AND CHRISTOPHER PROPERTIES

The Christopher mine adjoins the south boundary of the Cobalt Lode mine, in lot 2, concession III, Coleman township.

SHIPMENTS FROM SILVER MINES, COBALT-GOWGANDA AREA

		Arsenic	Copper	Cobalt	Lead	Nickel	Bismuth	Silver	Total
1904–1908	tons	86,230	1,755	21,688	446	8,037	lb. 264,000	oz. 480,574,000	———
	$	7,099,925	788,864	50,428,574	46,959	3,749,049	$ 310,528	$ 296,944,755	359,368,654
1959	tons	789	92	277	63	89	lb. 32,000	oz. 6,657,000	———
	$	63,786	54,645	962,653	8,559	133,562	$ 37,748	$ 5,843,657	7,104,610
1960	tons	862	136	170	74	64	lb. 38,000	oz. 7,155,909	———
	$	70,400	82,304	616,713	12,297	130,467	$ 45,402	$ 6,362,319	7,319,902
1961	tons	210	92	48	27	44	lb. 20,000	oz. 4,680,763	———
	$	16,772	53,643	162,572	5,445	63,107	$ 22,388	$ 4,412,087	4,736,014
1962	tons	80	38	20	———	6	lb. ———	oz. 4,707,590	———
	$	6,832	23,740	58,742	———	10,493	$ ———	$ 5,484,342	5,584,149
1963	tons	94	63	28	———	14	lb. 65	oz. 5,053,534	———
	$	7,498	39,268	113,530	———	23,603	$ 146	$ 6,994,091	7,178,136
Total	tons	88,265	2,176	22,231	610	8,254	lb. 354,065	oz. 508,828,796	———
	$	7,265,213	1,042,464	52,342,784	73,260	4,110,281	$ 416,212	$ 326,041,251	391,291,465

SHAFTS, LODE AND CHRISTOPHER MINES

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft	1970	Vertical	2	——	295
No. 2 shaft	106	Vertical	2	——	415
650 winze	——	Vertical	2	556	622

The Cobalt Lode and Christopher shafts are connected on the 400-foot level, and the nearby Brady Lake No. 4 shaft, leased from Silver-Miller, connects with the Cobalt Lode shaft on the 600-foot level. Mining operations throughout 1963 were on the Christopher property, with ore hoisted in both the Christopher and Lode shafts.

Development work during the year consisted of 659 feet of drifting, 511 feet of crosscutting, and 823 feet of raising. Total development footage to 31 December 1963 was as follows: 14,649 feet of drifts; 4,853 feet of crosscuts; 12,060 feet of raises. Diamond-drilling in 1963 consisted of 69 holes, totalling 10,716 feet, from underground.

A total of 38,516 tons of ore was hoisted; 35,600 tons was milled.

VIOLET PROPERTY

The Violet property, comprising about 40 acres, is located to the south of the O'Brien property.

Operations were continued throughout 1963.

SHAFTS, VIOLET PROPERTY

	Location	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 2 shaft	NW.¼, S. ½, lot 3, con. VI, Coleman twp.	Vertical	2	——	705
Winze, 690-foot level	——	70°	2	690	920
Winze, 410-foot level	——	Vertical	2	410	610

A connection, via old workings, was made to the lower levels of the adjoining O'Brien mine. Development work in 1963 consisted of 257 feet of drifting, and 75 feet of raising. Total development footage completed to 31 December 1963 was as follows: 302 feet of drifts; 209 feet of crosscuts; 90 feet of raises. Some 76 diamond-drillholes, totalling 10,664 feet, were completed from surface in 1963.

The headframe was repaired, and the hoist and dry building rehabilitated.

A total of 1,223 tons of ore was hoisted and milled.

O'BRIEN PROPERTY

Nipissing-O'Brien Mines Limited was incorporated in January 1952. The company acquired the properties of M. J. O'Brien Limited, and Nipissing Mines Company Limited in concessions V and VI, Coleman township, District of Timiskaming.

Nipissing-O'Brien Mines Limited operated the property until June 1958, when it was purchased by Agnico Mines Limited. Mining operations continued at the O'Brien mine, comprising about 153 acres, throughout 1963.

SHAFTS, O'BRIEN MINE

	Location	Inclination	Number of Compartments	Collar Depth	Depth from Surface
				feet	feet
Main shaft	R.L.403	Vertical	3	——	345
No. 2 shaft	R.L.403	Vertical	2	——	250
No. 6 shaft	R.L.403	Vertical	2	——	300
No. 14 shaft	R.L.403	Vertical	2	——	176
No. 615 winze	——	Vertical	2	340	460

Operations are carried on through the main shaft.

Development work in 1963 consisted of 860 feet of drifting, 1,086 feet of subdrifting, and 1,193 feet of raising. Total development footage to 31 December 1963 was as follows: 8,541 feet of drifts; 4,444 feet of subdrifts; 2,109 feet of crosscuts; 9,825 feet of raises. Some 103 diamond-drillholes, totalling 15,837 feet, were completed in 1963 from underground, and two holes totalling 142 feet from surface.

A total of 33,117 tons of ore was hoisted; 30,387 tons was milled.

NIPISSING 407 PROPERTY

The property comprises claim RL.407 located in Coleman township, where a vertical, two-compartment shaft had been sunk previously to a depth of 347.5 feet below the collar. The shaft, located in high ground, is north of the Silverfields property and about 500 feet from the highway passing the Glen Lake silver property.

Operations progressed from June to December in 1963.

The 407 shaft was rehabilitated, a headframe 65 feet high was erected, and a hoistroom (20 x 16 ft.) constructed. The CIR air hoist from the Right of Way mine was installed. Some 5 feet of raising was completed in 1963. Total development footage to 31 December 1963 was as follows: 543 feet of drifts; 3,734 feet of crosscuts; 105 feet of raises. One diamond-drillhole totalling 685 feet from surface and 12 holes totalling 2,877 feet from underground, were completed in 1963.

The following is taken from the company annual report for the year ending 31 December 1963:

Production

The following is a comparative summary of the main production items:

	1963	1962
Silver produced.....oz.	710,772	901,158
Cobalt produced.....lb.	73,320	61,527
Gross value of metals sold	$953,949.49	$1,060,394.58
Gross value paid per ounce of contained silver	$1.34	$1.18
Milled (O'Brien & Christopher).....oz.	67,210	66,195
Custom ore milled.....tons	9,542	Nil
Total milled.....tons	76,752	66,195
Total hoisted.....tons	72,722	67,157
Calculated head silver.....oz. per ton	11.64	14.76
Recovery silver.....oz. per ton	10.57	13.61
Extraction efficiency.....percent	90.82	92.21

Exploration by Units

O'Brien: Exploration continued to maintain this production operation. Several new ore zones were located and partially mined in the western section, near surface in the cobalt series. Most recent success has been achieved in the No. 16 shaft area, principally in the diabase-Keewatin rocks. This operation is still the main stay of production.

Christopher: exploration has not located anything substantially new. Several new zones have been located, entered and partially mined but no large tonnages or highgrade plums appeared in 1963. This operation is on the upward swing with more silver and tonnage now beginning to appear.

Violet: This unit has been difficult to maintain but recent drill intersections were highgrade, and raising and stoping is now encountering some rich ore, but the extent is unknown and possibly limited.

Brady Lake: This operation has been very much a money loser, although it may still have some promise. Notice of lease termination was given in August but necessary party wall bulkheads, lease terms, etc., required its continuing cost to December. Agnico has no further responsibility here.

Nipissing 407: This is a new exploration, now meeting with initial success. A bare headframe and hoist plant was completed in September, and the workings dewatered and rehabilitated down to bottom 300-foot level. A program of flat-hole, diamond-drill exploration was launched, and a strong silver zone outlined about 300 feet north of the shaft. Facilities were added to, including electric pumping; and crosscutting got underway this spring. The heading at May 30 was 40 feet from this silver zone. This property is unexplored in the centre of the company holdings.

Ibsen Mayfair Professor: Exploration was restored in this sector, and the long drive on the 600-foot level from Cobalt Lode shaft resumed. Extra ground coverage of this area was obtained by leasing two claims from Professor Mines Limited, on terms reasonable to both companies. Supplementary diamond-drilling with long holes has already located a powerful calcite cobalt-vein (assaying 19 oz. silver over 1.0 foot) on the Mayfair claim. Follow up surface drilling and crosscutting are now being pushed in this region.

Exploration assessment: Engineering assessment has been carried out on several other major exploration areas, owned by Agnico and having very real promise. Actual heavy expenditures on these programs will be dovetailed with the present program to keep in balance the total costs and revenue. As an exploration unit comes into production or is abandoned, these exploration program plans will be immediately implemented or stepped up.

General

During 1963, the Penn-Canadian property was leased to Hi Ho Silver, the Temiskaming mine to Patricia Silver, and the Gilgreer to Kirkland Townsite Mines. These leases are all still in effect.

During 1963, silver concentrates were shipped to American Smelting and Refining Company and Noranda Mines Limited.

In 1964, Agnico will be shipping to Cobalt Refinery and Noranda on more favourable terms. The decision to switch to Cobalt Refinery was a straight money saving proposition for Agnico with its increasing higher percentage of cobalt content and lower grade silver.

The average number of employees at all operations was 117: 61 underground, and 56 on surface. J. E. Armstrong was mine manager.

Alsof Mines Limited

Alsof Mines Limited was incorporated in June 1957 with an authorized capitalization of 4,000,000 shares of $1 par value, of which 1,763,440 shares have been issued. The directors and officers were: R. R. Coggan, president and director; M. G. Clarke, vice-president and director; P. J. Murray, secretary-treasurer and director; M. W. Tedford and W. G. Gardiner, directors. The head office is at Suite 2001, 80 King Street West, Toronto 1. The mine address is Elk Lake.

Alsof Mines Limited purchased the former Mapes-Johnson Silver property comprising fourteen claims southwest of Elk Lake in Mickle township, District of Timiskaming. Former operators had sunk the vertical, two-compartment Mapes-Johnson shaft, located in claim MR.423, to a depth of 208 feet below the collar. A vertical, two-compartment winze, collared on the 200-foot level, extended down for 176 feet to a vertical depth of 376 feet below surface. Levels had been established at depths of 65, 100, 200, 265, 300, and 370 feet. A total of 820 feet of drifts, 35 feet of crosscuts, and 98 feet of raises had been completed.

Operations continued from 1 January to 31 October 1963.

The following table gives the development footage in 1963, and the accumulated total at the date operations ceased, 31 October 1963.

	Drifts		Crosscuts		Raises	
	1963	Total	1963	Total	1963	Total
	feet	feet	feet	feet	feet	feet
65-foot	230	330	——	——	131	151
100-foot	——	155	——	——	38	76
200-foot	——	105	——	——	——	——
265-foot	——	60	——	——	——	——
300-foot	——	100	——	——	——	——
376-foot	——	300	——	——	——	——
Total	230	1,050	——	——	169	227

The dewatering of the shaft and winze to the 376-foot horizon was completed and an exploration program was carried out. Eight diamond-drillholes, totalling 1,337 feet, were completed from underground.

New construction in 1963 included an office and core shack (25 x 15 feet), a hoistroom (15 x 12 feet), and a machine shop, compressor room and dry (30 x 20 feet), all wood construction.

Added equipment included the following:

1 hoist (Jencks 6 x 8 in.).
1 hoist (Holman, single drum).
1 stoper (Holman Silverrill).
1 handril and tripod (Holman).
1 pump (duplex 6 x 4 x 6 in.).
1 compressor (CIR Gyroflow 600 cfm.)
1 skimobile.

The average number of employees was 11: 6 underground, and 5 on surface. Fred Walsh of Elk Lake was superintendent.

Amerigo Silver Mines Limited

Amerigo Silver Mines Limited is a private company of which J. J. Gray is president and director; C. L. Murray, vice-president and director; M. A. Sheridan, secretary-treasurer and director. The head office is at 7 King Street West, Toronto 1. The mine address is Box 769, Cobalt.

The company acquired the former Silver Banner property comprising three claims located in Coleman township, District of Timiskaming, about six miles southeast of Cobalt. The Silver Banner and Mayfair underground workings are connected.

Operations progressed from 1 June to 31 December 1963. The vertical, two-compartment No. 3 shaft located on claim No. 2016, sunk by former operators to a depth of 618 feet below the collar, was dewatered. Some 30 feet of crosscutting was completed on the 475-foot level. Total development footage to 31 December 1963 was as follows: 493 feet of crosscuts and 32 feet of raises on the 475-foot level; 98 feet of drifts and 82 feet of raises on the 524-foot sublevel. Some 27 diamond-drillholes, totalling 7,571 feet, were completed in 1963 from underground.

The existing buildings on the property were rehabilitated and repaired. The plant operates on compressed air supplied from the Ragged Chutes installation.

The average number of employees was 7: 4 underground, and 3 on surface. Gordon Watts was manager.

Candore Explorations Limited

Candore Explorations Limited was incorporated in May 1945 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 2,960,000 shares have been issued. The directors and officers were: H. R. Heard, president and director; K. J. Benner, vice-president and director; L. V. Barbisan, secretary-treasurer and director; P. J. Sullivan and M. Kirsh, directors; James Geddes, assistant secretary. The head office is at Suite 416, 25 Adelaide Street West, Toronto 1. The mine address is Elk Lake.

The company optioned the Otisse property comprising 23 claims located in Mickle township, District of Timiskaming, about 7 miles southwest of Elk Lake.

The vertical, two-compartment Otisse shaft, 160 feet in depth, located in claim No. 224, and the North American shaft were dewatered, and an exploration program was carried out. Some 33 diamond-drillholes, totalling 1,665 feet, were completed from the Otisse 75-foot level.

Sherman Tough was manager, and eight men were employed during the period of operation.

Cobalt Refinery Limited

Cobalt Refinery Limited was incorporated in June 1962; in 1963 it became a wholly owned subsidiary of Violamac Mines Limited with an authorized capitalization of 1,000,000 shares of no par value, of which 600,007 shares have been issued. The directors and officers were: A. W. White, president and director; H. R. Heard, secretary and director; James Geddes, treasurer and director; J. N. Cram, manager and director; L. V. Barbisan and K. J. Benner, directors. The head office is Suite 416, 25 Adelaide Street West, Toronto 1. The plant address is R. R. No. 1, Cobalt.

The treatment plant is located six miles south of Cobalt and one-half mile east of highway No. 11. It was formerly owned by Coballoy Mines and Refiners Limited and after being idle for several years was taken over by J. J. Gray in May 1961. Cobalt Refinery Limited purchased the plant 30 June 1962.

All major units of the plant operated more steadily during 1963 due to increased amounts of concentrates being received from ore producers in the area. Negotiations were proceeding with the objective of securing shipping contracts for all the Cobalt-Gowganda silver producers.

Investigations into improving the methods of silver refining and recovery of byproducts were carried out. The plant was remodelled, the cobalt facilities were expanded, additions and modifications were continued in the arsenic refinery. All byproducts produced have a ready market. Studies to improve dust and ventilation conditions were in progress. Storage facilities for processed materials were expanded. The power plant fuel has been converted from a combination of coal, coke, and light fuel oil to natural gas.

The No. 1 furnace operated for 215 days in 1963, treating 1,404 tons of concentrate at an average of 6.5 tons per working day, and produced the following:

Silver	oz.	1,870,654.7
Cobalt and nickel	lb.	73,547.0
Arsenic trioxide	lb.	171,950.0
Base bullion	lb.	809.0
Copper	lb.	2,450.0
Furnace slag	tons	1,328.0

The average number of employees was 51. J. N. Cram was general manager.

Copper-Man Mines Limited

Copper-Man Mines Limited was incorporated in April 1920 with an authorized capitalization of 5,000,000 shares of $1 par value of which 3,904,168 shares have been issued. The directors and officers were: E. C. Raaflaub, president and director; W. D. Paterson, vice-president and director; J. M. Anderson, secretary and director; Pryce Glover and F. J. McCullough, directors; G. G. Plaskett, supervisor. The head office is at Suite 419, 62 Richmond Street West, Toronto 1. The mine address is Box 9, Cobalt.

Copper-Man Mines Limited leased, in mid 1963, the former Nu-Silco property comprising sixteen claims situated on the west shore of Gireaux Lake in Gillies Limit, District of Timiskaming. The shaft site is near the Ragged Chutes highway and about a mile south of the Silver Summit property.

Operations progressed from October to December 1963.

SHAFTS, COPPER-MAN MINE

	Location	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
Nu-Silco	A 53	Vertical	2	Surface	105
Wyandoh No. 1	A 23	Vertical	2	Surface	100 (est.)
Wyandoh No. 2	A 23	Vertical	2	Surface	100 (est.)
Wyandoh No. 3	A 91	Vertical	2	Surface	85 (est.)

A 65-foot timber headframe was erected over the Nu-Silco shaft; a hoistroom (16 x 20 ft.), and an office, dry, warehouse building (40 x 20 ft.) were constructed. A 42-inch, single-drum air hoist was installed, and the shaft was dewatered. Total development footage by former operators comprised a total of 1,370 feet of drifts and 1,440 feet of crosscuts on the 60- and 100-foot levels. In 1963, some 14 diamond-drillholes, totalling 3,451 feet, were completed from surface, and 4 holes, totalling 2,100 feet, were completed from underground.

The average number of employees was 3: 2 underground, and 1 on surface. L. J. Cunningham was resident engineer in charge.

Deer Horn Mines Limited

Deer Horn Mines Limited was incorporated in December 1950, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 4,535,005 shares have been issued. The directors and officers were: N. B. Sheriff, president

and director; E. L. Baxter, vice-president and director; I. Dobbs, C. M. Hames, and M. Klyman, directors; G. McLaughlin, secretary-treasurer. The head office is at Suite 711, 62 Richmond Street West, Toronto 1. The mine address is Cobalt.

Deer Horn Mines Limited leased, then purchased, in 1963, the Cross Lake O'Brien property from Agnico Mines Limited. The property consists of 14 claims in Coleman township, district of Timiskaming, about 1½ miles east of Cobalt.

The mine, and mill operated throughout 1963.

SHAFTS, DEER HORN MINE

Location	Inclination	Number of Compartments	Collar Depth	Vertical Depth below Surface
			feet	feet
Main	Vertical	2	Surface	645.6
No. 1 winze	Vertical	2	584	656
No. 2 winze	Vertical	3	584	800

A total of 1,439 feet of drifting, 487 feet of crosscutting, and 2,976 feet of raising was completed in 1963. Total development footage to 31 December 1963 was as follows: 43,630 feet of drifts; 14,282 feet of crosscuts; 11,402 feet of raises. Some 244 diamond-drillholes, totalling 34,584 feet, were drilled from underground, and five holes, totalling 3,906 feet, were completed from surface.

The former Nipissing O'Brien mill, a 100-ton-per-day concentrator, comprising crushing, grinding, gravity, and flotation concentration, was purchased.

New construction consisted of a wood frame engineering office (30 x 15 ft.). An Atlas Trammer (type J, 1½-ton capacity) was added equipment.

Several new ore zones were opened on the 395- and 525-foot levels. The greater proportion of mill feed was obtained from workings down to and including the 595-foot level. No. 2 winze was reactivated, and new ore was developed on the 750-foot level. A limited amount of exploration was carried out from the 800-foot level on the adjoining leased Reinhardt claims.

The following is taken from the company annual report for the year ending 31 December 1963.

Summary

Six new silver zones were brought into production during 1963.
The broader exploration program obtained some very encouraging results.
Silver production totalled 749,838 ounces for the year.

Exploration and Development

Exploration and development was very successful in both the close range objectives and the broader exploration phases of the operation.

In the close range class, no less than six new silver zones were located and developed. These new ore zones are briefly described as follows:

No. 7 vein—This new highgrade vein was located by diamond-drilling, late in January at the 450-foot level horizon. Subsequent development extended this rich ore down to the 525-foot level and up to the 395-foot level. It has provided considerable highgrade for the operation.

No. 16 vein—Excellent ore on this new zone was entered at the 395-foot level, and it has proven to be one of the richest and most consistent ore zones yet encountered. The bulk of the better grade mill feed is coming from this ore source.

306 F.D. and G veins—Stoping of these zones was particularly encouraging in the porphyry above and below the lamprophyre. Although not much highgrade can be picked in this type of ore, it does provide some excellent mill feed.

1A vein—This new vein was located about 40 feet west of the major No. 1 or Michaels vein and running parallel to it on the 750-foot level. This ore is in Keewatin slates in widths up to 40 feet. This zone provides a considerable tonnage of medium-grade mill feed.

Nos. 41 and 906 veins—These two veins or shoots, were located on the 750-foot level and occur as chimneys of milling ore about 30 feet in diameter. Their full extent has not yet been established.

No. 27 vein—This new vein was reached near the year's end on the 450-foot level, in the eastern section of the mine. It is providing most of our highgrade presently being recovered.

In the broader exploration field, the unexplored ground to the north was given a preliminary exploration test from surface and underground. Several very strong veins have been located, but to date, silver values in these veins have not been high enough to embark upon a major development in this direction.

The greatest measure of encouragement has come from the drilling of the lake claims where more encouraging silver intersections were obtained. In this work, intersections up to 320 ounces per ton over narrow widths have been obtained. The values appear to be stronger below the bottom, or 800-foot level horizon, and continue down for at least 100 feet.

A program of crosscutting and drifting is under way now on the 800-foot level to develop this new structure and others to reasonably determine to what depth the silver extends.

Milling and Production

The mill operated continuously during the year except for shut-downs due to statutory holidays, periodic maintenance, and repairs. The mill processed 2,676 tons of custom ore in January and operated on Deer Horn ore exclusively for the balance of the year.

	1963	1962
Ore milled.....tons	29,584.0	22,022.0
Silver recovered.....oz.	749,837.61	425,826.87
Mill heads per ton.....oz.	26.0	20.04
Extraction efficiency.....percent	97.4	96.5

The average number of employees was 66; 45 underground, and 21 on surface. J. E. Armstrong was mine manager.

Ganda Silver Mines Limited

Ganda Silver Mines Limited was incorporated in April 1963 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 1,414,005 shares have been issued. The directors and officers were: T. A. Wilkinson, president and director; G. D. Pattison, vice-president and director; R. D. Bell, secretary-treasurer and director; W. E. Essery, assistant secretary-treasurer and director; Colin McNabb, director. The head office and mine office is at Suite 405, 25 Adelaide Street West, Toronto 1.

The property comprises forty-three claims in Willet township, District of Timiskaming. The vertical, two-compartment Paragon-Hitchcock shaft, located in claim MR.33308 and having a depth of 169 feet, was dewatered; the underground workings were examined and sampled. Some 300 feet of surface trenching to shallow depth was completed, as well as seven diamond-drillholes totalling 240 feet from surface.

A. C. A. Howe was consulting engineer, Lucien Cloutier was superintendent, and six men were employed during the period of operation.

Glen Lake Silver Mines Limited

Glen Lake Silver Mines Limited was incorporated in June 1960 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,100,005 shares have been issued. The directors and officers were: G. E. Buchanan,

president and director; R. J. Murphy, vice-president and director; Frank Cadesky, secretary-treasurer and director; R. J. Juby and A. J. Fortens, directors. The head office is at Suite 702, 100 Adelaide Street West, Toronto 1. The mine address is Box 590, Cobalt.

The property, comprising 20 claims, 18 in Gillies Limit, 2 in Coleman township, District of Timiskaming, was formerly known as the Bailey mine. It is located on the west side of Glen Lake, across from the Foster mill, about three miles southeast of Cobalt. The vertical, two-compartment No. 1 shaft located on the southwest half of the north half of lot 4, concession IV, Coleman township, had been sunk to a depth of 283 feet, by former operators. There are five levels, including the adit level, off the shaft.

Mining and milling operations progressed from 3 January to 31 December 1963.

Development work consisted of 1,312 feet of drifting, 1,920 feet of crosscutting, and 953 feet of raising. Total development footage to 31 December 1963 was as follows: 4,162 feet of drifts; 5,267 feet of crosscuts; 1,182 feet of raises. Diamond-drilling in 1963 consisted of 38 holes, totalling 7,490 feet from underground.

New construction in 1963 consisted of a warehouse building (20 x 12 ft., frame construction).

The major part of mine production was obtained from a large stoping section on the fourth level west, which continues to be highly productive. A long crosscut west on the fifth level has opened up the downward extension of this ore, which is being actively developed. The adjoining Powell claim was explored by drilling from a crosscut driven on the fourth level, and the leased Penn Canadian claim adjacent to and north of the Bailey is being diamond-drilled.

A total of 28,011 tons of ore was hoisted and milled, at an average of 80 tons per working day.

The average number of employees was 71: 42 underground, and 29 on surface. M. C. Halstead was general manager.

Hiho Silver Mines Limited

Hiho Silver Mines Limited was incorporated in February 1963 with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,000,000 shares have been issued. The directors and officers were: G. E. Buchanan, president and director; A. J. Fortens, vice-president and director; Frank Cadesky, secretary-treasurer and director. The head office is at Suite 702, 100 Adelaide Street West, Toronto 1. The mine address is Box 590, Cobalt.

The Hiho Silver property comprises the former Kerr Lake, Lawson, University, Cleopatra, Silver Hill, and Penn Canadian claims. The first five properties, lying in an east-west line south of the adjoining Glen Lake property, were purchased from Silver-Miller Mines Limited, then part was leased to Glen Lake Silver Mines Limited. The Penn Canadian, adjoining Glen Lake to the north, was leased from Agnico Mines Limited and also turned over to Glen Lake Silver. Hiho Silver property comprises 430 acres in Coleman township, District of Timiskaming.

Operations proceeded from 2 May to 31 December 1963.

SHAFTS, HIHO SILVER MINE

	Inclination	Number of Compartments	Collar Depth	Vertical Depth below Surface
			feet	feet
University No. 1	Inclined	2	Surface	100
University No. 3	Vertical	2	Surface	280
Lawson No. 8	Vertical	2	Surface	410

The University No. 3 shaft was dewatered and retimbered following the erection of a new 35-foot headframe and installation of an air hoist. Three transformers, 150 kva, were installed in the sub-station. Some 32 diamond-drill-holes, totalling 8,987 feet, were completed from surface, and 12 holes, totalling 4,471 feet, were completed from underground. Diamond-drilling was carried on from the face of the 90-foot level, west drift, into the abutting Cleopatra ground. This work and earlier surface-drilling on the Cleopatra property was encouraging.

The average number of employees was 4: 2 underground, and 2 on surface. M. C. Halstead, general manager of Glen Lake Silver Mines was in charge.

Keeley-Frontier Mines Limited

Keeley-Frontier Mines Limited was incorporated in September 1959, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 4,600,000 shares have been issued. The directors and officers were: J. T. Arnott, president and director; M. C. Mosher, vice-president and director; R. J. Murphy, secretary-treasurer and director; W. A. Carter and F. H. Todd, directors. The head office is at Suite 702, 100 Adelaide Street West, Toronto 1. The mine address is Box 339, Cobalt.

The company acquired the adjoining Keeley and Frontier properties, comprising 12 claims, approximately 386 acres, at Silver Centre in South Lorrain township, District of Timiskaming, about 20 miles south of Cobalt.

Mining operations continued throughout the year; the mill operated from 1 January to 14 November 1963.

Development work in 1963 consisted of 333 feet of drifting, and 360 feet of raising. Total development footage to 31 December 1963 was: 75,322 feet of drifts; 9,660 feet of crosscuts; 2,430 feet of raises. Some 62 diamond-drillholes, totalling 8,893 feet, were completed from underground.

During the year an extensive search for ore was carried on in the old upper level workings of both properties. All muck was hoisted up the Frontier No. 3 shaft in skips from the 6th level, which had been previously connected to the Keeley 8th level. Diesel haulage was employed on this main level. The Frontier section accounted for about 60 percent of the underground production.

An early milling rate of 140 tons per day was established. This was later increased to over 200 tons by the addition of Keeley tailings which were added directly to the milling circuit. Underground results were disappointing in that ore of milling grade could not be found in either section. Milling was discontinued 14 November 1963 pending new financing arrangements.

A total of 31,699 tons of ore was hoisted, 39,385 tons was milled at an average of 124 tons per working day.

SHAFTS, KEELEY-FRONTIER MINE

Shaft	Claim	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
FRONTIER PROPERTY					
No. 1	H.R.16	Vertical	2	Surface	376
No. 2	H.R.16	Vertical	2	Surface	62
No. 3	H.R.16	Vertical	3	Surface	627
Crompton	H.R.25	Vertical	2	Surface	40
No. 8 winze	——	Vertical	2	540	1,360
No. 9 winze	——	Vertical	2	1,360	1,455
KEELEY PROPERTY					
No. 1	H.R.19	Vertical	2	Surface	240
No. 2	H.R.19	Vertical	2	Surface	100
No. 3	H.R.19	Vertical	2	Surface	570
No. 4	H.R.21	60°	2	Surface	55
828 winze	H.R.21	Vertical	3 and 2	560	825
830 winze	H.R.19	Vertical	1 and 2	560	705
826 winze	H.R.21	Inclined	2	560	620
1162 winze	H.R.21	Inclined	2	822	930
LITTLE KEELEY PROPERTY					
No. 2	H.S.40	Inclined	2	——	90

The average number of employees was 72: 37 underground, and 35 on surface. Roger Gareau was mine manager.

Kirkland Townsite Gold Mines Limited

Kirkland Townsite Gold Mines Limited was incorporated in 1917 with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,985,006 shares have been issued. The directors and officers were: D. O. Johnson, president and director; T. J. Carbone, vice-president and director; H. G. Morris, secretary-treasurer and director; F. G. Fitzgerald, Charles Baker, and E. W. Noulty, directors. The head office is at 40 Helen Avenue, Brantford. The mine address was Haileybury.

The company leased in March 1963 the Gilgreer property of Agnico Mines Limited, comprising 9 claims on Maidens Creek, about 18 miles south of Cobalt and two miles east of the Silver Centre highway, South Lorrain township, District of Timiskaming.

Operations proceeded from 24 April to 22 August.

SHAFTS, GILGREER PROPERTY

	Claim No.	Inclination	Number of Compartments	Vertical Depth from Surface
				feet
No. 1	H.R.69	Vertical	3	260
No. 2	H.R.69	Vertical	2	85
Gilgreer	H.R.509	Vertical	2	50

The old 60-foot headframe and shaft collar were rebuilt, the 260-foot shaft was dewatered and cleaned up. A double-drum, 42-inch air hoist and a cage were installed. Portable compressors supplied the motive power. The camp buildings were rehabilitated. Some five diamond-drillholes, totalling 3,111 feet, were completed from surface, and six holes, totalling 2,043 feet, were completed from underground. The work was stopped 22 August 1963, and all machinery and equipment was removed from the property.

The average number of employees was 5: 2 underground, and 3 on surface. C. F. Cockshutt, geologist, was in charge.

Langis Silver and Cobalt Mining Company Limited

Langis Silver and Cobalt Mining Company Limited was incorporated in February 1953, with an authorized capitalization of 300,000 shares of $1 par value; in 1957 the capitalization was increased to 5,000,000 shares of which 3,800,015 shares have been issued. The directors and officers were: A. W. White, president and director; R. A. Halet, vice-president and director; K. J. Benner, D. F. Burt, and J. E. Armstrong, directors; H. R. Heard, secretary-treasurer. The head office is at Suite 416, 25 Adelaide Street West, Toronto 1. The mine address is New Liskeard.

The property consists of twenty claims in Casey and Harris townships, District of Timiskaming, and includes the former Casey Cobalt property.

Mining and milling operations continued throughout 1963.

SHAFTS, LANGIS SILVER PROPERTY

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft	T.354	75°	2 (inactive)	Surface	270
No. 3 shaft	T.354	Vertical	2	Surface	372
No. 4 shaft	T.1474	Vertical	2 (inactive)	Surface	150
No. 6 shaft	T.1110	Vertical	2	Surface	411
No. 4 winze	T.1110	Vertical	2	371	421

Development work consisted of 1,846 feet of drifting, 608 feet of crosscutting, and 1,581 feet of raising. Total development footage to 31 December 1963 was as follows: 21,799 feet of drifts; 17,431 feet of crosscuts; 6,377 feet of raises. Diamond-drilling in 1963 consisted of 193 holes, totalling 15,294 feet from underground, and 14 holes, totalling 5,435 feet, from surface.

New equipment installed in the crusher house consisted of a 3-foot Symons short-head cone crusher (by Nordberg Manufacturing Company).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

The mill products, after sampling at the Provincial testing laboratories, were shipped to Cobalt Refinery Limited for further treatment and marketing. Flotation concentrates, assaying less than 500 ounces of silver per ton, were sold directly to Noranda Mines Limited.

The gross estimated value of silver and other metals produced amounted to $846,342.30. The net smelter value, after deductions for refining, marketing, and treatment charges, was $762,976.74, compared to $702,489.67 in 1962.

With an improved and firm price for silver, the net average smelter return per ounce produced was $1.27, compared to $1.09 in 1962.

The net operating profit, before provision for depreciation, investment income, and taxes on income, was $156,203.34, compared to $95,674.81 for the previous year.

Costs

	Per Ton Ore Treated	
	1963	1962
Development	$ 5.21	$ 6.17
Mining	5.92	5.60
Ore treatment	3.13	3.12
Mine office management	.76	.76
General account	.21	.17
Total	$15.23	$15.82

Lower development expenditures account for the reduction in the cost per ton of ore treated. Expenses in connection with the rehabilitation of the Dolphin-Miller Mines buildings under lease are included in operating expenditures.

Development

The total footage of ore developed was 652 feet, which is 35.3 percent of the drift advance. A total of 2,454 feet of advance in drifting and crosscutting, along with 1,581 feet of raising, was accomplished during the year.

No. 30 and No. 22 veins, at No. 6 shaft, were developed on the 275-foot level in the diabase. Limited vertical continuity and excessive dilution restricted the extraction of ore from these veins, on this horizon.

At the year's end, an unexpected extension of No. 30 vein system to the northwest, on the 235-foot level, No. 3 shaft, has indicated the presence of an ore shoot that may surpass in richness any previously found in the mine. Subsequently, diamond-drilling has indicated a very promising area for exploration in the western end of the No. 3 shaft area, and in addition, drilling on the east side, No. 3 shaft, has indicated another favourable, unexplored area.

Ore Reserves

The firm and higher price for silver allowed lower grade veins, and vein extensions, to be profitably extracted.

Ore in the diabase formation supplied 20 percent of the mill feed for the year. Flat faults caused excessive dilution, resulting in lower mill heads than anticipated.

The new, favourable areas, recently indicated by diamond-drilling at No. 3 shaft, should provide plenty of scope for this year's development program on all levels.

The Dolphin-Miller leased area, and the south end of No. 6 shaft, should also yield some new ore veins.

Milling

At a rate of approximately 100 tons per day, the mill treated 36,748 tons.

In spite of lower mill heads, and reflecting the increased price of silver, the net smelter return per ton of ore treated this year was $20.76, compared to $19.12 last year.

	1963	1962
Milled, tons	36,748.00	36,750.00
Average per day, tons	100.68	100.68
Mill heads silver, oz. per ton	17.18	19.30
Silver produced, oz.	603,139.50	647,002.90

Note: The cost of milling was unchanged at $3.13 per ton.

DOLPHIN-MILLER MINES

A lease was obtained on the adjoining Dolphin-Miller Mines Limited property, and this property was prepared for resumption of underground operations.

A hydro transmission and pipe line were constructed, and buildings, headframe, etc. were rehabilitated.

At the year's end, everything was in readiness for dewatering.

The average number of employees was 85: 58 underground, and 27 on surface. J. E. Jerome was mine manager.

Majortrans Oil and Mines Limited

Majortrans Oil and Mines Limited was incorporated in January 1957 with an authorized capitalization of 15,000,000 shares of no par value, of which 9,605,000 shares have been issued. The directors and officers were: W. G. Wood, president and director; W. D. MacLean, vice-president and director; J. Ross, secretary-treasurer and director; C. W. Walker and D. H. Gorman, directors. The head office is at 4th floor, 244 Bay Street, Toronto 1. The mine address is Elk Lake.

The property, optioned from the Otisse Silver, comprises 26 claims in Mickle township, District of Timiskaming, near Elk Lake. Former operators had sunk a vertical, two-compartment shaft on claim No. 224, 160 feet below the collar, with levels established at 75- and 150-foot depths. On the 75-foot level, 755 feet of drifting and 240 feet of crosscutting had been completed; on the 150-foot level, 230 feet of drifting and 130 feet of crosscutting had been completed.

The present company operated from 1 January to 30 March 1963.

Some 23 diamond-drillholes, totalling 2,950 feet, were completed from underground. A silver vein on the 75-foot level was mined, with some high-grade material bagged and shipped to the Timiskaming Testing Laboratories at Cobalt. The mill rock was trucked to Noranda.

G. G. Caron was manager, and eight men were employed during the period of operation.

McIntyre Porcupine Mines Limited (Castle Division)

Castle-Trethewey Mines Limited was incorporated in January 1922; in December 1959 all assets were purchased by McIntyre Porcupine Mines Limited and it became the Castle Division of McIntyre. The directors and officers are given under McIntyre Porcupine Mines Limited, in the gold operations section of this report. The McIntyre head office is at Suite 1500, 25 King Street West, Toronto 1. The mine address is O'Brien.

The Castle Division property, consisting of 42 claims, is located in Haultain and Nicol townships, Gowganda area, District of Timiskaming. The property comprises the Castle and Capitol sections; all work in recent years has been in the Capitol section of the mine.

Mining operations continued from 1 January to 26 June 1963, when a labour strike occurred, terminating operations for the balance of the year. The underground workings are being kept dewatered. The mill did not operate in 1963.

Development work in 1963 included 2,442 feet of drifting, 384 feet of crosscutting, and 295 feet of raising. Total development footage to 31 December 1963 was as follows: 36,488 feet of drifts; 16,521 feet of crosscuts; 8,862 feet of raises. Diamond-drilling in 1963 consisted of 81 holes totalling 12,535 feet from underground, and one hole totalling 781 feet from surface. Some 5,404 tons of ore was hoisted and stockpiled.

SHAFTS, CASTLE AND CAPITOL MINES

	Claim No.	Inclination	Number of Compartments	Collar Depth	Total Depth from Surface
				feet	feet
CAPITOL MINE					
Capitol shaft	H.S.351	Vertical	2	Surface	819
Capitol winze	H.S.351	Vertical	2	778	1,131
Inclined haulageway	H.S.351	27°	2	1,125	1,425
Capitol Cobalt shaft	H.S.351	Vertical	1 (inactive)	Surface	38
CASTLE MINE					
No. 1 shaft	R.S.C.106	Vertical	(inactive)	Surface	460
No. 2 shaft	R.S.C.101	Vertical	(inactive)	Surface	160
No. 3 shaft	R.S.C.101	Vertical	2	Surface	850

The following is taken from the annual report of McIntyre Porcupine Mines Limited for the year ending 31 December 1963:

Although a substantial amount of ore was developed in the first half of the year, there was not sufficient ore to warrant opening the mill up to the time the men went on strike, which was June 27, and no work has been done since that time. The underground workings and surface plant are being maintained on a stand-by basis.

The average number of employees was 34: 22 underground, and 12 on surface. G. D. McLeod was manager.

Miller-Lorrain Mines Limited

Miller-Lorrain Mines Limited was incorporated in January 1961, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,000,005 shares have been issued. The officers and directors were: H. G. Miller, president and director; P. M. King, chairman of the board and director; Bernard Chubet, vice-president and director; P. E. Cain, director; Lillian McKinley, secretary-treasurer. The head office is at 392 Bay Street, Toronto, c/o J. A. Mahon, Q.C. The mine address is Cobalt, Box 142.

The property, consisting of five claims on the shore of Lake Timiskaming, about three miles from the Silver Centre highway, is located in South Lorrain township, District of Timiskaming; it was operated for a number of years in the nineteen-twenties by Nipissing Mining Company.

A 100-hp. diesel-electric unit and an 18-inch air hoist were installed, and an 18-foot headframe was erected over the vertical, two-compartment shaft, located in claim T.19261. The shaft collar was retimbered and dewatered to the 205-foot level; this level connects with an adit on Maidens Creek through a series of old stopes.

New construction included an office and pumphouse (both 20 x 16 ft., frame with asbestos sheeting).

All work was suspended in May pending new financial arrangements.

H. G. Miller was in charge, and six men were employed during the period of operation.

Patricia Silver Mines Limited

Patricia Silver Mines Limited was incorporated in December 1961, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 2,490,005 shares have been issued. The directors and officers were: G. E. Buchanan,

president and director; R. J. Murphy, vice-president and director; Frank Cadesky, secretary-treasurer and director; A. J. Fortens, and R. J. Juby, directors. The head office is at Suite 702, 100 Adelaide Street West, Toronto 1. The mine address is Box 590, Cobalt.

The property consists of four claims in Coleman township, District of Timiskaming, about 5 miles southeast of the town of Cobalt. It includes the former one-claim Cochrane property and the leased Beaver-Timiskaming property.

Operations progressed to December 1963.

SHAFTS, PATRICIA SILVER MINES

Shaft	Claim	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
BEAVER					
No. 1	1348	Vertical	2	Surface	1,650
No. 1 winze	———	Vertical	2	70	140
TIMISKAMING					
No. 1	441	Vertical	3	Surface	1,650
COCHRANE					
No. 1	1623	Vertical	2	Surface	200
No. 2 (Silver Dollar)	1623	60°	2	Surface	———

Development work in 1962 and 1963 consisted of 143 feet of drifting on the 270- and 322-foot levels, and 200 feet of crosscutting on the 500-foot level. Some 49 diamond-drillholes, totalling 10,519 feet, were completed from underground.

Mining and diamond-drilling were carried out in the Timiskaming workings down to the 500-foot level; the level was rehabilitated to the south, and a 200-foot connection made to the old Cochrane (Silver Dollar) shaft. Diamond-drilling from the bottom of the shaft failed to locate ore, and in early December all operations ceased. A bulkhead was installed between the two properties on the 500-foot level, and both properties were permitted to flood. Two lots of mill rock, about 2,420 tons, were treated in the LaRose mill, leased from Silver-Miller Mines Limited, with disappointing results.

The average number of employees was 26; 16 underground, and 10 on surface. G. E. A. Edwards was manager.

Professor Silver Mines Limited

Professor Silver Mines Limited was incorporated in August 1949, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,877,838 shares have been issued. The directors and officers were: J. M. Cunningham-Dunlop, president and director; Douglas Henderson, vice-president and director; H. E. Cawley, W. B. Maxwell, G. C. Russell, and D. A. Thomson, directors; C. C. D. Pringle, secretary-treasurer; Gwendolyn M. Mahon, assistant-secretary; H. B. Briden, accountant. The head office is at 6th floor, 360 Bay Street, Toronto 1. The mine address is Box 39, Cobalt.

The property comprising 17 claims in Gillies Limit township, District of Timiskaming, formerly known as the South Giroux mine, is about 3½ miles southeast of Cobalt.

Operations continued from 5 May to 20 November 1963.

In 1961 an adit 920 feet long had been driven from the base of a sheer rock face, and lateral development followed on several silver veins intersected. The workings were approximately 200 feet below the highest point of ground, and some 1,930 feet of advance had been completed. In 1962 a further 865 feet of drifting was completed. Total development work to 31 December 1963 consisted of an adit crosscut 920 feet long, with 1,856 feet of drifting off this adit. Some eight diamond-drillholes totalling 3,470 feet from underground, and five holes totalling 3,030 feet from surface were completed in 1963.

G. R. Cunningham-Dunlop was manager, and four men were employed during the period of operation.

Rix Athabasca Uranium Mines Limited

Rix Athabasca Uranium Mines Limited was incorporated in February 1950, with an authorized capitalization of 4,000,000 shares of $1 par value; all shares have been issued, 225,000 are pooled. The directors and officers were: W. H. Bouck, president and director; R. D. Lord, vice-president and managing director; W. N. Millar, D. R. Derry, and J. B. Aird, directors; George Baker, secretary D. A. MacFarlane, treasurer. The head office is at 335 Bay Street, Toronto 1. The mine address is Box 530, Cobalt.

The company leased the King Edward property from United Cobalt Mines in early 1960. This property comprises six claims totalling 197 acres in Coleman township, District of Timiskaming, on the west side of Cross Lake about 1.5 miles east of Cobalt.

Underground operations continued throughout 1963.

The vertical, two-compartment, King Edward winze, collared at adit elevation on the Watts claim, has a vertical depth of 1,135 feet below the collar. The second level is 1,092 feet below the collar. Development footage consisted of 974 feet of drifting, 438 feet of crosscutting, and 1,969 feet of raising. Total development by the company to 31 December 1963 was as follows: 2,329 feet of drifts; 3,131 feet of crosscuts; 3,436 feet of raises. Some 180 diamond-drillholes, totalling 22,552 feet, were completed from underground.

Both the first and second levels were extended, and two more connections were made between them. The 250-foot interval between levels was explored from the connecting raises, and stopes were established on favourable sections of ore. A limited amount of development was carried out in the adjoining Silver Cliff adit.

A total of 15,777 tons of ore was hoisted. Five lots totalling 14,811 tons was custom treated in local concentrators.

The average number of employees was 34: 33 were underground. E. C. Rudd was mine manager.

Rockzone Mines Limited

Rockzone Mines Limited was incorporated in March 1960 with an authorized capitalization of 4,000,000 shares of $1 par value, of which 1,648,952 shares have been issued. The directors and officers were: J. R. Nevison, president and director; J. M. DaCosta, secretary-treasurer and director; P. S. Broadhurst, director. The head office is at Suite 100, 12 Richmond Street East, Toronto 1. The mine address is Box 566, Cobalt.

The company acquired the former Smith-Cobalt property comprising 8 claims, about 720 acres, in Coleman and Lorrain townships, District of Timiskaming, adjoining the Cross Lake–O'Brien holdings of Deer Horn Mines Limited on the east.

Operations progressed from 1 January to 31 December 1963.

SHAFTS, ROCKZONE MINES LIMITED

	Claim	Inclination	Number of Compartments	Collar Depth	Vertical Depth below Surface
				feet	feet
No. 1	654	Vertical	3	Surface	425
No. 1 winze	654	Vertical	2	400	460
No. 2 winze	654	Vertical	2	452	525

Diamond-drilling on a single shift was carried on continuously from the 400-foot level. Toward the end of the year the 60-foot No. 1 winze from the 400-foot level was being dewatered, preparatory to drilling from this lower elevation. Some 10 diamond-drillholes, totalling 4,768 feet, were completed from underground.

P. S. Broadhurst was consulting engineer, and three men were employed.

Rusty Lake Mining Corporation

Rusty Lake Mining Corporation was incorporated in April 1959 with an authorized capitalization of 4,000,000 shares of $1 par value, of which 1,900,000 shares have been issued. The directors and officers were: J. E. Harris, president and director; Bernard Mariot, vice-president and director; Carl Stohn and John Helmer, directors; M. J. Campbell, secretary-treasurer. The head office is at Suite 623, 1117 St. Catharines Street West, Montreal 2, Quebec. The mine address is Box 159, Elk Lake.

The property, formerly known as the Hudson Bay Silver, comprises 33 claims in Leith township, District of Timiskaming.

Operations progressed from June to 31 December 1963.

SHAFTS, RUSTY LAKE MINING CORPORATION

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth below Surface
				feet	feet	feet
No. 1	696(L)	Vertical	2	Surface	——	190
No. 2	696(L)	Vertical	2	Surface	——	80
No. 3	696(L)	Vertical	2	Surface	——	225

The No. 3 shaft and underground workings were dewatered. Development work completed by former operators was approximately as follows: 120 feet of drifting on the 190-foot level, No. 1 shaft; 254 feet of drifting on the 76-foot level, No. 2 shaft; 1,125 feet of drifting, 115 feet of crosscutting, 76-foot level; and 300 feet of drifting on the 176-foot level, No. 3 shaft. The present company started an exploration and development program on both levels of No. 3 shaft.

New construction in 1963 consisted of the following: an explosive storage magazine (10 x 8 ft. double walls, sand filled); a compressor house (30 x 24 ft.); a machine shop (36 x 24 ft.); a bunkhouse, (50 x 24 ft.); a cookery (50 x 20 ft.); a hoistroom (18 x 16 ft.), all frame construction, sided and insulated. An old dry house (32 x 24 ft.) was partially renovated, and a timber headframe about 55 feet high was erected and partially sheathed.

New equipment added included the following:

2 compressors (CIR-IKA 500 driven by UD-24 International motors).
1 motor generator set (Onan gasoline driven, 1,800 watts, 110v., 50/60 cycle, 2.7 kva.).
1 generator (Lister diesel, model kva-15, 115v., 60 cycle).
1 air hoist (Jenks 48 x 42 in., size 10 x 15 in., 700 fpm., 6,500 lb. rope pull).
1 cage (Bridge & Tank steel for 4.5 x 5 ft. compartment).
1 sheave wheel (bicycle-type, 4 ft., diam., grooved for $\frac{7}{8}$ in. diam. rope).
6 mine cars (24 in. gauge).
1 rocker shovel (Eimco 12 B).

The average number of employees was 14: 4 underground, and 10 on surface. A. J. Hough was manager.

Silverfields Mining Corporation Limited

Silverfields Mining Corporation Limited was incorporated in September 1962 with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,500,005 shares have been issued. The directors and officers were: Sir Michael Butler, president and director; Stephen Kay, vice-president and director; C. G. MacIntosh, general manager and director; J. B. Aird and D. A. Perigoe, directors; D. S. Brown, secretary-treasurer. The head office is at Suite 914, 111 Richmond Street West, Toronto 1. The mine address is Box 679, Cobalt.

The property consists of four claims in Coleman township, District of Timiskaming. This was formerly known as the Alexandra property; it is located between Glen Lake Silver Mines and Silver Summit Mines on Diabase Mountain.

Operations continued throughout 1963.

Former operators had sunk the vertical, two-compartment Alexandra shaft to a depth of 308 feet below the collar; in 1963 it was sunk 126 feet to a depth of 434 feet below collar. The 4th and 5th levels were established at depths of 356 and 419 feet below the collar. A total of 2,007 feet of drifts, 1,843 feet of crosscuts, and 147 feet of raises had been completed by the company in 1962 and 1963. About 86 diamond-drillholes, totalling 20,321 feet, were completed during 1963 from underground.

An intensive development program on the 4th level disclosed several ore shoots, and stoping preparations were in progress. A start was also made to open up this ore on the bottom level. Underground diamond-drilling continued throughout the year at the Alexandra property, and the adjoining Meteor workings were drilled, this drilling terminating in June.

New construction in 1963 included a mine dry (24 x 48 ft.), a powder magazine, deck and rock dump handling facilities were improved.

Added equipment included the following:

2 rocker shovels (Eimco 12 B).
5 rock drills (Atlas Copco BB-16-C).
1 M.G. set (Westinghouse).
1 trammer (Atlas battery).
12 end-dump mine cars (Long, 1-ton).

Some 3,000 tons of ore was hoisted and stockpiled.

The average number of employees was 12: 5 underground, and 7 on surface. K. F. O'Flaherty was mine manager.

Silvermaque Mining Limited

Silvermaque Mining Limited was incorporated in July 1961, with an authorized capitalization of 4,000,000 shares of $1 par value; of which 3,445,892 shares have been issued. The directors and officers were: A. D. Hellens, president and director; J. D. Bateman, vice-president and director; V. N. Harbinson, secretary-treasurer and director; G. B. Hellens, M. Bruce, H. Wilton-Clark, and P. H. McCloskey, directors. The head office is at 132 St. James Street West, Montreal, Quebec. The mine address is Box 47, Cobalt.

Silvermaque Mining Limited, in early 1963, obtained control of the Harrison-Hibbert holdings along with the adjoining Ruby, Green Meehan, Cob-Sil, and Redrock properties, comprising about 554 acres, located in Bucke township, District of Timiskaming. These were all former silver producers located in Ruby Valley, about a mile south of North Cobalt, with access from the Silver Centre highway.

Operations proceeded from 15 February to 31 December 1963.

SHAFTS, SILVERMAQUE MINING LIMITED

Shaft	Location	Inclination	Number of Compartments	Vertical Depth below Surface
				feet
Harrison-Hibbert	SE.¼, N. ½, lot 13, con. I	Vertical	2	258
Ruby	NE.¼, S.½, lot 13, con. I	Vertical	2	161
Cobalt Contact	SE.¼, N.½, lot 14, con. I	Vertical	2	230
RED ROCK	N.¼, S.½, lot 14, con. I			
No. 1	———	Vertical	2	110
No. 2	———	Vertical	2	75
No. 3	———	Vertical	2	75
GREEN MEEHAN	SW.¼, N.½, lot 14, con. I			
No. 1	———	Vertical	2	200
No. 2	———	Vertical	2	85

Efforts during 1963 were concentrated on the Harrison-Hibbert property where a complete electrified mining plant has been kept intact for the past ten years. The Harrison-Hibbert shaft was dewatered, and development work was carried out on the 190- and 240-foot levels consisting of 849 feet of drifting, 350 feet of crosscutting, and 168 feet of raising. Total development footage to 31 December 1963 was: 6,665 feet of drifts; 1,835 feet of crosscuts; 2,428 feet of raises. Some 41 diamond-drillholes, totalling 11,369 feet, were completed from underground. Favourable ore intersections were obtained in the northwest corner of the property on the 190-foot level; this area was extensively developed and back stopes were established.

New added equipment included two stopers (Tampella Engineering Works), a Pomona shaft pump (500 gpm., Fairbanks Morse), and a pickup truck (½-ton, General Motors).

A total of 2,500 tons of ore was hoisted; late in the year 300 tons was custom-treated in a local concentrator.

The average number of employees was 11: 6 underground, and 5 on surface. F. G. Chitty was manager.

Silver-Miller Mines Limited

Silver-Miller Mines Limited was incorporated in January 1946, with an authorized capitalization of 3,000,000 shares of $1 par value; in 1952 the number of shares was increased to 4,000,000; in 1953 to 5,000,000; and in 1960 to 6,000,000, of which 5,396,181 shares have been issued. The directors and officers were: Murray Cooper, president and director; R. K. Hart, vice-president and director; J. M. Wainberg, secretary-treasurer and director; H. B. McLean, mine manager and director; E. F. Griffith, E. F. Furniss, and W. A. Carter, directors. The head office is at 715, 62 Richmond Street West, Toronto 1. The mine address is Drawer 230, Cobalt.

The company owns a number of properties in Coleman and Lorrain townships and in the Gillies Limit, District of Timiskaming. Claims owned by the Kerr Lake Mining Company and located south of the Lawson mine were acquired in 1959. Production in 1963 was obtained from the company's Princess dump and the Conisil underground workings. Ore is trucked a distance of four miles to the La Rose Mill.

CONISIL PROPERTY

Silver-Miller Mines Limited acquired, in 1960, an option to purchase claims held by Conisil Mines. The property, comprising about 80 acres, adjoins the Lawson mine on the southwest.

Underground operations continued throughout 1963.

The vertical, two-compartment Conisil shaft, located in claim J.B. 27, has a depth of 625 feet below the collar. Development work in 1963 consisted of 790 feet of drifting, 231 feet of crosscutting, and 1,215 feet of raising. Total development footage to 31 December 1963 was as follows: 3,742 feet of drifts; 1,210 feet of crosscuts; 2,671 feet of raises. Some 86 diamond-drillholes, totalling 17,274 feet from underground, were completed in 1963.

A total of 2,034 tons of ore was hoisted from the Conisil property; the La Rose mill operated from 15 May to 22 August 1963, treating 1,161 tons of Conisil ore and 153 tons from the Princess dump. The mill was leased to Patricia Silver Mines Limited, and the balance of the ore was stockpiled.

The following is taken from the company annual report for the year ending 30 April 1963:

Milling and Production

Milled	tons	1,435
Calculated heads per ton silver	oz.	15.73
Mill residues per ton silver	oz.	0.87
Recovery per ton silver	oz.	14.86
Production (silver)	oz.	21,334.80

The above figures represent a two-week mill run in November 1962, of ore broken on the 610-foot or bottom level of the Conisil Property.

LAWSON

There was no work carried on at the Lawson Property during the year. The 40-horsepower pump was maintained to handle the water and prevent any overflow into the Conisil workings.

CONISIL

On the completion of drilling four holes east from the 535-foot level into the Hargreaves Claim, the decision was made to investigate the silver intersections obtained from the new bottom or 610-foot level.

By August 1962, drifting had revealed four veins. Raises were driven on three of these veins, and a pocket of ore was mined from each. Further development of these ore sections was suspended in order to pursue No. 4 vein to the east, and simultaneously to drive a cross-cut south 125 feet to No. 5 vein at the Giroux Lake fault. No. 5 vein, previously picked up by diamond-drilling, was drifted on for 190 feet, and although it was a strong 2-inch vein of calcite and cobalt, the only section that made ore was 20 feet of back at the spot the drillhole passed through.

While development work was in progress on the 610-foot level, the company drill was testing ground on the 535-foot level to the north of No. 1 south-east vein. Several intersections indicated a parallel vein structure 75 feet north of the fault. Two separate holes returned 68.3 ounces over 3.6 feet and 94.5 ounces over 0.7 feet.

The following briefly outlines developments from 30 April 1963 to 15 July 1963:

A small branch vein in No. 4 vein sub-drift was tested and found to make ore for 40 feet. The backs were taken down to the diabase contact, and the 222 tons recovered ran 21.6 ounces to the ton.

In the original No. 5 No. 1 raise, 37 feet above the track of the 610-foot level, a strong 3-inch calcite vein, striking north 39 degrees east, was tested up to the diabase contact. It was then slashed and found to offset 8 feet. The offset was raised on a further 39 feet at 55 degrees into the diabase and cut 2½ inches of high-grade silver in the 5th round. Eight slash holes in the raise under this ore opened up high-grade up to 5½ inches in width. A 2½-inch piece from the raise ran 4,692.3 ounces to the ton, and a piece from the slash ran 5,371.2 ounces to the ton. The vein now known as No. 8 was sub-drifted on at the Keewatin diabase contact for 41 feet. Half this distance was high-grade and the remainder millrock.

A raise, driven from the 610-foot level to join up with the face of the sub-drift, encountered high-grade silver in the second round off the track. Drifting on the 610-foot level has uncovered two 4-foot sections of high-grade, and the face is still in 5 inches of massive cobalt.

This most recent No. 8 vein discovery has proven conclusively that the lower contact in the area now under exploration has the potential of materially enhancing future productive capacity.

During the latter part of June, 161 tons of ore was hoisted containing 3,435.2 ounces of silver, and 1.49 tons of high-grade ore was bagged, containing approximately 6,070.0 ounces of silver.

The average number of employees was 14: 8 underground, and 6 on surface. H. B. McLean was manager.

Silver Regent Mines Limited

Silver Regent Mines Limited was incorporated in January 1962 with an authorized capitalization of 5,000,000 shares of no par value, of which 2,560,005 shares have been issued. The directors and officers were: E. L. Baxter, president and director; N. B. Sheriff, vice-president and managing director; Irving Dobbs and Milton Klyman, directors; Gordon McLaughlin, secretary-treasurer. The head office is at Suite 711, 62 Richmond Street West, Toronto 1. The mine address is Box 9, Cobalt.

The property, formerly known as the Fisher-Eplett, comprises four claims in Coleman township, District of Timiskaming. It lies just north of the Beaver group and is about four miles south of Cobalt.

Operations continued from 2 January to 31 December 1963.

The vertical, two-compartment Fisher-Eplett shaft, located in lot 1, concession IV, Coleman township, has a depth of 489 feet below surface.

Development work in 1963 consisted of 575 feet of drifting, 295 feet of cross-cutting, and 216 feet of raising. Total development footage to 31 December 1963

was as follows: 2,111 feet of drifts; 2,220 feet of crosscuts; 323 feet of raises. Some 59 diamond-drillholes, totalling 9,890 feet, were completed from underground.

Diamond-drilling was carried out from all levels during the year. Lateral development was concentrated on the 3rd level, and favourable sections were explored by raising and backstoping. A connection was made on the 3rd level with the adjoining Silver Belle (Shamrock) workings, which were also diamond-drilled.

The average number of employees was 7: 3 underground, and 4 on surface. L. J. Cunningham was manager.

Silver Summit Mines Limited

Silver Summit Mines Limited was incorporated in June 1962 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,100,005 shares have been issued. The directors and officers were: G. E. Buchanan, president and director; A. J. Fortens, vice-president and director; Frank Cadesky, secretary-treasurer and director; C. L. Murray, assistant secretary and director; E. H. Clark, director. The head office is at Suite 702, 100 Adelaide Street West, Toronto 1. The mine address is Box 800, Cobalt.

The company purchased, in mid-summer, the privately owned Mensilvo mine consisting of 25 acres in lot 5, concession IV, Coleman township, and combined it with their adjacent 40-acre Savage property, also in Coleman township. The Savage property lies to the north of the Mensilvo property, about three miles southeast of Cobalt on the road leading to the Ragged Chute compressed air plant.

Mining operations continued from 2 January to 31 December, milling from 6 August to 31 December.

SHAFTS, SILVER SUMMIT MINE

	Claim	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth below Surface
				feet	feet	feet
No. 1	Savage	Vertical	2	Surface	——	80
No. 2	Savage	Vertical	2	Surface	——	290
No. 3	Savage	Vertical	2	Surface	——	140
No. 4	Savage	Vertical	2	Surface	75	230
8 others	Savage	Vertical	1 (inactive)	Surface	——	no record
No. 1	Mensilvo	Vertical	2	Surface	——	100
No. 2	Mensilvo	Vertical	2	Surface	——	140
No. 3	Mensilvo	Vertical	1	Surface	——	40
No. 4	Mensilvo	Vertical	1	Surface	——	70
No. 7	Mensilvo	Vertical	2	Surface	——	200

The 230-foot level was established 190 feet below the collar of Savage No. 4 shaft.

Development work consisted of 3,126 feet of drifting, 509 feet of crosscuts, and 1,112 feet of raising. Total development work to 31 December 1963 was: 7,306 feet of drifts; 2,422 feet of crosscuts; 2,017 feet of raises. Some 72 diamond-drillholes, totalling 10,015 feet from underground, and one drillhole from surface totalling 312 feet, were completed in 1963.

Early in the year an intensive development program from the 140-foot level of the Mensilvo No. 7 shaft disclosed several good ore sections in the southeast corner of the adjoining Savage claim. The Mensilvo 200-foot level was also advanced into this area. Ore was stockpiled at the Mensilvo.

The Savage No. 4 shaft, lying 600 feet northwest from No. 7, was rehabilitated, and the mine workings were pumped out. An 85-foot headframe was erected, a 2-drum 42-inch electric hoist was installed, and the shaft was equipped with a skip-cage unit and counterbalance.

A connection between the two properties was made on their respective 140-foot levels, which are 40 feet apart. Originally all ore was handled at the Savage No. 4 shaft through the connecting raise, but in mid-summer No. 4 shaft was deepened 75 feet, and a haulage at the 230-foot horizon was driven out under the Mensilvo workings. Production from both sections of the mine will be handled on this level. Mensilvo No. 7 shaft continues to be used for limited servicing.

Stopes were established on the known ore zones, and an aggressive diamond-drilling and lateral development program in both mines is under way. Stockpile ore was trucked to No. 7 shaft, dumped into the ore pass system, and hoisted.

The following surface installations were completed: a combined changehouse, warehouse, and office; a hoistroom; a heating plant; a machine shop and an electrical substation.

A 200-ton crushing and milling plant was constructed at the Savage shaft site, comprising a jaw crusher, a 3-foot cone crusher, a ball mill, jigg, 4 tables, 8 flotation cells, dryer, filter, etc.

A total of 22,078 tons of ore was hoisted; the mill commenced operation on 6 August, treating 21,027 tons at a daily average of 167 tons.

The average number of employees was 59: 34 underground, and 25 on surface. M. C. Halstead was general manager; H. R. Fowlie was mine manager.

Silver Town Mines Limited

Silver Town Mines Limited was incorporated in January 1963 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 2,300,005 shares have been issued. The directors and officers were: J. P. Arnott, president and director; A. J. Fortens, vice-president and director; Frank Cadesky, secretary-treasurer and director; N. W. Lamport and R. J. Murphy, directors. The head office is at Suite 702, 100 Adelaide Street West, Toronto 1. The mine address is Box 590, Cobalt.

The property comprises about 257 acres and consists of several claims adjacent to and embodying Peterson Lake, in Coleman township, District of Timiskaming.

Operations proceeded from 20 March to 31 December 1963.

Early in the year three shafts on the property were dewatered, and a program of diamond-drilling the connecting underground workings was commenced. The No. 1 shaft is situated about 300 feet from the highway to the Ragged Chutes compressed air plant and about two-thirds of a mile north of the Silver Summit property. The other two shafts are about 1,300 and 2,300 feet north of No. 1. Some 50 diamond-drillholes, totalling 13,889 feet, were completed from underground.

SHAFTS, SILVER TOWN MINES LIMITED

	Location	Inclination	Number of Compartments	Collar Depth	Total Depth from Surface
				feet	feet
PETERSON	S.W.476				
No. 1	S.W.476	———	2	Surface	200
No. 2	S.W.476	———	2	Surface	200
Little Nipissing	S.W.476	———	2	Surface	155
Winze No. 1	S.W.476	———	———	273	603
Winze No. 2	S.W.476	———	———	150	423
Susque-Hanna	S.W.476	———	2	Surface	200

The average number of employees was 10: 6 underground, and 4 on surface. M. C. Halstead was general manager; J. A. Hogan was in charge.

Siscoe Metals of Ontario Limited

Siscoe Metals of Ontario Limited is a wholly owned subsidiary of Siscoe Mines Limited, incorporated in September 1950. The directors and officers were: J. B. Lynch, president and director; C. A. Robinson, vice-president and director; J. G. Ahern, E. E. Campbell, A. H. Campbell, A. S. Fraser, and J. P. Crete, directors; A. P. Garratt, assistant to the president; C. M. Masterman, secretary-treasurer; R. M. P. Fisk, assistant secretary-treasurer. The head office and mine address is O'Brien.

SHAFTS, SISCOE METALS MINE

	Claim No.	Inclination	Number of Compartments	Collar Depth	Sinking 1963	Vertical Depth below Surface
				feet	feet	feet
No. 6 shaft	R.S.C.91	Vertical	3 and 2	Surface	618	1,542
No. 2 shaft	R.S.C.91	75½°	2 (inactive)	Surface	——	438
No. 20 shaft	R.S.C.94	76°	2 (inactive)	Surface	——	158
No. 1 winze	———	75°	2 (inactive)	350	——	458
No. 2 winze	———	82°	2 (inactive)	350	——	460
No. 3 winze	———	76°	2 (inactive)	350	——	402
No. 4 winze	———	82°	2 (inactive)	350	——	530
No. 5 winze	———	Vertical	2 (inactive)	525	——	640
No. 7 winze	———	75°	2 (inactive)	730	——	902
No. 8 winze	———	68°	2 (inactive)	730	——	788
No. 9 winze	———	Vertical	3 (inactive)	730	——	898
No. 10 winze	———	69°	2 (inactive)	900	——	970
No. 11 winze	———	Vertical	2	850	——	1,369
SHAFTS AND WINZES NOT CONNECTED TO PRESENT WORKINGS						
UPPER BONSAL						
No. 1 shaft	R.S.C.95	Vertical	2 (inactive)	Surface	——	85
No. 2 shaft	R.S.C.84	80°	2 (inactive)	Surface	——	115
No. 3 shaft	R.S.C.84	Vertical	2 (inactive)	Surface	——	68
LOWER BONSAL						
No. 1 shaft	R.S.C.83	76°	2 (inactive)	Surface	——	132
MILLERETT						
No. 1 shaft	R.S.C.95	Vertical	2 (inactive)	Surface	——	85
No. 7 shaft	R.S.C.95	Vertical	2 (inactive)	Surface	——	210
No. 9 shaft	R.S.C.95	Vertical	1 (inactive)	Surface	——	35
No. 10 shaft	R.S.C.95	77°	2 (inactive)	Surface	——	127
No. 1 winze	———	65°	2 (inactive)	70	——	136
No. 2 winze	———	79°	2 (inactive)	200	——	303

The company owns and operates the Siscoe Metals property, formerly the Miller Lake O'Brien mine, comprising fourteen claims in Nicol and Haultain townships, Gowganda area, District of Timiskaming.

Mining and milling continued throughout 1963. Work was carried on through No. 6 shaft, which was created in 1956 by raising No. 6 winze to surface.

The deepening of No. 6 shaft was continued, and 618 feet was completed in 1963 to a vertical depth of 1,542 feet below surface. The 1,475-foot level was established.

Development work in 1963 consisted of 2,539 feet of drifting, 2,027 feet of crosscutting, and 1,001 feet of raising. Total development footage by present operators to 31 December 1963 was as follows: 73,380 feet of drifts; 20,323 feet of crosscuts; 7,933 feet of raises. Diamond-drilling in 1963 consisted of 191 holes, totalling 29,053 feet, from underground.

New equipment added included the following:

1 stoper drill (Atlas).
1 rock drill (AL-47, Joy).
6 mine cars (24 cu. ft., Wabi Iron Works).
1 pump, two stage, motor and belt drive (Canadian Ingersoll-Rand).
1 locomotive trammer (Mancha plus 20 cell battery, Exide).
3 transformers (3 kva. dry type, Ferranti).
1 hoist (53 x 36 in. PE-I, Canadian Ingersoll-Rand).
1 fan (Turmag 12 in.).

The following is taken from the company annual report for the year ending 31 December 1963:

Operating Costs

	1963		1962	
	Per Ton	Per Ounce Silver	Per Ton	Per Ounce Silver
Marketing (including smelting)	$ 2.63	$0.121	$ 2.17	$0.101
Exploration and development	2.33	0.107	2.23	0.104
Mining	5.85	0.269	5.33	0.249
Milling	1.86	0.086	1.72	0.080
Mine overhead	1.31	0.060	1.21	0.057
Total Mine Operating Cost	$13.98	$0.643	$12.66	$0.591

The increase in mine unit operating costs for the year results mainly from the following:

1. The 4-percent general wage increase effected in March 1963.
2. Increased smelting and marketing charges.
3. The slightly lower tonnage milled, attributable to interference from shaft-sinking operations.

Mining

SOURCES OF ORE FROM THE MINE TO THE MILL

	1963			1962		
	Ore	Grade	Total	Ore	Grade	Total
	tons	oz. per ton	oz.	tons	oz. per ton	oz.
Development	3,358	19.3	64,782	6,099	20.97	127,900
Mining	61,302	21.8	1,339,245	62,566	21.48	1,341,470
Waste rock (to back-fill)	16,489	——	——	15,143	——	——
Broken ore reserves	15,001	——	——	17,673	——	——

Of the total ore hoisted, 39 percent of the tonnage or 42 percent of the ounces came from levels above the 900-foot level and the balance from No. 11 winze workings.

Milling

	1963	1962
Ore treated.....tons	64,660	68,665
Calculated heads.....oz. per ton	21.58	21.22
Mill residues.....oz. per ton	0.61	0.71
Recovery.....percent	97.18	96.63
Total recovery—mill.....oz.	1,355,866	1,407,987
Hand-picked mine ore.....oz.	48,161	61,383
Over-all silver production.....oz.	1,404,027	1,469,370

The mill operated efficiently throughout the year. A minor change in reagents used in the flotation circuit resulted in an improved over-all recovery. Including hand-picked crude ore, over-all recovery in high-grade form accounted for 85.2 percent of total production, distributed as follows:

	1963	1962
	percent	percent
1. Hand-picked high-grade	3.4	4.3
2. High-grade concentrates	81.8	83.2
3. Flotation concentrates	14.8	12.5
Total	100.0	100.0

The average number of employees was 101: 67 underground, and 34 on surface. E. A. Pearson was mine manager.

Solomino Gold Mines Limited

Solomino Gold Mines Limited was incorporated in March 1962 with an authorized capitalization of 5,000,000 shares of $1 par value of which 400,000 shares have been issued. The directors and officers were: R. Zarysky, president and director; W. Pankiewich, vice-president and director; P. Kohut and M. Romaniuk, directors; B. Romaniuk, secretary; H. Schemionek, treasurer. The head office is at Suite 223, 12 Richmond Street East, Toronto. The mine address is Elk Lake.

The property, formerly the Beacon Silver property, comprises nine claims in James township, District of Timiskaming, about seven miles south of Elk Lake.

The two compartment shaft in claim MR.28869, about 370 feet deep, was pumped to the 200-foot level, and a sampling and diamond-drilling program was carried out. About 25 feet of surface trenching, averaging 12 feet in depth, was completed. Seven diamond-drillholes, totalling 469 feet, were completed from surface, and one hole 362 feet deep from underground. A storage shed (12 x 12 ft.) was constructed.

Operations were terminated in September.

G. G. Caron was in charge, and eight men were employed during the period of operation.

Tormont Mines Limited

Tormont Mines Limited was incorporated in July 1949 with an authorized capitalization of 5,000,000 shares of $1 par value of which 3,300,000 shares have been issued. The directors and officers were: Andrew Robertson, president and

director; Wilfred Garnett, vice-president and director; G. D. Pattison, secretary-treasurer and director; R. D. Bell, L. N. Dalton, L. C. Creery, and S. J. O. McClay, directors. The head office is at Suite 405, 25 Adelaide Street West, Toronto 1. The mine address is Elk Lake.

The property comprises 65 claims: 34 in Haultain township, which included the Wigwam property, and 31 in Farr township, which included the Little Otisse and Roy Silver properties, near Lost Lake, District of Timiskaming.

Operations proceeded from 8 January to 7 September 1963.

SHAFTS, TORMONT MINES LIMITED

	Claim	Inclination	Number of Compartments	Total Depth below Surface
				feet
Wigwam adit	MR.13255	Horizontal	2	180
Haultain	MR.12913	Vertical	2	375
Little Otisse	MR.12900	Vertical	2	105
Roy	MR.12898	Vertical	2	250±

The following table shows the development footage completed in 1963, and the total development footage when work terminated on 7 September 1963:

	Drifts		Crosscuts		Raises	
	1963	Total	1963	Total	1963	Total
	feet	feet	feet	feet	feet	feet
Wigwam adit	111	1,691	—	470	90	307
100-foot level	—	150	—	—	—	—
HAULTAIN						
125-foot level	—	20	—	—	—	—
150-foot level	—	380	—	260	—	—
250-foot level	no record		—	—	—	—
350-foot level	no record		—	—	—	—

About 500 feet of surface trenching, averaging 2 feet in depth, and eight diamond-drillholes, totalling 643 feet from underground, were completed.

The average number of employees was 4: 3 underground, and 1 on surface. R. A. Granger was resident engineer.

TELLURIUM—*see* NICKEL AND COPPER

THORIUM

Rio Tinto Dow Limited

Rio Tinto Dow Limited was incorporated in January 1958, with an authorized capitalization of 200,000 shares of $10 par value, of which 35,000 shares have been issued. The directors and officers were: L. D. Smithers, vice-president and director; J. D. Head, general-manager and director; H. G. DeYoung, E. B. Gillanders, A. F. Lowell, D. J. McParland, W. J. Rave, and J. L. Smart, directors;

George Baker, secretary; B. A. Howard, treasurer; G. R. Devey, assistant secretary; H. J. Attwater, assistant treasurer. The head office is at 335 Bay Street, Toronto. The plant address is Box 190, Elliot Lake.

The thorium crude section and a research pilot plant were constructed in the mill at the Rio Algom Nordic mine. The plant is designed to produce a thorium concentrate from treatment of the Rio Algom Nordic mill tailings, using a solvent extraction process. The final thorium processing is still completed at the Rio Algom Quirke mine.

The plant operated from 1 January to 31 May 1963.

The average number of employees was 21. M. E. Grimes was research manager.

URANIUM OXIDE

The production of uranium oxide in Ontario in 1963 decreased 0.27 percent in quantity, from 12,805,203 pounds in 1962 to 12,770,421 pounds in 1963; the value of production decreased 12.96 percent, from $118,283,081 in 1962 to $102,951,146 in 1963.

Denison Mines Limited

Denison Copper Mines Limited was incorporated in November 1936; it was succeeded in 1946 by Denison Nickel Mines Limited; in 1949 the name was changed to North Denison Mines Limited; in March 1954 it was again changed to Consolidated Denison Mines Limited; in March 1960, on amalgamation of Consolidated Denison Mines Limited and Can-Met Explorations Limited, the name was changed to Denison Mines Limited. The authorized capitalization is 6,000,000 shares of $1 par value, of which 4,474,703 shares have been issued. The directors and officers were: S. B. Roman, president and director; John Kostuik, vice-president, general manager, and director; A. W. Stollery and Hon. H. A. Willis, vice-presidents and directors; J. C. Puhky, secretary-treasurer and director; F. H. Jowsey, B. E. Willoughby, J. W. Berry, Hon. G. A. Drew, G. C. Knowles, and L. R. Perini, directors; E. B. McConkey, assistant secretary-treasurer. The head office is at 4 King Street West, Toronto 1. The mine address is P.O. Box B-2600, Elliot Lake.

The Denison property comprises 124 claims in Townships 144, and 150, Blind River area, District of Algoma.

SHAFTS, DENISON MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1	586071	Vertical	5	1,856
No. 2	586118	Vertical	8	2,776

Development work in 1963 consisted of 8,816 feet of drifting and 173 feet of raising. Total development footage on a single plane to 31 December 1963 was as follows: 145,087 feet of drifts; 2,302 feet of raises. Some 1,584 diamond-drillholes, totalling 25,198 feet, were completed from underground.

Annual Report for 1963

The following is taken from the company annual report for the year ending 31 December 1963:

Mining

Mining was consolidated in three main working areas where the U_3O_8 content of the ore was higher than the previous mine average. Most of the ore was extracted from areas northeast and southwest of No. 1 shaft. The remainder was mined from the area south of No. 2 shaft to the limits of the installed conveyor system. This has since been replaced by ore from the western and mid-shaft sections.

The development program to provide for a major north-south transportation axis, about 3,000 feet to the east of the shafts, was continued. In the northeast area a conveyor-way to the north was extended an additional 264 feet, and a ventilation drive was started to an island in Quirke Lake, where a third opening to surface will be located. Developed reserves of readily accessible ore were maintained.

A total of 1,661,397 tons of ore and 36,545 tons of waste was broken during the year. The ore hoisted at No. 1 shaft amounted to 1,356,601 tons with No. 2 shaft accounting for the remaining 223,388 tons. The average grade of the ore mined was 3.34 pounds of U_3O_8 per ton, which is a record for the operation to date. In order to maximize revenue and cope with the existing situation it was necessary to increase the cut-off grade, resulting in some areas being temporarily by-passed. Total heading advance was 44,882 lineal feet. The waste handled was used either to build up haulageways or was disposed of as backfill in worked-out rooms.

Automatic neutralization of the mine water before pumping to surface has been converted from lime to ammonia for better control and to effect savings in labour. The budgetary controls and performance standards, which have been instituted, are continuing to show their effect on our cost reduction program. The unit operating and maintenance cost on conveyor hauling was reduced by an additional 16 percent, and rockdrill maintenance showed a decline of 8 percent. Several other modest improvements have been noted in other functions performed.

SUMMARY OF PRODUCTION

	1960	1961	1962	1963
Ore broken.....tons	2,021,643	2,043,946	1,808,011	1,661,397
Milled.....tons	[1]2,013,846	[1]2,033,483	[1]1,828,993	1,586,600
Average milled per day.....tons	5,787	5,827	5,680	4,444
Recovery.....percent	93.04	93.18	93.11	94.72
U_3O_8 produced.....lb.	4,911,761	5,379,168	4,844,259	5,078,760
Average U_3O_8 per ton.....lb.	2.70	2.85	2.88	3.34

[1]Plant shut down for annual holiday.

Milling

The tonnage treated was reduced to 1,586,600 dry tons, but the ion-exchange and precipitation areas were kept at plant capacity because of higher U_3O_8 content in the ore. The tons milled per day was scheduled lower and averaged 4,444 tons per working day.

Recovery was increased to 94.72 percent as compared to the previous year's average of 93.11 percent. The improved extraction performance is credited to the better use of the automated acid, steam, and chlorate controls as well as to the additional recycling of solution and pulp which became feasible with the lower input tonnage. Leach data are recorded on mechanically punched cards and are statistically analyzed in the tabulating department. The information compiled has led to improved grade of the final product to the highest economical percentage believed possible with the present circuit. Research work has been initiated and laboratory equipment purchased to carry out further tests to establish a flow sheet for the production of a reactor grade product.

The flow in the grinding plant has been made more flexible in that either, or both, rod mills can be used with any, or all, of the four pebble mills, resulting in a saving of 4 cents per ton in the consumption of grinding rods and a more efficient use of off-peak power.

Safety

The emphasis on safe production was pursued through courses given to supervisors and by the introduction of the "Safety System" throughout the various phases of the operation. Changes were enacted in the Workmen's Compensation Act that make a comparison of statistics with previous years difficult. The injury frequency of 20.1 per million man hours worked for the year was again the best in the area.

The average number of employees was 940: 550 underground, and 390 on surface. M. J. de Bastiani was mine manager.

Macassa Gold Mines Limited
(Bicroft Division)

Bicroft Uranium Mines Limited was incorporated in April 1955, as an amalgamation of Centre Lake Uranium Mines Limited and Croft Uranium Mines Limited. On 1 November 1961, Bicroft Uranium Mines Limited and Macassa Mines Limited were amalgamated under the name of Macassa Gold Mines Limited. Details of the amalgamation, and the officers and directors are given in the gold section of this report, under Macassa Gold Mines Limited. The mine address of the Bicroft Division is R.R. No. 3, Bancroft.

The Croft properties are in Cardiff township, Haliburton county, and Faraday and Herschel townships, Hastings county. The Centre Lake property is in Cardiff township.

Mining operations at the Centre Lake property continued from 1 January to 20 May; milling, from 1 January to 31 May 1963.

SHAFTS, CENTRE LAKE MINE

Location	Inclination	Number of Compartments	Vertical Depth from Surface
			feet
No. 1 shaft, claim E.O.5936; N.½, lot 27, con. XI, Cardiff twp.	Vertical	3	234
No. 2 shaft, S.½, lot 28, con. XI, Cardiff twp.	Vertical	5	1,843

Development work completed in 1963, and the accumulated totals at the time mining operations ceased on 31 May are given in the following table:

Level	Drifts		Crosscuts		Raises	
	1963	Total	1963	Total	1963	Total
	feet	feet	feet	feet	feet	feet
Adit	———	1,784.0	———	383.0	———	———
1st	———	9,261.8	———	5,583.2	———	2,323.3
2nd	———	7,041.0	———	5,533.5	———	6,114.5
3rd	———	6,859.5	———	6,153.5	———	7,468.5
4th	———	6,204.0	———	5,541.0	———	5,210.5
5th	63.5	6,432.0	———	5,624.0	———	7,926.0
6th	87.0	6,437.5	———	4,291.5	18.0	8,639.0
7th	———	6,435.0	———	5,150.0	———	7,957.5
8th	———	5,240.0	———	5,025.0	———	7,402.0
9th	558.0	6,064.0	150.5	4,675.0	145.5	6,528.0
10th	269.0	5,446.5	82.0	3,870.5	301.0	7,384.5
11th	309.5	4,915.5	———	4,127.0	1,529.0	9,198.0
12th	666.0	3,573.5	204.0	3,465.0	1,796.5	6,265.5
13th	928.0	3,698.0	281.0	3,486.0	792.5	5,228.0
Total	2,881.0	79,392.3	717.5	63,108.2	4,582.5	87,645.3

A total of 133,137 tons of ore was hoisted; 117,852 tons was milled; the mill averaged 1.016 tons per working day from 1 January to 31 May 1963.

The average number of employees was 183: 92 underground, and 91 on surface. J. D. Bryce, president, was in charge.

Metal Mines Limited
(Bancroft Division)

Faraday Uranium Mines Limited was incorporated in June 1949; in December 1963 it became the Bancroft Division of Metal Mines Limited. Further information on Metal Mines Limited will be found in the nickel-copper section of this report under Metal Mines Limited, Gordon Lake Division.

The Bancroft Division property comprises eight claims in Faraday township, Hastings county. The mine address is Bancroft.

Mining and milling operations continued throughout 1963.

SHAFTS, BANCROFT DIVISION MINE

Shaft	Location	Inclination	Number of Compartments	Total Depth below Adit Level
				feet
No. 1	Lot 16, con. XI, Faraday twp.	Vertical	3 to 750 feet 4 below 750 feet	1,455
No. 2	Lot 17, con. XI, Faraday twp.	Vertical	3	196

Development work in 1963 consisted of 3,471 feet of drifting, 3,407 feet of crosscutting, and 3,087 feet of raising. Total development footage to 31 December 1963 was as follows: 52,705 feet of drifts; 35,271 feet of crosscuts; 41,292 feet of raises. Diamond-drilling in 1963 consisted of 127 holes, totalling 17,478 feet, from underground.

New equipment added underground included two mine locomotive batteries (Gould 20 SH-15), and a pump (Mather & Platt type 1A, 5 stage).

The following is taken from the company annual report for the year ending 31 December 1963:

Production

Production was maintained at the contracted shipping rate of 65,000 pounds of uranium oxide per month. A total of 780,382 pounds of U_3O_8 was produced.

Mining

The bulk of the ore mined originated on the lower levels of the mine. A total of 152,216 tons was broken in stopes, distributed 10 percent in panel stoping, 37 percent in shrinkage, and 53 percent in cut-and-fill stoping. Broken reserves at the year's end totalled 24,368 tons, a reduction of 46,204 tons from the figure at the end of 1962.

Milling

The mill treated 355,039 tons for an average of 1,241 tons per milling day. Comparative statistics are as follows:

	1963	1962	1961	1960
Milled, tons	355,039	306,339	339,659	468,939
Heads, U_3O_8, percent	0.116	0.134	0.122	0.100
Tails, U_3O_8, percent	0.006	0.007	0.006	0.005
Recovery, percent	94.50	94.66	95.06	95.11
Precipitate grade, U_3O_8, percent	74.80	73.85	74.50	76.14

Development

Little development was carried out during the first half of the year, but a normal schedule was resumed in July. To date, ore indicated on the 1,050-foot level, the lowest on which work has been carried out, compares favourably with that developed on upper levels.

Ore Reserves

The development carried out during the latter part of the year was mostly crosscutting and other work outside the ore zones, and hence did not add materially to ore reserves. Additions to reserves reached important proportions only after the end of the year. The ore reserve estimate as of the end of 1963, therefore, shows a reduction from the previous year by approximately the number of tons mined.

The following table sets forth the relevant figures:

	1963 Grade U_3O_8			1962 Grade U_3O_8		
	tons	percent	pounds	tons	percent	pounds
Proven Ore						
Broken	24,368	0.100	48,537	70,572	0.099	140,365
Solid	149,700	0.124	375,251	294,795	0.141	830,989
Total proven ore	174,068	0.121	423,788	365,367	0.133	971,355
Probable ore	42,200	0.159	134,454	228,750	0.105	479,540
Total proven and probable ore	216,268	0.128	558,242	594,117	0.122	1,450,895

Costs

The following tabulation provides comparative cost data:

	1963	1962	1961	1960
Development	$1.47	$0.33	$1.39	$1.40
Mining	3.58	4.05	4.31	4.35
Milling	3.34	3.77	3.47	2.96
Total	$8.39	$8.15	$9.17	$8.71

The average number of employees was 260: 150 underground, and 110 on surface. D. R. Wilson was mine manager.

Rio Algom Mines Limited

Algom Uranium Mines Limited was incorporated in July 1953; Milliken Lake Uranium Mines Limited was incorporated in October 1952; Northspan Uranium Mines Limited was incorporated in June 1956; Pronto Uranium Mines Limited was incorporated in June 1953. The four companies were controlled by Rio Tinto Mining Company of Canada Limited. In June 1960, they were amalgamated under the name of Rio Algom Mines Limited with an authorized capitalization of 12,000,000 shares of no par value of which 10,612,132 shares have been issued. The directors and officers were: Hon. R. H. Winters, chairman and director; H. G. DeYoung, president and director; E. B. Gillanders, executive vice-president (mining) and director; W. B. Malone, executive vice-president (finance) and director; W. H. Bouck, Henry Borden, F. G. Gardiner, Sam Harris, Leo Model, F. A. Petito, J. N. V. Duncan, B. R. MacKenzie, W. A. Arbuckle, L. A. Lapointe, J. B. Ridley, W. A. Thomas, J. G. Edison, Hon. S. A. Hayden, Sir Mark Turner, J. H. Smith, and R. W. Wright, directors; A. C. Rae, executive vice-president (steel division); George Baker, secretary; H. S. Wilson, controller and treasurer; G. R. Devey, assistant secretary. The head office is at 335 Bay Street, Toronto 1. The address of the mines in the Elliot Lake area is Elliot Lake. Details of the Rio Algom Mines Limited, Pronto Division, Pater mine appear in the Nickel-Copper section of this report.

ALGOM DIVISION

The property comprises some 283 claims in the Blind River area, District of Algoma. Two mines, the Nordic and the Quirke, were being operated. Milling operations were suspended at the Quirke mine on 26 January 1961, and the mine is maintained on a care and maintenance basis.

Nordic Mine

Mining and milling operations continued throughout 1963 at the Nordic mine which consists of 140 claims in Townships 143, 149, and 155.

The vertical, six-compartment, Nordic No. 1 shaft, located on claim S.66619, in Township 149, has a total depth of 1,780 feet below the collar. Development work in 1963 consisted of 12,031 feet of drifting, 1,780 feet of crosscutting, and 22,840 feet of raising. Total development footage to 31 December 1963 was as follows: 86,137 feet of drifts; 21,174 feet of crosscuts; 154,401 feet of raises. Some three diamond-drillholes, totalling 397 feet, were completed from underground.

New equipment added was as follows:

1 lathe (McDougall model E-3, 18 in.).
20 mine cars (140 cu. ft. Granby).
1 exhaust fan (Sheldon 84 in.) and electrical equipment (west exhaust raise).

A total of 1,147,370 tons of ore was hoisted; 1,141,500 tons was milled; the mill averaged 3,309 tons per working day.

MILLIKEN DIVISION

The property consists of twenty-four claims immediately east of Elliot Lake in Township 149, District of Algoma.

Mining and milling operations continued throughout 1963.

SHAFTS, MILLIKEN LAKE MINE

Shaft	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 (service)	S.80247	Vertical	2	3,071
No. 2 (production)	S.80247	Vertical	3	3,400

The 276 south service raise is inclined and has a total length of 1,852 feet.

Development work in 1963 consisted of 3,493 feet of drifting, and 17,639 feet of raising. Total development footage to 31 December 1963 was as follows: 47,872 feet of drifts; 8,776 feet of crosscuts; 152,687 feet of raises. Diamond-drilling in 1963 consisted of some 1,622 holes, totalling 16,438 feet, from underground.

A total of 862,884 tons of ore was hoisted; 864,229 tons was milled at an average of 2,460 tons per working day.

NORTHSPAN-PANEL DIVISION

The properties include the Lacnor mine (formerly called the Lake Nordic), the Buckles property in Township 149, the Panel mine in Township 144, and the Spanish American mine in Township 150, all in the Blind River area, District of Algoma.

The Buckles property closed in October 1958, when all available ore had been removed, the Spanish American mine discontinued operations in February 1959, the Lacnor mine in June 1960, and the Panel mine in June 1961.

The following is taken from the company annual report for the year ending 31 December 1963:

Production of Uranium Concentrates

Production from the Milliken and Nordic mines amounted to approximately 4,789,000 pounds, compared with 4,993,000 pounds in 1962.

Milling

Further technical changes were made at each of the mills during the year to improve efficiencies and costs.

At Milliken, 1963 was a record year in both recovery of uranium and cost of reagents. At 94.4 percent, the recovery reached an all-time high, and cost of reagents was reduced by $0.15 per ton.

Continued experiments at ion exchange showed that further improvements over the 1962 performance could be made. Consumption of nitric acid and ammonia was reduced.

The reduction in manpower continued during the year, and at each mill it amounted to about 5 percent.

Production Summary	1963	1962	1961
Milled.....tons	2,005,729	2,071,790	2,850,921
Average calculated heads (U_3O_8 per ton).....lb.	2.51	2.56	2.55
Average recovery based on average calculated heads..percent	95.01	94.3	94.1

Sources of Ore

	1963	1962	1961
	tons	tons	tons
Broken Ore:			
Development	409,873	314,801	318,010
Stoping	1,724,509	1,692,669	2,549,985
Total	2,134,382	2,007,470	2,867,995
Tons of ore hoisted	2,010,254	2,069,560	2,837,191

Ore Reserves

	Milliken		Nordic	
	Ore	U_3O_8 Per Ton	Ore	U_3O_8 Per Ton
	tons	pounds	tons	pounds
Proven ore	302,000	2.25	745,190	2.77
Probable ore as disclosed by underground development[1]	602,000	2.08	1,604,495	2.45
Probable ore as disclosed by diamond-drilling[2]	8,120,000	2.36	6,523,793	2.44

[1]Includes dilution based on experience; excludes permanent pillars.
[2]Tonnages and grades undiluted.

The average number of employees was: at Nordic mine, 591: 328 underground, and 263 on surface; at Milliken mine, 457: 243 underground, and 214 on surface. W. P. Arnold was general manager; G. M. Godfrey was mine manager at Nordic; E. W. Cheeseman was mine manager at Milliken.

Stanrock Uranium Mines Limited

Stanrock Uranium Mines Limited was incorporated in March 1956, with an authorized capitalization of 5,000,000 shares of $1 par value; in 1958 the number of shares was increased to 6,000,000 of which 4,963,286 shares have been issued. The directors and officers were: G. W. Rowe, Jr., president and director; D. S. Robertson, vice-president and director; J. F. A. Nisco, V. V. Jacomini, J. R. Dunning, H. H. Merritt, J. C. Ward Jr., James Bruce, and L. T. Norville, directors; Harmon Duncombe, secretary; D. C. Marshall, treasurer. The head office is at 80 Richmond Street West, Toronto 1. The mine address is Box 1700, Elliot Lake.

The property comprises 22 claims, about 595 acres in Townships 144 and 150, Blind River area, District of Algoma.

Mining and milling operations continued throughout 1963.

SHAFTS, STANROCK MINE

	Claim No.	Inclination	Number of Compartments	Total Depth
				feet
No. 1 shaft	S.82324	Vertical	3	3,379
No. 2 shaft	S.82323	Vertical	2	2,953
Service raise	S.82323	Vertical	3	220

Development work during the year consisted of 13,117 feet of drifting, 434 feet of crosscutting, 880 feet of conveyorways, 125 feet of raising. Total development footage to 31 December 1963, was as follows: 110,272 feet of drifts; 2,852 feet of crosscuts; 6,020 feet of conveyorways; 4,025 feet of raises. Some 540 diamond-drillholes, totalling 8,008 feet, were completed in 1963 from underground.

New equipment installed in 1963 included the following:

SHAFT No. 1:
- 2 hoist tail ropes (1⅜ in. diam., 3,375 ft. long, 18 x 19 seal non-rotating, Anglo-Canadian).
- 4 friction hoist ropes (1¼ x 1⅜ in. diam., 3,435 ft. long, lock coil type, Anglo-Canadian).

MILL:
- 1 ammonia precipitation tank (8 x 46 ft., 40 ton capacity, Toronto Iron Works).
- 1 compressor (model 291, 5 hp. 2 cycle motor, Corken Compressor).
- 1 truck (Chevrolet ½-ton pickup, 6 cylinder, General Motors Ltd.).

UNDERGROUND:
- 20 stoper drills (JR-38, Canadian Ingersoll-Rand).
- 1 pump (1A 3 stage, 6 in., 60 hp., 520 gpm. at 250 ft. head, Mather & Platt).
- 4 pumps (1½ RVH, 1½ in., 10 hp., 160 gpm., 160 ft. head, Canadian Ingersoll-Rand).
- 2 pumps (1½ RVH, 1½ in., 7½ hp., 100 gpm., 160 ft. head, Canadian Ingersoll-Rand).
- 1 pump (1½ K & L, 1½ in., 5 hp., 100 gpm., 100 ft. head, Kelly & Lewis).
- 1 pump (1½ KRVL, 1½ in., 3 hp., 100 gpm., 80 ft. head, Canadian Ingersoll-Rand).

A total of 1,035,568 tons of ore was hoisted, 1,033,515 tons was milled at an average of 2,928 tons per working day.

The following is taken from the company annual report for the year ending 31 December 1963.

The mine is situated 15 miles by road from the town of Elliot Lake. Access to the mine is by means of two shafts about 800 feet apart on the shore of Quirke Lake. The ore hoisting shaft is 3,380 feet deep, and the service shaft is 2,950 feet deep. The ore zones are formed by a thin series of closely overlapping conglomerate beds, dipping an average of about 17 degrees to the south.

Ore is extracted by opening panel stopes, approximately 7 feet high by 35 feet wide, up dip from haulageways driven in the ore zone. The ore is scraped by means of slusher hoists into trucks. The trucks transfer the ore to conveyors, which deliver it to the hoisting shaft.

Concentration is by an acid leach ion-exchange process. Plant capacity for efficient operation is 3,000 tons per day. Milling commenced 1 March 1958.

An initial contract with Eldorado Mining and Refining Limited (Contract No. 1) covered 9,198,000 pounds of uranium oxide (U_3O_8). Deliveries under this contract were completed in June 1963. In August 1962, a contract (Contract No. 2) for an additional 2,886,105 pounds of uranium oxide was obtained; this contract and the remainder of Contract No. 1 to be delivered at the rate of 150,000 pounds of uranium oxide per month.

Summary of Operations

Ore milled	tons	1,033,515
U_3O_8 content	lb. per ton milled	1.889
Production, U_3O_8 packaged	lb.	1,845,662
U_3O_8 in circuit at year's end	lb.	112,423
Shipment of U_3O_8:		
No. 1 Contract	lb.	713,516
No. 2 Contract	lb.	1,077,555
Total U_3O_8 Shipped	lb.	1,791,071

Ore Reserves

Ore reserves, including developed and indicated ore reserves, but excluding possible ore reserves, are more than sufficient to fulfill Eldorado Contract No. 2, with a considerable margin of safety. In addition, the company's properties include relatively unexplored areas of significant extent, which according to geological projections contain possible ore.

Significant quantities of uranium oxide were recovered from mine drainage waters in 1961 and 1962. In 1963 the recoveries were greatly increased by a program of washing down stope walls and residues. Estimated recovery from mine waters in 1963 was 105,622 pounds of uranium oxide. This program will continue in 1964.

At the end of 1963, there remained to be shipped 1,808,550 pounds of U_3O_8 under the No. 2 Contract. Of this amount, 53,816 pounds were in containers ready for shipment, and an estimated 112,423 pounds were in the mill circuit.

Facilities

Early in the year, the reinstallation of No. 3 conveyor, now designated No. 4 conveyor, was completed to transfer ore from areas immediately east of No. 1 shaft to the shaft storage bin.

At the year's end the reinstallation of No. 2 conveyor, now designated No. 5 conveyor, was about 75 percent complete (in service 24 January 1964). This conveyor will transport ore from the concentrated mining area north of No. 2 shaft to a transfer point at the feed end of No. 1 conveyor.

In order to meet the product specifications of the No. 2 Contract, it was necessary to convert the concentrator precipitation circuit from the use of magnesium oxide to the use of ammonia as neutralization agent. The necessary ammonia storage tank and related equipment were installed in April and May of 1963.

The average number of employees was 599: 397 underground, and 202 on surface. F. R. Jones was mine manager.

ZINC—*see*—LEAD AND ZINC

Non-Metallics and Fuels

ARSENIC

In 1963, 187,450 pounds of arsenic trioxide, valued at $7,498, was recovered from concentrates shipped from the Cobalt-Gowganda area; in 1962, 160,750 pounds, valued at $6,832, was recovered.

ASBESTOS

The production of asbestos in Ontario decreased 5.16 percent in quantity, from 35,551 tons in 1962 to 33,715 tons in 1963; the value of production decreased 5.52 percent, from $5,686,720 in 1962 to $5,372,645 in 1963.

The general statistics for asbestos, gypsum, nepheline syenite, peat moss, and talc are combined and published here. These industries paid $603,915 to 98 salaried employees, and $2,337,681 to 427 wage-earners; fuel and electricity cost $668,451, and process supplies $872,233.

Canadian Johns-Manville Company Limited

Canadian Johns-Manville Company Limited was incorporated in September 1918. It is a wholly owned subsidiary of Johns-Manville Corporation. The authorized capitalization is 25,000 shares of $100 par value, of which 15,705 shares have been issued. The directors and officers were: K. V. Lindell, chairman and director; A. G. Sinclair, president and director; L. M. Adamson, F. A. H. Gallop, N. W. Hendry, and J. O. Eby, vice-presidents and directors; W. H. Soutar, secretary; H. W. Clarkson, treasurer. The head office is at 310 Victoria Avenue, City of Westmount, Quebec. The mine address is Matheson.

The company's holdings include twenty-six claims known as the Munro mine in Munro township, and the Barton Creek mine in Beatty township, Porcupine area, District of Cochrane.

Mining and milling at the Munro mine continued throughout 1963.

SHAFTS, MUNRO MINE

Shaft	Claim No.	Inclination	Number of Compartments	Sinking in 1963	Collar Depth	Depth Below Surface
				feet	feet	feet
No. 1 main.....	Veterans lot P.1152	Vertical	4	——	Surface	1,204
No. 2 or No. 1 service.....	L.4510	Vertical	3	308	Surface	936
No. 3.....	L.16365	Vertical	2	——	637	949

The 737-, 835-, and 941-foot main haulage levels were established at vertical depths of 712, 810, and 920 feet below the collar of No. 1 service shaft.

Development work in 1963 consisted of: 600 feet of drifting; 2,063 feet of crosscutting; 309 feet of raising. The total development to 31 December 1963 was as follows: 1,957,252 tons of overburden stripped; 32,128 feet of drifts; 21,529 feet of crosscuts; 6,425 feet of raises. Diamond-drilling consisted of 13 holes, totalling 3,643 feet, from underground.

Blast-hole stoping to slusher drifts continued to be the mining method employed, but mucking machine draw points have to a great extent replaced the slusher drifts. The 941-foot main haulage level was connected to shafts Nos. 1 and 2; a crusher chamber and sumps were established. The drive westerly from the 635-foot level toward the Barton Creek and Beatty areas was stopped in mid-year. Three grades of asbestos fibre were produced during the year; this included the new 7-H grade used in asphalt mixes.

The following equipment was added:

1 unit heater (Peerless, gas-fired).
2 tailings conveyor extensions.
1 dump truck (3 ton).
1 station wagon (Pontiac).
1 sewing machine for sly dust bags.
1 screen (Tyler double-deck).
1 sifter (Great Western Manufacturing).
2 fans (Joy axial-flow).
1 shaking table, with collector, airlock, and fan (Canadian Blower & Forge).

There was 1,081,708 tons of ore hoisted from underground; the mill treated 785,522 tons, operating at an average daily rate of 2,410 tons.

The average number of employees was 299: 90 underground, and 209 on surface. R. W. Winson was mine manager.

Hedman Mines Limited

Hedman Mines Limited was incorporated in August 1956 with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,368,085 shares have been issued. The directors and officers were: J. J. Mangan, president and managing director; J. C. Lavigne, vice-president and director; S. E. McCrory, secretary-treasurer and director; H. K. Passmore, director. The head office address is Box 467, Timmins. The mine address is P.O. Box 336, Matheson.

The property comprises 29 claims, about 1,164 acres, located in Warden and Munro townships, District of Cochrane, about 25 miles north-east of Matheson. The open pit is located near the centre of the Warden township property; the pilot plant is on the railway siding at Matheson.

Operations continued throughout 1963, and consisted of further stripping of the asbestos orebody, with the first bench in the open pit being established. The 40-ton pilot plant was operated intermittently, and some 853 tons of ore was treated. Sampling of the orebody, product evaluation, and market research were also carried out.

New equipment added consisted of:

1 screw conveyor, 4-inch.
1 screw conveyor, 6-inch.
1 electric motor (15-hp.).
1 machine, Tyler Ro-Tap.

E. W. Gagan was consulting engineer in charge of operations at the property, and 13 men were employed.

FLUORSPAR

There was no recorded production of fluorspar in Ontario in 1963.

GARNET

There was no recorded production of garnet in Ontario in 1963.

Stonefields Industrial Minerals Limited

Industrial Garnet Company Limited was incorporated in March 1958; in September 1963 the name was changed to Stonefields Industrial Minerals Limited with an authorized capitalization of 200,000 common shares of no par value and 200,000 preferred shares of $1 par value; all shares have been issued. The officers and directors were: H. F. Wiemer, president, director, and general manager; Mrs. I. J. I. Wiemer, vice-president and director; R. W. Wiemer, secretary-treasurer and superintendent. The head office is at 1774 Harriet St., North Bay. The mine address is River Valley.

The company's property consists of eighteen claims located in Dana, Crerar, McWilliams, and Gibbons townships, District of Nipissing.

Operations were continued in 1963. A temporary crushing plant has been built at the village of River Valley to supplement the plant in Gibbons township. Quartz, feldspar, granite, garnet, quartzite, gabbro, etc., are quarried in a number of places between Sault Ste. Marie and River Valley to produce such materials as chips for facing precast concrete panels, stucco dash, and roofing granules.

Construction in 1963 included open storage sheds (20,000 sq. ft., wood frame, plywood roof). Equipment added included an Allis-Chalmers front-end loader (H-3); an International truck (1900); a Hough payloader, an International ½-ton pickup; 3 belt conveyors; two double-deck screens (6 ft. x 28 in.).

The mill was operated intermittently in 1963, treating 5,000 of 5,500 tons of material mined in the open pit, and averaged 50 tons per working day.

The average number of employees was 22: 14 in the quarries, and 8 on surface.

GYPSUM

The production of gypsum in Ontario in 1963 increased 0.93 percent in quantity from 435,140 tons in 1962 to 439,206 tons in 1963; the value of production increased 21.58 percent, from $1,007,818 in 1962 to $1,225,301 in 1963.

Canadian Gypsum Company Limited

Canadian Gypsum Company Limited was incorporated in September 1907. The authorized capitalization is 3,000 shares of $100 par value, of which 2,710 shares have been issued. The directors and officers were: Edward Rembert, president and director; G. A. Long, vice-president and director; D. C. McConkey, secretary, treasurer, and director; Beverley Matthews and F. L. Stellner, directors; W. G. Parsons, T. R. McCleary and R. L. Jackson, vice-presidents. The head office is at 790 Bay Street, Toronto 2. The mine address is Hagersville.

The company operates a gypsum mine and plant in lots 14 and 15, concession IV, Oneida township, Haldimand county. The company owns or holds the mining rights on about 2,623 acres.

The mine is operated through the three-compartment, No. 1 vertical shaft, 102 feet deep, in lot 15. There is a vertical two-compartment ventilation and escapement shaft, 90 feet deep, known as No. 2, in lot 15. In 1959, No. 3 vertical, two-compartment, ventilation and escapement shaft was completed to a depth of 86 feet below the collar, in lot 14. The room-and-pillar method of mining is used.

The mine and mill operated throughout 1963.

A battery locomotive (Atlas type-D, 10 ton, Atlas Car & Manufacturing, Cleveland, U.S.A.) was added to underground equipment.

A total of 299,856 tons of ore was hoisted; 279,266 tons was milled, the mill averaging 913 tons daily.

The average number of employees, excluding the mill was 71: 58 underground, and 13 on surface. C. F. Gloeckner was works manager; C. F. McGrath was mine superintendent.

Domtar Construction Materials Limited (Gypsum Products)

Gypsum, Lime and Alabastine, Canada, Limited was incorporated in July 1927, and in May 1956, the capitalization was increased. The company became a wholly owned subsidiary of Dominion Tar and Chemical Company Limited in February 1959, and in March 1961 the name was changed to Domtar Construction Materials Limited (Gypsum Products). The head office is at 2100 Sun Life Building, Montreal 2, Quebec. The executive office is at 50 Maitland Street, Toronto. The mine address is Caledonia.

The company has two gypsum properties comprising 3,520 acres, of which 675 has been proven mineable, and a mill, in Seneca township, Haldimand county. The old mine, in lot 10, range 1 west, has been abandoned. Operations at the new mine in lot 8, range 2 west, continued throughout 1963. The room-and-pillar method of mining is used, which consists of rooms or pockets, leads, and crosscuts, all approximately 21 feet in width by 8.5 feet in height. A ton of gypsum ore in place is equivalent to about 13.7 cubic feet. Each foot of advance produces an average of 13.3 tons of gypsum. The total advance in 1963 was 13,443 feet; approximately 10 acres were mined out.

The mine transformer capacity was increased from 450 to 1,000 kva. with the introduction of a transformer installation underground. The underground primary crusher and shuttle car dumping station was moved 1,000 feet farther horizontally from the shaft bottom, and 2,000 feet of belt was added to the rock-conveying system.

During the year a total of 166,935 tons of ore was hoisted; 124,544 tons was milled. The mill averaged 554 tons daily.

The average number of employees, excluding the mill, was 29: 27 underground, and 2 on surface. C. L. Dryden was general manager; G. R. Hunt was mine superintendent.

MICA

The production of mica decreased in quantity from 501,272 pounds valued at $9,248 in 1962 to 342,185 pounds valued at $5,114 in 1963. There are no general statistic figures available because the production was attained by individual operators.

MINERAL WATER

There was no reported production of mineral water in 1963.

NATURAL GAS AND PETROLEUM

Production of natural gas increased 1.74 percent in quantity, from 15,648,294 thousand cubic feet in 1962 to 15,920,055 in 1963; the value of production increased 4.26 percent, from $5,802,387 in 1962 to $6,049,621 in 1963.

Production of petroleum increased 6.24 percent in quantity, from 1,134,534 barrels in 1962 to 1,205,376 in 1963; the value of production decreased 5.51 percent, from $3,661,174 in 1962 to $3,459,429 in 1963.

Full details on these industries are found in the 1963 report of the Department of Energy Resources.

NEPHELINE SYENITE

Production decreased 0.16 percent in quantity, from 254,418 tons in 1962 to 254,000 tons in 1963; the value of production increased 3.60 percent, from $2,605,421 in 1962 to $2,699,202 in 1963.

General statistics for the industry are given under ASBESTOS.

Indusmin Limited
(Nepheline Syenite Operation)

American Nepheline Limited was incorporated in January 1945; in 1961 the name was changed to Industrial Minerals of Canada Limited; in 1962 to Indusmin Limited. It is a wholly owned subsidiary of Industrial Minerals of Canada Limited. The authorized capitalization is 1,000,000 shares of no par value, of which 410,000 shares have been issued. The directors and officers were: H. J. Fraser, president and director; J. J. Mather, executive vice-president and director; F. D. Hart, R. C. Mott, and W. H. Woods, directors; J. T. McWhirter, treasurer; D. D. Anderson, secretary. The head office is 7 King Street East, Toronto. The mine address is Nephton, via Lakefield.

The property, consisting of about 2,424 acres, is located in concession IX, Methuen township, County of Peterborough.

Operations continued throughout 1963 in the open pit on the Cabin Ridge section of the property. Some 888 feet of rock trenching averaging two feet in depth was completed. A total of 15 diamond-drillholes, totalling 3,062 feet, was completed from surface. New construction consisted of a pumphouse (16 x 20 ft., Armco metal), and a dust collector (Wheelabrator dustube No. 80, model 171 series 5, cloth area 55,360 sq. ft., 147,000 cfm.) installed in primary mill (Wheelabrator Corp. of Canada Ltd.).

A total of 199,918 tons of ore was crushed, of which 199,826 tons was milled. The mill averaged 721 tons per working day.

The average number of employees was 74: 60 in the plant, and 14 in the pit. E. B. Wright was resident manager.

International Minerals and Chemical Corporation (Canada) Limited

Canadian Flint and Spar Company Limited was incorporated in March 1930. In December 1955, the name was changed to International Minerals and Chemical

Corporation (Canada) Limited. The company is wholly owned by International Minerals and Chemical Corporation, Old Orchard Road, Skokie, Illinois, U.S.A. The company officers were: T. M. Ware, president and director; B. R. Carlson, treasurer and controller; C. M. Edwards, secretary. The head office is at 4 King Street West, Toronto 1. The mine address is Box 309, Havelock.

The company owns about 511 acres, in Methuen township, County of Peterborough. The present operation is in lots 19, 20, and 21, concession VI, at the northeast end of Blue Mountain. The property is known as the Blue Mountain nepheline syenite mine.

Mining and milling continued throughout 1963.

New equipment included the following:

1 ball mill (Patterson 8 x 12 ft.).
1 air separator (Gayco 14 ft.).
1 shovel (Bucyrus Erie, 1 yd.).

The open-pit operation produced 139,101 tons. The mill treated 101,953 tons, averaging 403 tons per working day.

The average number of employees was 43: 37 in the plant, and 6 in the pit. L. F. McDonnell was manager.

PEAT MOSS

The production of peat moss increased 23.62 percent in quantity, from 24,801 tons in 1962 to 30,659 in 1963; the value of production increased 12.06 percent, from $455,826 in 1962 to $610,784 in 1963.

Atkins and Durbrow (Erie) Limited operated in Welland county gathering material, from 16 April to 15 December; the plant operated from 2 January to 23 December.

Amaranth Peat Products operated at Shelburne in Dufferin county from June to September.

General statistics for the industry are given under Asbestos.

PETROLEUM—see NATURAL GAS AND PETROLEUM

QUARTZ

The production of quartz and quartzite decreased in quantity and value, from 1,352,612 tons valued at $1,077,784 in 1962, to 952,166 tons valued at $644,287 in 1963. The major portion is produced by the mines in the Sudbury area, from their own pits and quarries. Quartz and quartzite are used as flux for ore processing.

SALT

Production of salt increased 1.01 percent, from 3,155,589 tons in 1962 to 3,187,491 tons in 1963; the value decreased 3.87 percent from $15,387,911 in 1962 to $14,793,161 in 1963. Brining operations were continued; in Essex county at Brunner Mond Canada Limited, Canadian Brine Limited, and Canadian Salt Company Limited in the Windsor-Amherstburg area; in Lambton county by Dow Chemical of Canada Limited and Domtar Chemicals Limited, Sifto Salt Division

in the Sarnia area; in Huron county by Domtar Chemicals Limited, Sifto Salt Division in the Goderich area. Underground mining of salt continued at the Canadian Rock Salt Company Limited at Ojibway near Windsor, and at Domtar Chemicals Limited, Sifto Salt Division, Goderich mine at Goderich.

The industry paid $400,391 to 92 salaried employees, and $2,346,260 to 458 wage-earners.

Fuel and electricity cost $700,891, and process supplies cost $869,056.

The Canadian Rock Salt Company Limited

The Canadian Rock Salt Company Limited was incorporated in September 1952, with an authorized capitalization of 50,000 shares of no par value, of which 5,162 shares have been issued. The directors and officers were: Daniel Peterkin Jr., president and director; W. D. Mahaffy, executive vice-president, general manager, and director; H. A. Clarke, vice-president, secretary-treasurer, and director; J. D. Mair, vice-president and director; L. M. McBride, assistant secretary and director; F. B. Common Jr., N. C. Hobson, F. H. Sobey, E. G. Smith, H. R. Stratford, and R. C. Vail, directors. The head office is at 30 Prospect Avenue, Windsor. The mine address is Ojibway.

The company's property is in concession 1, Sandwich West township, Essex county, on the shore of the Detroit River.

Operations continued throughout 1963.

SHAFTS, CANADIAN ROCK SALT MINE

Shaft	Inclination	Number of Compartments	Total Depth
			feet
No. 1	Vertical	4	1,082
No. 2	Vertical	3	1,025

Production remained at a fairly high level throughout the year. An additional 2,400 feet of conveyor and a second crusher station were installed underground. The conveyor cuts down truck haulage distances substantially. The second crusher station gives an alternate dumping arrangement in case of breakdown at either station. The run-of-mine salt from the faces is transported to a crushing location, 5,000 feet from the shaft bottom.

The mining pattern of room-and-pillar advance, with faces to a height of 20 feet, continues. The rooms are 50 feet wide, and truck-ways are 30 feet wide. The recovery factor of 50 percent remains unchanged, and the practice of leaving 6 feet of salt on the roof is still being maintained. Underground transformer stations and control rooms are being advanced each year as the faces advance.

Development work in 1963 on the 975-foot level consisted of 6,762 feet of drifting, 6,200 feet of crosscutting, and 8,243 feet of rooms. Total development footage to 31 December 1963 was as follows: 48,419 feet of drifts; 36,465 feet of crosscuts; 82,847 feet of rooms.

A total of 944,508 tons of salt was hoisted and milled. The mill treated a daily average of 3,511 tons.

The average number of employees was 158: 90 underground, and 68 on surface. W. M. Rice was mine manager.

Domtar Chemicals Limited
(Sifto Salt Division, Goderich Mine)

Astrea Company Limited was incorporated in March 1956, under Dominion charter. In December 1956, the name was changed to Dominion Rock Salt Company Limited; in July 1959 to Sifto Rock Salt Limited; in 1960 to Sifto Salt (1960) Limited; and in 1962 to Domtar Chemicals Limited, Sifto Salt Division, Goderich Mine. The company is a wholly owned subsidiary of Dominion Tar and Chemical Company Limited. The head office is at 2240 Sun Life Building, Montreal, P.Q. The mine address is Box 910, Goderich.

Operations continued throughout 1963.

SHAFTS, SIFTO SALT DIVISION, GODERICH MINE

Shaft	Inclination	Number of Compartments	Sinking in 1963	Total Depth
			feet	feet
No. 1	Vertical	3	———	1,867.5
No. 2	Vertical	———	418	1,835

Late in 1961 a start was made on sinking No. 2 shaft, which was completed to a depth of 1,835 feet below the collar in 1963. The shaft is circular in shape, 16 feet in diameter, concrete-lined with partitioned manway from collar to sump, and connects with the working level at a vertical depth of 1,757 feet below the collar. It provides a fresh air inlet and an auxiliary escapeway from the mine; there are no hoisting facilities; however, the design and location of the collar provides accommodation for a service cage.

Mining is carried out by the room-and-pillar method on the 1,760-foot level. Original headings were excavated 18 feet high and 60 feet wide. Later a large drill jumbo was used to increase the excavation height to 45 feet. Pillars are 210 feet square, giving an extraction ratio of 40 percent.

The production rate of rock salt and the tonnage shipped during 1963 was comparable with 1962. The surface expansion program was completed in 1963. The additional surface storage areas, started in 1962, were brought into use. New construction consisted of an air plenum and heater house over No. 2 shaft collar, and a new conveyor gallery from No. 1 shaft to the top of the extension to the screening building.

The following was added new equipment:

UNDERGROUND:
- 1 giraffe (Trump mounted on White chassis, boom motor Lister 22 hp.; traction motor, Cummins 130 hp.).
- 1 dump truck (Wagner telescopic, capacity 35 tons, Deutz 260 hp.).
- 1 truck (Landrover, 62 hp.).
- 1 road grader (Dominion Roads Machinery Ltd., 80 hp.).

SURFACE:
- 1 fan for No. 1 shaft (250,000 cfm., Sheldon Engineering).
- 1 heater for No. 2 shaft (Olson, 4,000,000 btu. addition to two existing heaters).

Development footage in 1963 consisted of 8,185 feet of drifting. Total development footage to 31 December 1963, was as follows: drifts, 32,154 feet, 220 feet of which has been for ventilation; raises, 108 feet.

A total of 1,012,500 tons of ore was milled underground; 812,627 tons was hoisted for further processing. The average daily milling rate was 3,200 tons.

The average number of employees was 144: 93 underground, and 51 on surface. The shaft contractor, The Cementation Company (Canada) Limited, employed an additional average of 43 men to complete the sinking of No. 2 shaft. W. G. Muir was mine manager.

SULPHUR

The total value of sulphur and sulphur products produced in 1963 increased 53.28 percent, from $952,877 in 1962 to $1,460,438 in 1963. Some elemental sulphur is recovered; however, the greater portion of Ontario's production is represented by the sulphur content of liquid sulphur dioxide and sulphuric acid, manufactured from smelter gases in the Sudbury area. There is also production of liquid sulphur dioxide and sulphuric acid in the Port Maitland area, from the smelting of zinc concentrates received from the mines operating in the Manitouwadge area.

General statistics for the production of sulphur are included in the statistics under NICKEL AND COPPER.

Canadian Industries Limited

The new No. 2 sulphuric acid plant of Canadian Industries Limited commenced operation in March 1958. It was constructed to produce sulphuric acid from the stack gas of International Nickel Company's iron ore recovery plant. The Cutler Acid Limited plant, purchased from Noranda Mines and located at Cutler, was moved to Copper Cliff; it commenced production as plant No. 3 on 30 November 1963. The three sulphuric acid plants and the liquid sulphur dioxide plant are located at Copper Cliff.

No. 1 plant produced 20,825 tons; No. 2 plant produced 114,059 tons; No. 3 plant produced 10,619 tons of sulphuric acid.

The liquid sulphur dioxide plant produced 82,412 tons.

The average number of employees was 98. A. A. Perley was works manager.

Cutler Acid Limited

Cutler Acid Limited was incorporated in October 1962 with an authorized capitalization of 20,000 shares of $100 par value of which 18,500 shares have been issued. The company officers were as follows: W. T. D. Ross, president; J. D. Wright, vice-president; R. W. Allgood, general manager; L. A. Wheable, secretary; E. H. Kemp, treasurer. The head office is at 130 Bloor Street West, Toronto. The plant address is Cutler.

The company, controlled by Canadian Industries Limited, took over the Sulphuric Acid Division (Cutler Plant) from Noranda Mines Limited who operated it under a management agreement. The plant, located on the north shore of Lake Huron in the Serpent River Indian Reserve, is in Lewis township, District of Algoma.

Operations continued from 1 January to 30 September 1963; the plant was then moved to Copper Cliff and commenced production as plant No. 3 of Canadian Industries Limited. Production from 1 January to 30 September, from the treat-

ment of 72,500 long tons of pyrite ore at an average of 290 long tons per working day, was as follows:

Sulphuric acid	net tons	110,000
Iron calcine	long tons	49,000

The average number of employees was 59. G. E. Norman was plant superintendent.

TALC

The production of talc in Ontario decreased 14.59 percent, from 8,082 tons in 1962 to 6,903 tons in 1963; the production value decreased 15.58 percent, from $127,912 in 1962 to $107,986 in 1963. The sole producer, Canada Talc Industries, also produced 3,139 tons of marble chips, valued at $41,987, which was included in the stone totals.

Canada Talc Industries Limited

Canada Talc Industries Limited was incorporated in July 1951, with an authorized capitalization of 1,600,000 shares of no par value, of which 1,050,341 shares have been issued. The officers were: A. D. Dickson, president; N. C. Urquhart, vice-president; C. H. Windeler, secretary-treasurer. The head office and mine office is at P.O. Box 250, Madoc.

The company's property in Huntingdon, Elzevir, and Madoc townships, County of Hastings, comprises six lots and includes the Conley and Henderson mines.

Operations continued throughout 1963. Mining is through No. 2 shaft of the Conley mine, and No. 3 shaft of the Henderson mine.

SHAFTS, CANADA TALC PROPERTIES

	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
CONLEY MINE				
No. 1 shaft (inactive)	Huntingdon twp. lot 15, con. XIV	Vertical	2	431
7th level winze (below 420 feet) (inactive)	lot 15, con. XIV	Vertical	2	451
Escapement raise (inactive)	lot 15, con. XIV	Vertical	1	185
No. 2 shaft	lot 15, con. XIV	Vertical	3	420
HENDERSON MINE				
No. 3 shaft	Huntingdon twp. lot 14, con. XIV	Vertical	2	456

Development work in 1963 consisted of 71 feet of drifting and 50 feet of crosscutting. Total development footage to 31 December 1963 was as follows: 14,243 feet of drifts; 4,217 feet of crosscuts; 3,793 feet of raises.

A total of 10,641 tons of ore was hoisted; 10,471 tons was milled, at an average of 50 tons daily.

The average number of employees was 18: 7 underground, and 11 on surface. H. E. Roscoe was manager.

Structural Materials

CEMENT

The production of cement in Ontario increased 1.67 percent, from 2,510,783 tons in 1962 to 2,552,665 tons in 1963; the value of this production increased 2.90 percent from $38,704,090 in 1962 to $39,551,719 in 1963.

The industry paid $1,452,986 to 202 salaried employees, and $4,721,918 to 841 wage-earners. Fuel and electricity cost $6,633,578 and process supplies cost $1,083,233.

The following is a list of the Ontario cement producers for 1963:

Canada Cement Company Limited:
- Belleville Plant, Belleville.
- Port Colborne Plant, Port Colborne.
- Woodstock Plant, Woodstock.

Lake Ontario Portland Cement Company Limited, Picton.

St. Lawrence Cement Company Limited, Clarkson.

St. Mary's Cement Company Limited, St. Marys.

CLAY PRODUCTS

The value of clay products manufactured in Ontario increased 8.30 percent, from $20,146,786 in 1962 to $21,819,687 in 1963. There were 52 reporting companies operating 56 plants; they paid $1,682,805 to 355 salaried employees and $6,537,196 to 2,057 wage-earners. Fuel and electricity cost $3,622,883, and process supplies cost $924,150.

CLAY PRODUCTS MARKETED, 1963

Kind of Product	Quantity	Value
BRICK:		
Soft-mud process, face — M	200	$ 10,000
Soft-mud process, common — M	147	4,390
Stiff-mud (wire-cut) process, face — M	237,029	12,024,063
Stiff-mud (wire-cut) process, common — M	20,090	474,976
Dry-press, face — M	5,191	291,598
Dry-press, common — M	1,294	81,722
Fancy or ornamental brick (including special shapes, embossed and enamelled brick) — M	14,026	1,031,471
Sewer — M	524	24,525
TILE:		
Structural (hollow blocks, including fireproofing and load-bearing tile) — tons	41,714	819,218
Floor — sq. ft.	767,349	82,775
Drain — M	53,335	3,094,958
Sewer pipe — feet	3,003,852	1,802,316
Pottery from domestic clay	———	566,222
Flue linings — feet	651,821	355,859
Other products	———	1,155,594
Total	———	$21,819,687

LIME

Production of quicklime increased 5.65 percent in quantity and increased 9.89 percent in value from 1962. Production of hydrated lime decreased 3.03 percent in quantity and increased 3.36 percent in value over 1962.

There were 11 operators with 13 plants and 52 kilns in use. The industry paid $284,469 to 53 salaried employees, and $1,617,379 to 347 wage-earners. Fuel and electricity cost $1,724,828, and process supplies cost $1,249,285.

The following operators produced lime in Ontario:

Bonnechere Lime Limited, Gratton township, Renfrew county.
Brunner Mond Canada Limited, Amherstburg.
Canada and Dominion Sugar, Chatham.
Canadian Gypsum Company Limited, Guelph.
Carleton Lime Products Company, Carleton Place.
Chemical Lime Limited, Ingersoll.
Cyanamid of Canada Limited, Ingersoll.
Cyanamid of Canada Limited, Niagara Falls.
Dominion Magnesium Limited, Haley.
Domtar Chemicals Limited, Gypsum Lime Division, Beachville.
Domtar Chemicals Limited, Gypsum Lime Division, Hespeler.
Indusmin Limited, Coboconk.
Rockwood Lime Company Limited, Rockwood.

LIME, 1963

Industrial Consumption	Quicklime		Hydrated Lime	
	Quantity	Value	Quantity	Value
	tons		tons	
Building trades, finishing, and masonry	19,003	$ 252,918	66,963	$1,528,715
Agriculture	705	8,034	1,971	28,832
Industry:				
Smelters	4,143	41,527	787	11,871
Iron and Steel	194,009	2,227,731	170	2,640
Gold milling	1,509	24,966	—	—
Uranium milling	90,852	1,086,028	105	1,558
Pulp and paper	25,758	259,341	1,770	25,340
Sugar	5,784	33,363	1,190	13,499
Tanneries	727	8,456	3,279	48,625
Fertilizers and insecticides	2,827	32,476	581	10,788
Chemical industries	267,540	2,682,465	18,461	333,387
Other consumers	234,835	2,638,274	9,976	133,389
Total	847,692	$9,295,579	105,253	$2,138,644

SAND AND GRAVEL

Production of sand and gravel increased 4.78 percent in quantity and 7.59 percent in value over 1962 production. There were 330 reporting pit operators and 9 reporting dredge operators. The industry employed 274 salaried personnel and paid them $1,326,854, and 1,927 wage-earners and paid them $7,708,437.

Fuel and electricity cost $2,262,830, and process supplies cost $1,116,248.

OUTPUT OF SAND AND GRAVEL

Source	1959	1960	1961[1]	1962	1963
Private pit operators.....tons	34,559,281	34,670,825	30,905,527	37,742,342	41,033,231
$	24,520,143	24,254,713	21,237,199	27,102,169	30,265,051
Dredged from the Great Lakes and rivers.....tons	1,306,943	1,163,678	1,123,897	1,074,148	1,033,666
$	1,616,294	1,490,251	1,380,597	1,257,201	1,158,613
Ontario Department of Highways.....tons	24,776,179	26,303,751	24,395,141	21,123,800	23,802,679
$	7,226,546	10,521,500	10,977,813	15,842,850	17,852,009
Counties and townships...tons	11,919,781	14,281,959	12,214,371	14,820,156	13,033,912
$	5,959,891	7,140,980	6,107,186	7,410,078	6,516,956
Railway ballast.....tons	1,419,519	1,240,620	1,569,263	1,840,367	1,386,262
$	372,728	522,264	641,276	752,906	545,575
Total.....tons	73,981,703	77,660,833	70,208,199	76,600,813	80,259,750
$	39,695,602	43,929,708	40,344,071	52,365,204	56,338,204

[1]Revised figures.

STONE

Production of stone increased 8.02 percent in quantity and 0.01 percent in value over the 1962 production. There were 80 reporting operators working about 94 quarries. The industry paid $1,128,283 to 231 salaried employees, and $4,106,954 to 1,029 wage-earners. Fuel and electricity cost $1,573,919, and process supplies cost $1,941,032.

OUTPUT OF STONE

Variety	1959	1960	1961[1]	1962	1963
Limestone.....tons	16,322,071	16,118,571	16,654,878	17,279,797	19,205,898
$	19,363,443	18,782,082	19,242,067	19,892,022	20,544,057
Marble.....tons	51,440	40,423	33,929	34,926	44,866
$	327,644	356,762	309,628	288,480	448,220
Trap and granite.....tons	882,236	1,695,446	1,647,655	1,448,916	1,116,629
$	1,811,344	3,631,262	3,515,601	4,318,067	3,537,948
Sandstone.....tons	33,049	84,143	25,381	34,009	35,201
$	550,994	450,553	425,796	544,981	543,482
Total.....tons	17,288,796	17,938,583	18,361,843	18,797,648	20,402,614
$	22,053,425	23,220,659	23,493,092	25,043,550	25,073,707

[1]Revised figures.

INDEX

NOTE: All places referred to are in Ontario unless otherwise designated.

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